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Using virtual reality to support autistic employees: a perspective on creating inclusive neurodiverse work environments

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The double empathy problem underscores a two-way gap in understanding between autistic and neurotypical individuals, contributing to systemic barriers in workplace communication and inclusion. Virtual reality (VR) technologies offer immersive, low-pressure environments for autistic users to build confidence, regulate stress, and navigate high-stakes workplace interactions. A strengths-based approach to VR design emphasizes autistic individuals' unique capabilities, such as attention to detail and innovative problem-solving, by incorporating user feedback, customizable prompts, and participatory co-design. To advance equity in neurodiverse employment, this paper concludes with five actionable strategies that position VR as a vehