

Davis, Leon and Brown, Alyssa Eve (2026) Digital Gaps and Opportunities: PWDs and Improving the Live Event Experience in Sports Stadiums. Annals of Leisure Research. ISSN 1174-5398 (In Press)

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Annals of Leisure Research

ISSN: 1174-5398 (Print) 2159-6816 (Online) Journal homepage: www.tandfonline.com/journals/ranz20

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To cite this article: Leon Davis & Alyssa Eve Brown (01 Aug 2026): Digital gaps and opportunities: PWDs and improving the live event experience in sports stadiums, Annals of Leisure Research, DOI: 10.1080/11745398.2026.2712314

To link to this article: https://doi.org/10.1080/11745398.2026.2712314

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ANNALS OF LEISURE RESEARCH
https://doi.org/10.1080/11745398.2026.2712314

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Digital gaps and opportunities: PWDs and improving the live event experience in sports stadiums

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ABSTRACT

Sports stadiums increasingly function as multipurpose venues, hosting large-scale live music events alongside sporting fixtures. Despite their technological sophistication, these environments often present barriers that limit participation and enjoyment for persons with disabilities. This study examines how digital technologies can enhance accessibility and inclusion in stadium-based music events, positioning digital systems as integral to how audiences navigate, orient themselves, and experience live leisure spaces.

Utilizing qualitative informal conversations with persons with disabilities, the research explores lived experiences of attending concerts in English sports stadiums and outlines opportunities for user-informed digital interventions. While peer advice, staff support, and existing technologies shape how attendance is managed, challenges remain in usability, awareness, and reliability across digital and physical infrastructures. The study highlights the potential of personalized wayfinding with step-free routing, augmented-reality venue previews, real-time service alerts, and integrated accessible media, including live captions and audio description, to support more autonomous and inclusive participation.

ARTICLE HISTORY
Received 6 February 2026
Accepted 21 July 2026

KEYWORDS
Digital leisure spaces; immersive technologies; mixed reality; accessibility; disability inclusion; smart stadiums

Introduction

Sports stadiums across England have evolved into multifunctional entertainment environments that host major sporting events alongside large-scale live music performances and cultural spectacles. These venues are increasingly shaped by digital infrastructures, including mobile ticketing, in-venue connectivity, data-driven crowd management, and immersive audio-visual systems, which influence how audiences move, orient themselves, and engage with events. Despite these advancements, persons with disabilities[1] (PWDs) frequently encounter visible and invisible barriers that limit their ability to navigate, access services, and participate on equal terms. Challenges such as unclear wayfinding, inconsistent staff knowledge, and unreliable digital information can affect both the practicality and enjoyment of live events.

Within leisure and event studies, accessibility is increasingly understood not only as legal compliance but as a matter of equity and belonging in cultural life (Bossey 2020; Herbison et al. 2023; Kearney 2020), and as part of wider transformations in technology-driven leisure engagement (Devine and Gale 2023). Scholars emphasize inclusive design and recognition of diverse sensory, cognitive, and physical ways of engaging with leisure environments. This also reflects growing scholarship positioning leisure as a site of social justice, where equitable participation depends upon challenging structural inequalities embedded within leisure spaces and practices (Cock, Coombes, and Swain 2025; Lawrence, Hill, and Mowatt 2024; Long, Fletcher, and Watson 2017). However, less attention has been given to how digital infrastructures embedded in these settings shape embodied and spatial experiences of access. This gap is particularly evident in large, commercially operated stadiums where digital systems mediate how people navigate and participate.

This paper addresses that gap by examining how digital technologies may enhance accessibility and inclusion for PWDs attending live music events in English sports stadiums. These events and venues present distinctive accessibility conditions compared with festivals, arenas, or purpose-built concert

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venues. Concert staging, floor seating, and crowd management can alter established routes, entrances, and sightlines, creating spatial unpredictability. High crowd density, amplified sound, and intense lighting further increase sensory and navigational demands, making stadium concerts an important setting in which to examine how digital systems can support more inclusive participation. Drawing on informal conversational data, it foregrounds lived experience as design insight. The study explores:

(1) how existing digital systems (e.g. wayfinding apps, mobile ticketing, in-venue information) enable or constrain access;
(2) how disabled attendees navigate stadium concerts in practice, and;
(3) what user-informed digital interventions could strengthen inclusive participation.

The analysis considers interventions including accessible wayfinding, augmented/virtual pre-visit familiarization, real-time service alerts, and integrated accessible media streams, positioning digital systems as infrastructure that shapes autonomy, confidence, and participation across the event journey.

Literature review

Disability, leisure, and inclusion

Leisure studies have shifted from viewing disability through a medical lens toward understanding it as socially and culturally constructed. Critiques by Aitchison (2009) and Horne and Howe (2009) exposed ableist assumptions in leisure research and showed that exclusion often stems from environmental design, institutional practice, and dominant discourses rather than individual impairment. Accessibility is therefore framed as an issue of equity, participation, and cultural belonging rather than simple compliance (Finkel and Dashper 2020).

Other research has examined how leisure participation contributes to identity, empowerment, and inclusion. Patterson (2001) highlighted serious leisure as a site of self-development for people with intellectual disabilities, while Cole et al. (2019) demonstrated that both motivation and environmental accessibility shape engagement. Darcy's work advanced a whole-of-life, and later whole-of-journey, approach to access, emphasizing that barriers arise across stages of participation from planning to reflection (Darcy 2012; Darcy and Dickson 2009). Dickson's research on inclusive sport events further shows how accessibility is shaped through interactions between organizational practices, service systems, and user needs (Dickson et al. 2016). More recent literature highlights the continued underrepresentation of disability perspectives in event research and calls for more lived-experience-led and whole-of-journey approaches to accessibility (Darcy and Dickson 2025; Darcy et al., 2025). Together, this scholarship positions accessibility as relational and systemic.

Research has increasingly extended questions of access into digital and cultural contexts. Bossey (2020, 2022) highlights how information and communication technologies can improve accessibility at live music events, while also noting uneven industry adoption. Policy research further frames participation in culture, sport, and leisure as a fundamental right, yet shows that structural barriers persist despite legal protections (see Georgescu 2025). Strobel, Gerling, and Rixen (2025) demonstrate that digital tools such as interactive seat selection can reproduce exclusion when not designed with disabled users in mind. However, digital systems are still frequently treated as neutral channels for information provision rather than as active spatial actors that shape movement, decision-making, and autonomy before and during live events. While this work establishes accessibility as relational and systemic, less attention has been given to how these dynamics operate within increasingly digitalized leisure environments.

Stadiums as multipurpose cultural spaces

Sports stadiums have evolved from single-purpose venues into multifunctional cultural arenas hosting concerts, festivals, and civic events (Getz and Page 2019; Richards and Palmer 2010). This shift reflects wider processes of urban festivalisation in which large-scale events generate economic and symbolic value (Yeoman et al. 2014). Scholars have explored how these changing uses reshape audience identities and relationships to place. Richards et al. (2021; 2022) show how stadium redevelopment alters notions of home, heritage, and

match-day ritual. At the same time, stadiums have become technologically sophisticated environments. Smart infrastructures and connected systems promise enhanced engagement and data-driven service delivery (Liang 2025; Panchanathan et al. 2017). However, emerging research suggests that smart stadiums also operate as sites of datafication, where fan behaviours are monitored, analysed, and normalized through digital systems (Hutchins, 2016; Yang and Cole 2022). These developments raise important questions about surveillance, inclusion, and the uneven accessibility of app-mediated environments. Yet these developments can produce new exclusions, particularly for visitors who rely on assistive technologies or need clear, reliable information. Research on sport venue accessibility further highlights how design, service systems, and information provision interact to shape the experiences of disabled spectators, underscoring the importance of integrated approaches rather than isolated accessibility features (Darcy et al., 2025). Koželj et al. (2025) note ongoing gaps in staff training and accessible communication, while Davis, Brown, and Hayes (2025) show that concert configurations often disrupt routes and facilities designed for sport spectators.

Digital mediation and the transformation of live event experience

One way of extending these insights is through digital leisure scholarship, which examines how technologies reshape participation. Digital leisure scholarship frames contemporary events as hybrid experiences shaped through interactions between physical environments and networked media, influencing how audiences anticipate, navigate, and remember live events (Redhead 2019; Silk et al. 2016). Research in live music contexts further shows that digital media are embedded in how audiences communicate, prepare for, and interpret event experiences, extending participation beyond the venue itself (Brown et al. 2020). In sport and music settings, digital platforms also intensify identity, belonging, and interaction, turning audiences into active participants across interconnected media spaces (Lawrence and Crawford 2022; Ludvigsen and Petersen-Wagner 2023).

Immersive and interactive technologies further reshape sensory and affective dimensions of leisure. Green (2025) illustrates how virtual music festivals can reproduce liveness and collective experience, while Reed et al. (2023) describe hybrid leisure communities formed through digital platforms. Work on audience engagement also highlights a growing expectation that live events incorporate participatory and co-creative digital elements as part of the overall experience design (Brown 2023). Iftikhar, Khan, and Pasanchay (2023) emphasize the potential of virtual and augmented environments to support spatial familiarization and rehearsal, particularly for disabled users when sensory comfort and usability are prioritized. However, much of this research focuses on remote participation rather than digitally mediated experiences within physical venues. Disability is rarely central, and access is often framed in terms of content rather than embodied navigation of complex spaces.

Recent developments in so-called 'smart stadiums' further complicate the role of digital technologies in shaping access. Venues such as Levi's Stadium (Santa Clara, California) and Tottenham Hotspur Stadium (London, England) increasingly rely on integrated mobile applications to manage ticketing, wayfinding, food ordering, and real-time communication (Duke, Markides, and Oyon 2017). These systems are often promoted as enhancing convenience, efficiency, and accessibility through personalized services and data-driven insights. However, such app-centric environments raise critical questions about digital inclusion.

While these platforms may support navigation and information access for some users, they can simultaneously create new barriers for others. Reliance on smartphones, stable connectivity, and digital literacy may disadvantage older attendees, those with limited technological confidence, or individuals using assistive technologies that are not fully compatible with proprietary apps (Wilson et al. 2022). Moreover, the centralization of services within a single-platform risks reducing flexibility, particularly when systems fail, are inaccessible, or provide incomplete information. As Hutchins (2016) argues, the increasing datafication of sport environments also introduces concerns around surveillance, behavioural tracking, and the normalization of data extraction within leisure spaces.

From an accessibility perspective, this raises a critical tension: digital systems that promise seamless, personalized experiences may simultaneously intensify exclusion when they are not designed inclusively from the outset. Rather than viewing smart stadium technologies as inherently progressive, it is therefore

necessary to critically examine how they redistribute the labour of access, potentially shifting responsibility onto users who must navigate complex digital ecosystems alongside physical environments.

Digital accessibility and inclusive design

As leisure environments become more digitized, accessibility must extend beyond physical infrastructure to include informational and communicative systems. Ellis (2019) shows how digital media can both enable and restrict cultural engagement depending on interface design. Lapierre et al. (2024) find that digital platforms can facilitate participation for people with sensory or mobility impairments when grounded in universal design principles. In event and sport settings, technologies such as real-time captioning, assistive media streams, and digital information services can enhance autonomy and reduce reliance on staff (Misener and Darcy 2014). However, Gillovic and McIntosh (2020) argue that such measures often remain peripheral rather than embedded in core planning.

Research on immersive and intelligent systems reinforces this concern. Schmidt (2021) and Sturm (2020, 2021) note that data-driven and interactive technologies are reshaping audience experience. Iftikhar, Khan, and Pasanchay (2023) stress that immersive tools can support empowering leisure experiences only when sensory load and cognitive demand are carefully managed. Despite these advances, digital accessibility research still tends to prioritize online participation or general usability rather than digitally mediated physical environments. We know comparatively little about how in-venue digital systems shape real-time, embodied experiences of access.

Conceptual framework

This study adopts an integrated framework combining digital leisure theory, inclusive design, and embodied accessibility. Stadiums are understood as hybrid environments in which physical space and digital infrastructures together shape how people anticipate events, move through venues, access information, and participate socially (Redhead 2019; Silk et al. 2016). A whole-of-journey perspective informs the analysis, recognizing that accessibility unfolds across planning, arrival, in-venue navigation, service interaction, and post-event reflection (Darcy 2012; Darcy and Dickson 2009; Darcy et al., 2025). Accessibility is therefore relational and systemic, emerging through interactions between organizational practices, service systems, and user needs (Dickson et al. 2016).

Inclusive design principles further frame digital systems as integral components of the environment rather than neutral tools. Ticketing platforms, wayfinding applications, and in-venue information services can enable or constrain participation depending on how well they align with diverse bodies and spatial arrangements. Insights from research on digitally mediated and immersive event experiences extend this perspective by showing that digital systems shape how events are imagined and experienced (Green 2025; Lawrence and Crawford 2022). Immersive environments may support spatial familiarization and confidence when designed with attention to sensory and cognitive needs (Iftikhar, Khan, and Pasanchay 2023).

The study conceptualizes digital accessibility in stadium concerts as emerging from relationships between technologies, spaces, and bodies across the event journey. By foregrounding lived experience as design knowledge, it identifies opportunities for interventions such as personalized wayfinding, immersive previsit familiarization, and responsive in-event information systems that support more autonomous participation.

Methodology

Research design

This study adopted a qualitative, in-situ approach using informal conversations to explore how digital and spatial accessibility are experienced by PWDs at live music events in sports stadiums. Informal conversations are increasingly recognized as a valuable method for capturing situated, time-sensitive experiences in dynamic environments where formal recorded interviews may be impractical or intrusive (Davis and Brown 2024; Swain and King 2022). The study takes an interpretive qualitative orientation concerned with

credibility, contextual depth, and trustworthiness rather than statistical generalization (Lincoln and Guba 1985). In keeping with this qualitative and context-sensitive approach, the following sections clarify how disability and access needs were understood within the sample and outline the authors' reflexive positioning in conducting brief in-situ conversations in live event environments. This approach also responds to calls for disability and event research that centres lived experience rather than relying solely on organizational or policy perspectives (Darcy and Dickson 2025).

Data collection and sample

Data were collected across seven football stadiums in England during 10 large-scale live music concerts between 2023 and 2025. A total of 103 eventgoers (see Table 1) participated in brief, spontaneous conversations lasting approximately 1–5 min.

Participants were approached opportunistically in circulation areas, queues, and accessible viewing platforms and hospitality areas before performances began, ensuring engagement did not disrupt their experience (Davis and Brown 2024). The authors did not target specific demographic groups but engaged a broad range of attendees to capture diverse perspectives typical of stadium concerts (see Table 2).

Participants were included on the basis of self-identified disability and/or access requirements relevant to attending stadium concerts. In line with social and relational models of disability, the study did not seek clinical or diagnostic detail but instead focused on how individuals described their own access needs in relation to navigating large leisure environments (Darcy and Dickson 2009; Imrie and Hall 2001; Kearney 2020). Participants discussed a range of access requirements, including mobility-related needs (e.g. limited walking tolerance, fatigue, or use of step-free routes), sensory access needs (e.g. managing sound, lighting, or crowd density), and communication and information needs (e.g. reliance on clear signage, captions, or staff guidance). Several attendees referenced the use of mobility aids such as wheelchairs or walking sticks and/or the use of accessible viewing platforms and step-free infrastructure. A smaller number described situational or fluctuating conditions that shaped stamina, timing, or route choice, reflecting scholarship that recognizes disability and access as dynamic and context-dependent rather than fixed biomedical categories (Darcy 2012). This approach foregrounds lived experience and environmental interaction as central to understanding access in leisure spaces (Aitchison 2009; Devile and Kastenholz 2020).

Conversations focused on experiences of navigating the venue, using digital tools, accessing facilities, and managing uncertainty. The live setting occasionally led to nearby attendees contributing brief comments, but care was taken to maintain individual exchanges. Due to the fast-paced and public nature of the environment, audio recording was not appropriate. Instead, key points were recorded in a smartphone notes application during or immediately after conversations, consistent with informal conversational methods in live contexts (Davis 2025; Swain and King 2022). Notes were expanded shortly after each event to preserve detail and context, balancing ecological validity with practical constraints (Davis and Brown 2024). Because conversations were not audio-recorded, the participant excerpts presented throughout the findings are reconstructed from contemporaneous field notes and expanded researcher notes rather than verbatim transcripts. These excerpts are intended to accurately represent the substance, wording, and meaning of participants' accounts while acknowledging the interpretive nature of researcher-generated field notes. Data collection continued until recurring patterns were evident and no substantially new insights were emerging, indicating sufficient thematic depth (Mwita 2022).

Table 1. Concerts attended by the authors during 2023–2025.

Sports Stadium	City	No. of concerts attended
Wembley Stadium	London, England	2
Stadium of Light	Sunderland, England	2
Riverside Stadium	Middlesbrough, England	2
University of Bolton Stadium	Bolton, England	1
Etihad Stadium	Manchester, England	1
Lancashire County Cricket Ground	Manchester, England	1
Villa Park	Birmingham, England	1

Table 2. Concert attendee characteristics (103 concertgoers).

Category	Group	Number	Percentile
Gender	Male	43	42%
	Female	54	52%
	Preferred not to self-identify gender[a]	6	6%
Attendance history	Attended a live music concert at a sports stadium before	83	81%
	First-time attendee at a sports stadium concert	20	19%

[a]Gender was self-reported where participants chose to disclose it.

Data analysis

Data analysis followed an inductive thematic approach informed by reflexive qualitative analysis. Analysis began with repeated reading of the expanded notes to build familiarity with the dataset. Attention was given to descriptions of spatial navigation, digital tool use, interactions with staff, and expressions of uncertainty, confidence, or exclusion. Initial observations were documented as analytic memos (Salmona and Kaczynski 2024).

A systematic coding process followed. Data segments were assigned descriptive codes reflecting features such as pre-event planning, wayfinding challenges, peer knowledge, digital information use, and sensory management. Coding was iterative, with earlier data revisited as new codes developed, following reflexive thematic analysis principles (Braun and Clarke 2022). Codes were then organized into broader themes capturing shared processes rather than frequency alone. Themes were refined through ongoing comparison with the dataset to ensure coherence and grounding in participants' accounts. To enhance transparency and credibility, illustrative participant excerpts, reconstructed from contemporaneous field notes, are presented throughout the findings to convey the meaning and substance of attendees' accounts.

Ethics and positionality

Ethical approval was granted by the authors' institutional research ethics committee prior to data collection. Research in live event environments presents ethical complexities due to public settings and spontaneous interactions. Verbal informed consent was obtained before each interaction, with participants informed of the study's purpose, voluntary nature, and right to disengage (Swain and King 2022). This approach prioritized capturing embodied, real-time accounts of accessibility within complex leisure environments. The study followed a situational ethics perspective, recognizing that ethical practice requires reflexive judgement during field encounters (Guillemin and Gillam 2004; Taquette and Borges da Matta Souza 2022). Care was taken to ensure participants controlled the depth of disclosure. No identifying data was collected, and notes were stored on password-protected devices before transfer to secure encrypted storage. Conversations were brief and timed to avoid interfering with event enjoyment.

Both authors attended multiple concerts as in-situ researchers, conducting informal conversational data collection and shared observation while engaging in ongoing reflexive field discussions during and after events to support interpretive depth and analytic rigour. Ongoing dialogue between the authors formed part of the analytic process, supporting transparency and interpretive rigour in the handling of researcher-noted data (Guillemin and Gillam 2004; Lincoln and Guba 1985). Participants were approached respectfully in low-pressure moments (for example queues, circulation areas, or upon accessible platforms) using a brief explanation of the study and an explicit invitation to decline. Conversations were intentionally short and participant-led, with individuals able to determine the depth of disclosure and to end the interaction at any time. This approach aligns with situational ethics perspectives that emphasize sensitivity, consent, and participant control in unpredictable field environments (Swain and King 2022; Taquette and Borges da Matta Souza 2022).

Reflexive qualitative practice was used to distinguish between descriptive accounts and interpretive commentary, supported by analytic memos and iterative engagement with the dataset (Braun and Clarke 2022; Salmona and Kaczynski 2024). Ongoing reflexive attention was given to how assumptions about disability, technology, and event environments might shape interpretation, consistent with credibility-focused qualitative inquiry (Lincoln and Guba 1985; Silverman 2024).

Findings and discussion

Findings are presented as four themes; interpretation is integrated throughout. For readability, the terms *participants*, *attendees*, and *eventgoers* are used interchangeably in this section to refer to people who contributed to the informal conversations during stadium concerts. This study explores how digital technologies shape accessibility and inclusion for PWDs attending live music events in English sports stadiums. The themes are presented in sequential order, tracing accessibility across the event journey from pre-event anticipation to in-venue navigation, real-time adaptation, and longer-term design implications.

Pre-event: anticipation, familiarization, and affective accessibility

Accessibility work began well before arrival at the stadium. Participants described preparing for concerts through information seeking, spatial rehearsal, and emotional regulation, reinforcing whole-of-journey understandings of access (Darcy and Dickson 2009; Darcy et al., 2025). This uncertainty was especially evident in how participants prepared for arrival and attempted to visualize routes through unfamiliar stadium spaces. One eventgoer explained how she uses digital tools to simulate routes in advance, noting that 'using the Street View is good because you can see where actual drop kerbs are'. Mainstream mapping technologies are therefore being repurposed as informal accessibility tools. However, this requires time, digital literacy, and confidence, placing the burden of accessibility work onto individuals rather than venues and extending the access journey before arrival (Darcy 2012). These experiences also reflect arguments that disability is produced through the spatial organization of environments rather than residing solely in individual bodies (Imrie 2012; Imrie and Hall 2001). In digitally mediated venues, these inequalities are shaped not only by architecture but also by the availability and design of digital information systems.

A recurring issue was the lack of clear and detailed pre-event information about venue layouts and facilities. One event attendee explained that seeing aspects of a venue in advance made a significant difference to her confidence, noting that a video walkthrough helped her understand 'where I could get to and things like that'. This kind of preview reduced the cognitive effort required on arrival and allowed her to plan routes and identify facilities ahead of time. Without such information, participants described entering venues with a heightened sense of risk, unsure whether advertised access features would be usable in practice. This reflects broader arguments that accessibility includes informational and psychological dimensions, not only physical provision (Darcy 2012). Another participant described arriving at a previous concert feeling 'on edge the whole time because I didn't know where anything was going to be', explaining that uncertainty about entrances and facilities made the experience more stressful than the performance itself.

Pre-visit familiarization was closely tied to managing bodily needs and time pressure. An attendee emphasized the importance of knowing toilet locations beforehand so that she did not have to 'search for it when I desperately need it'. Spatial uncertainty was therefore experienced not only as inconvenience but as anxiety and loss of control. Accessibility in this context includes affective dimensions such as reassurance, predictability, and perceived autonomy, echoing calls to recognize emotional and cognitive aspects of participation in event environments (Darcy and Dickson 2025). An attendee explained that researching venues in advance was 'the only way I can relax enough to actually enjoy it', noting that without prior visual information, he spent much of the event 'just trying to figure out where things were instead of being in the moment'.

Participants also described piecing together information from multiple digital sources to build mental maps of venues. Online images, maps, and user generated content were used to approximate an understanding of entrances, internal routes, and seating areas. However, this process was fragmented and dependent on what could be found rather than what venues intentionally provided. Disabled attendees were therefore undertaking additional digital and emotional labour simply to establish whether attendance felt feasible. Participants described this preparatory work as necessary but tiring. One attendee explained, 'I feel like I have to do the venue's job before I even leave the house'. Another noted, 'I'm not just checking the ticket, I'm checking entrances, toilets, lifts, where to sit, how to get out – everything'. For some, this shaped whether attendance felt possible at all. As one participant put it, 'If I can't find enough information beforehand, I start thinking maybe it's not worth the stress'.

These experiences highlight the role of digital media in shaping how leisure events are anticipated and emotionally negotiated. Research on music festivals similarly shows that digital media are central to how

attendees prepare for, imagine, and emotionally orient themselves toward live events, with online communication and digital content shaping expectations well before arrival (Brown et al. 2020). Digital leisure research shows that mediated environments influence not only how events are consumed, but how they are imagined and prepared for in advance (Silk et al. 2016). This aligns with broader calls to develop a more critical digital leisure studies that recognizes how technologies shape identities, participation, and inequalities across leisure contexts (Carnicelli, McGillivray, and McPherson 2017; Redhead 2019; Spracklen 2015). For participants in this study, the event experience began with digital exploration of space, which influenced their willingness to attend and their expectations of safety and comfort. Such practices illustrate how leisure participation increasingly unfolds across interconnected digital and physical stages, with mediated exploration forming part of the lived experience of attending events (Silk et al. 2016).

This points toward the potential of immersive and interactive technologies to support affective accessibility. Several attendees suggested that being able to 'look around properly before going' would make a major difference, with one noting that a virtual walkthrough 'would take away that fear of the unknown straight away'. Research on virtual and augmented environments indicates that immersive systems can help users develop spatial familiarity and confidence prior to physical travel, particularly when sensory load and interface complexity are carefully managed (Iftikhar, Khan, and Pasanchay 2023). Studies of digitally mediated event experiences also show how technological layers reshape anticipation and perceptions of presence (Green 2025). In the context of stadium concerts, virtual walkthroughs or augmented previews could therefore provide accessible representations of routes, seating areas, and facilities. Rather than functioning as promotional extras, such tools could act as accessibility infrastructures that reduce uncertainty and support independent decision making.

Overall, this theme demonstrates that accessibility is an anticipatory and emotional process as well as a spatial one. Participants' accounts show how pre-visit uncertainty generates cognitive and affective labour that can be reduced through clearer, more immersive, and more trustworthy digital representations of venues. From a whole-of-journey perspective, digital familiarization tools have the potential to shift accessibility from reactive problem solving toward proactive inclusion before the event begins (Darcy and Dickson 2009; Darcy et al., 2025).

In-venue navigation: spatial legibility and digital wayfinding

This theme focuses on how attendees attempt to understand and navigate the fixed spatial layout of the stadium, highlighting how limited digital wayfinding undermines spatial autonomy even when conditions are stable. Once on site, participants described difficulty not simply with movement, but with understanding the stadium as a navigable space. One attendee explained: 'It's not just getting there – it's knowing where 'there' actually is when everything looks the same'. Another noted, 'You think you're going the right way and then suddenly you're stuck or turned around'. Wayfinding was described as an ongoing process of interpretation and adjustment, with attendees constantly assessing routes, entrances, and facilities, often without dependable spatial information. Accessibility in this context was shaped through interactions between bodies, built environments, and digital systems that either supported or undermined spatial legibility, reinforcing whole-of-journey understandings of access.

Once inside the stadium, attendees reported a sharp drop in reliable navigational support. An attendee described how large venues can become disorienting without clear guidance and suggested that a tool allowing users to search for facilities such as toilets and receive directions would be valuable. This need was intensified by inconsistent staff knowledge, particularly where temporary event staff were unfamiliar with accessible routes or facilities. Digital systems were imagined as stable layers of spatial information within complex service environments (Dickson et al. 2016). Several attendees described this lack of reliable guidance as particularly frustrating because it occurred after extensive preparation. One participant explained, 'I'd done all the planning, but once I was inside it didn't match what I'd seen online'. Another stated, 'The signs tell everyone where to go, but they don't tell me the route I can actually use'. This distinction between general wayfinding and accessible wayfinding was central to participants' experiences.

Breakdowns in wayfinding were moments of exclusion. One eventgoer recalled being 'pushed from pillar to post trying to find where this platform was. No one knew. It was ridiculous' when staff could not direct them correctly to the accessible seating. In technologically advanced venues, the absence of accurate

spatial information can render disabled attendees effectively invisible within operational systems (Darcy and Dickson 2025; Strobel, Gerling, and Rixen 2025). From a mobilities perspective, movement through space is structured by interconnected infrastructures that enable some journeys while constraining others (Sheller and Urry 2006). Within stadium environments, digital navigation tools, venue apps, and information systems form part of this mobility infrastructure, shaping how easily different bodies can move, pause, or reroute.

Participants also articulated visions of more supportive digital navigation. Another attendee proposed systems that could integrate parking, route planning, and seating suitability, asking for tools that could suggest 'the smoothest route to the venue' and identify appropriate seating based on individual requirements. This moves beyond generic accessibility labels toward personalized, context-sensitive routing (Steinfeld and Maisel 2012).

These experiences reveal an additional layer of embodied labour. When digital systems do not provide reliable routing, landmarking, or real-time location information, the work of accessibility is shifted onto individuals through vigilance and improvisation (Darcy and Dickson 2009; Darcy et al., 2025). Accessible digital wayfinding therefore emerges as a core infrastructure of inclusive participation in digitally mediated leisure environments. Overall, this theme shows that navigation at stadium concerts is shaped by unequal access to reliable spatial knowledge, with digital systems easing or intensifying that inequality. Participants suggested that more responsive, personalized, and spatially aware systems could reduce anxiety, increase autonomy, and shift accessibility from reactive assistance toward proactive inclusion.

Peri-event adaptation: temporal uncertainty and the need for live accessibility information

While the previous theme addressed how attendees make sense of the stadium's layout, this theme examines what happens when accessibility breaks down *after* spatial orientation has been achieved. Participants described stadium concerts as fluid, unpredictable environments where routes, facilities, and crowd conditions could change rapidly. Accessibility therefore depended not only on knowing where things were, but on whether those features remained usable over time. This introduces a temporal dimension of access, in which inclusion hinges on the availability of timely, reliable updates about changing conditions (Darcy and Dickson 2009; Darcy et al., 2025).

Participants emphasized that the absence of live, trustworthy information increased stress and reduced independence. Uncertainty arose not from disorientation, but from the risk that previously identified routes or facilities might no longer be accessible at a given moment. An attendee explained, 'You don't want to go all the way somewhere and then find out you can't actually use it. By then you're already tired and stressed'. Here, accessibility failure stemmed from instability rather than lack of spatial knowledge.

Uncertainty was intensified when access features were unavailable without warning. Participants described situations where lifts were out of service, routes were blocked, or spaces were unexpectedly crowded. In these moments, the lack of real-time updates created additional physical and emotional strain, as individuals had to improvise alternatives while managing fatigue, pain, or anxiety. These experiences show how accessibility can break down not only through design, but through gaps in communication and coordination across venue systems. Research on service interfaces in stadiums similarly notes that accessibility depends on the integration of information, staff knowledge, and operational practices rather than on infrastructure alone (Dickson et al. 2016).

From a mobilities perspective, such breakdowns represent disruptions in the infrastructures that support movement (Sheller and Urry 2006). Digital platforms, venue apps, and internal information systems form part of this mobility infrastructure, shaping how easily people can adapt to changing conditions. From a digital leisure perspective, these systems operate as embedded mediators of experience, influencing not only how people move through space but how they perceive control, risk, and participation within live environments (Silk et al. 2016). When these systems do not provide live updates about lift availability, congestion, or route closures, the burden of adaptation falls on disabled attendees, who must navigate uncertainty with fewer margins for error. Another attendee recalled arriving at a lift only to find it closed, saying, 'There was no sign, nothing on the app, so I'd already used up my energy getting there. Then you're stuck trying to work out a Plan B when you're already exhausted'. Participants emphasized that these disruptions had cumulative effects. One attendee explained, 'For someone else it might just be annoying, but for me it can use up

all the energy I had for the night'. Another noted, 'Once something changes, you're relying on guessing or asking strangers, and that makes you feel vulnerable'. These comments show how temporary breakdowns in information could quickly become embodied barriers.

Participants also expressed interest in technologies that could help them make decisions in real-time. Alerts about congestion, alternative step free routes, or changes to accessible facilities were seen as ways to maintain autonomy in dynamic environments. One participant suggested that live updates would make venues feel 'less like a guessing game', adding that 'if it told you a route was blocked or too busy, you could just change plans straight away instead of finding out the hard way'. These ideas align with broader work on digitally mediated event experiences, which shows how data driven systems are increasingly used to manage crowd flow and enhance visitor experience, though rarely with accessibility as a central priority (Liang 2025). At the same time, participants did not position digital systems as replacements for human support. Instead, they imagined them as tools that could provide consistent baseline information, allowing staff assistance to become more targeted and effective. This reflects inclusive design principles that emphasize flexibility and multiple forms of support rather than one size fits all solutions (Steinfeld and Maisel 2012).

This theme demonstrates that accessibility in stadium concerts is dynamic rather than fixed. Attendees' accounts show how the absence of real-time, reliable information transforms manageable environments into stressful and exclusionary ones. Digital systems that provide live updates, personalized alerts, and adaptive routing have the potential to reduce uncertainty and redistribute the work of adaptation away from individuals and back toward venue infrastructures. Real-time digital communication functions as a live informational layer over the physical venue, shaping how people experience and move through stadium space.

From workarounds to design: reimagining digital accessibility in stadium events

Across all stages of the event journey a recurring pattern was the need to create personal workarounds to compensate for gaps in stadium systems. Rather than experiencing accessibility as embedded in the environment, attendees described anticipating problems, gathering informal knowledge, and adapting continuously throughout the event journey. Digital tools often supported these strategies but were rarely designed with accessibility as a primary goal. As one attendee put it, 'You're always kind of on alert, thinking two steps ahead in case something doesn't work the way it's supposed to'. These accounts reflect scholarship identifying accessibility as a negotiated and relational process rather than a fixed feature of environments (Darcy 2012; Darcy and Dickson 2009).

Several participants relied on peer networks, forums, or social media to obtain practical accessibility information unavailable through official channels. One eventgoer noted that advice from other disabled attendees was often 'more reliable than the venue website', because it reflected lived experience rather than generic policy. This reliance on informal networks highlights both the value of peer knowledge and the absence of trustworthy, integrated accessibility information in formal event systems, echoing research showing that disabled audiences frequently compensate for institutional gaps through collective knowledge-sharing (Aitchison 2009; Bossey 2020; Devile and Kastenholz 2020). Participants often framed peer advice as more practical because it came from people who understood access as lived experience rather than policy. One attendee explained, 'The website says it's accessible, but another disabled person will tell you what that actually means'. Another said, 'I trust someone who has been there more than I trust a map that hasn't been updated'. These accounts highlight the gap between formal accessibility claims and situated accessibility knowledge.

Participants also described combining mainstream technologies to compensate for limited in-venue support. Mapping tools, messaging apps, and photo sharing were used to coordinate meeting points, check routes, or verify facilities. These practices show how disabled attendees assemble ad hoc digital ecosystems to manage uncertainty. Similar audience-led coordination has been observed in festival settings, where digital media support collaborative experience-making (Brown et al. 2020). One participant described 'having five different things open on my phone just to make sure I don't get stuck somewhere', though this improvisation requires time, confidence, and digital literacy, reinforcing inequalities (Ellis 2019; Strobel, Gerling, and Rixen 2025).

These findings support inclusive design research showing that accessibility is often treated as a retrofit rather than foundational. When digital systems are developed around assumed 'average' users, people with access needs must bridge the gaps themselves. Accessibility thus becomes hidden labour, with disabled attendees planning more, monitoring conditions more closely, and adapting more often than non-disabled audiences, taking considerably more time (Gillovic and McIntosh 2020; Imrie and Hall 2001; Steinfeld and Maisel 2012). This supports calls to shift responsibility for inclusion from individuals to systemic design and organizational accountability (Darcy et al., 2025).

Attendees' suggestions focused more on integration than entirely new technologies. Rather than requesting segregated tools, many wanted mainstream stadium apps and services to include accessibility features as standard. As one eventgoer noted, 'I don't want a separate 'disabled version' of everything. I just want the normal app to actually work for me too'. Another participant made a similar point, explaining, 'If the app is meant to be for everyone, then accessibility shouldn't be hidden away or missing'. A further attendee added, 'I don't want special treatment. I just want the same chance to get around without panicking'. These accounts reinforce the need to design accessibility into mainstream systems rather than treating it as a separate add-on. Ideas included personalized routing accounting for step-free access and crowd density, real-time notifications about lift outages or congestion, and clearer digital communication about accessible entrances, toilets, and viewing areas. These proposals align with inclusive design principles emphasizing flexibility and shared systems rather than segregation (Misener and Darcy 2014; Steinfeld and Maisel 2012).

Augmented and immersive technologies were also imagined as tools for building confidence before arrival. Participants highlighted the value of virtual walkthroughs or previews that would allow them to familiarize themselves with entrances, seating layouts, and facilities in advance. Such tools were seen not as novelty features but as ways to reduce anxiety and support independent decision making. One attendee suggested that exploring a venue virtually would mean 'you'd arrive already knowing the space instead of figuring it out while you're stressed'. This resonates with research showing immersive environments can support spatial rehearsal and anticipatory confidence when designed with sensory and cognitive accessibility in mind (Green 2025; Iftikhar, Khan, and Pasanchay 2023).

Taken together, these accounts suggest a shift in how digital accessibility should be understood in large-scale event environments. Rather than focusing on isolated assistive features, accessibility emerges from how digital, spatial, and organizational systems work together (Darcy et al., 2025; Dickson et al. 2016). When poorly aligned, disabled attendees fill the gaps through personal time, labour and informal networks. When designed more holistically, digital infrastructures can redistribute that labour back to venues, supporting greater autonomy and more equitable participation.

Implications of the research

Theoretical implications

Drawing on digital leisure theory, inclusive design, and whole-of-journey accessibility frameworks, this study advances digital leisure scholarship by reconceptualising digital accessibility as an embodied, spatial, and relational phenomenon rather than a purely informational or technical issue. While existing work has examined how digital media extend and mediate leisure experiences (Redhead 2019; Silk et al. 2016), this research demonstrates how in-venue digital infrastructures actively shape mobility, autonomy, and participation within physical environments. In doing so, the findings resonate with Lawrence's (2025) conceptualization of the claustropolitan and the enablements/constraints paradox of digital leisure, illustrating how the same digital systems that promise greater convenience, efficiency, and autonomy can simultaneously generate new forms of dependence, exclusion, and spatial constraint for disabled event attendees.

The findings also contribute to disability and event research by showing how digital systems function as part of the 'access chain' (Darcy and Dickson 2009), influencing not only pre-event planning but also real-time navigation and adaptation. This highlights the need to understand accessibility as produced through interactions between bodies, technologies, and organizational systems.

Importantly, the study introduces a critical perspective on the rise of data-driven and app-mediated leisure environments. Rather than assuming that increased digitization enhances inclusion, the findings show that digital infrastructures can simultaneously enable and constrain participation, depending on

their design, integration, and usability. This positions smart stadium technologies as sites of both opportunity and inequality, contributing to emerging debates around datafication, surveillance, and digital inclusion in leisure contexts (Hutchins, 2016 ; Yang and Cole 2022).

Practical implications for stadium and event design

This article responds to longstanding calls within event and sport management research to move beyond compliance-based approaches to accessibility (Darcy et al., 2025; Dickson et al. 2016). For stadium operators and event organizers, the findings indicate that digital accessibility is most effective when embedded within core infrastructures rather than added as separate features. Venue apps, ticketing systems, and information platforms can incorporate personalized accessibility settings such as step-free routing, facility search functions, and real-time service updates. Providing reliable, centralized digital information reduces reliance on informal peer networks and increases attendee confidence. Pre-event digital familiarization tools also emerge as an important area for development. Virtual walkthroughs, visual previews of entrances and seating areas, and interactive maps can support planning and help attendees anticipate sensory and spatial conditions. These tools are particularly valuable in stadium environments where layouts vary between events.

The research further suggests that digital systems should complement, not replace, human support. Clear and consistent digital information can reduce pressure on staff while ensuring assistance remains available when needed. Integrating digital tools with organizational practices is therefore essential for creating coherent and supportive accessibility experiences.

Policy and industry implications

Encouragingly, parts of the UK live events sector are already demonstrating how accessibility can be embedded through structured standards, accreditation, and continuous improvement. The findings align with a growing shift toward treating accessibility as a core dimension of event quality and innovation rather than a compliance obligation. As stadiums invest in smart technologies and data-driven services, this shift provides a foundation for extending inclusive practice into digital wayfinding, real-time communication, and pre-event familiarization.

Embedding digital accessibility requires coordinated action across policy, industry, and organizational levels. Responsibility cannot rest solely with individual venues or isolated technologies. Sector-wide frameworks and accountability mechanisms can help ensure digital systems, spatial design, and operational practices develop in integrated and inclusive ways.

Organizations such as *Attitude is Everything* demonstrate how accessibility can be embedded into industry standards. Their 'Live Events Access Charter' provides a recognized framework guiding venues and festivals in integrating disability equality into planning, staff training, communication, and audience experience. Its tiered accreditation structure promotes continuous improvement and accountability across both physical and digital aspects of delivery. Industry implementation further illustrates how policy translates into practice. *DF Concerts & Events*, promoters of major UK festivals including TRNSMT, have partnered with Attitude is Everything to strengthen accessibility planning and staff training. TRNSMT's 'Platinum status' under the Charter reflects an embedded approach spanning organizational culture, spatial planning, and audience services. These initiatives provide a strong foundation for expanding accessibility policy to explicitly include digital infrastructures through accreditation, funding requirements, and licensing processes. While such accreditation frameworks represent important progress, they do not guarantee consistent implementation across venues or events, and digital accessibility in particular remains uneven in practice, especially where apps, platforms, and venue systems are developed by different providers with varying levels of accessibility expertise.

Conclusion

This study examined how digital technologies shape accessibility and inclusion for PWDs attending live music events in English sports stadiums. Accessibility emerged as an ongoing process spanning pre-event planning, in-venue navigation, and real-time decision making. When digital infrastructures were fragmented

or unreliable, participants described increased preparation, reliance on informal networks, and continuous adaptation. When digital systems aligned with spatial layouts and organizational practices, they reduced uncertainty, supported autonomy, and enabled more confident participation. The findings extend accessibility research by positioning digital infrastructures as spatial and experiential actors rather than informational add-ons. Digital tools shape movement, anticipation, and social participation in large-scale venues, grounding digital leisure scholarship in the embodied realities of in-person attendance and reinforcing inclusive design principles that call for accessibility to be embedded across systems rather than retrofitted.

The research also highlights a moment of opportunity. As stadiums invest in smart technologies and data-driven service systems, accessibility can be built into digital infrastructures rather than treated as an afterthought. Tools such as personalized wayfinding, immersive pre-visit familiarization, and responsive in-event information systems can shift the labour of access away from individuals and back toward venues, supporting more equitable and self-directed participation. These findings also reinforce broader calls to foreground social justice within leisure scholarship by addressing structural inequalities that shape participation in increasingly digital leisure environments (Cock, Coombes, and Swain 2025; Lawrence, Hill, and Mowatt 2024; Long, Fletcher, and Watson 2017).

This paper forms part of a broader research agenda examining digitally mediated accessibility across the full event journey, including AI-supported communication before and during events and post-event digital storytelling that extends participation beyond the venue. Together, these strands position accessibility as a continuous, digitally supported process linking anticipation, attendance, and post-event engagement.

Although focused on live music events in English sports stadiums, these insights have wider relevance for other large-scale, technologically complex leisure environments. As live events become increasingly shaped by digital systems, ensuring these infrastructures are designed with inclusion at their core will be essential for equitable cultural participation. By centring lived experience and user-informed design, this research underscores the capacity of digital technologies not only to remove barriers but to reshape live event environments in ways that foster autonomy, confidence, and belonging.

Limitations and future research directions

This study is based on qualitative informal conversations with a relatively small participant group. While offering rich insight, the findings are not statistically representative and may vary according to impairment type, digital literacy, or familiarity with specific venues and technologies. The focus on English sports stadium concerts also limits generalisability. Other event formats and cultural contexts may involve different spatial and technological dynamics. The study prioritizes user perspectives and does not include direct analysis of venue management or technology providers, meaning organizational and technical constraints remain underexplored. Rapid technological change also means the study identifies broad design principles rather than fixed solutions.

Future research should examine how in-venue digital infrastructures can be integrated with AI-mediated communication systems to provide responsive real-time support while addressing ethical concerns. Emerging developments such as the metaverse and gamified leisure environments further complicate how accessibility may be experienced across hybrid digital-physical spaces (Pizzo et al. 2024; Valencia, 2026). Further work is also needed on post-event digital participation and on inequalities in digital literacy, device access, and platform usability. Comparative and interdisciplinary research involving designers, technologists, and venue operators could support participatory development of inclusive digital tools.

Note

1. In line with the terminology commonly used by many scholars in the field of events management and disability this paper utilizes the term 'persons with disabilities' (PWDs) in this article (also see Davis, Brown, and Hayes 2025). This is persons who identify as d/Deaf, disabled, and neurodivergent.

Acknowledgements

The authors would like to thank Dr Christopher J. Hayes and Dr Laura Nelson for their support.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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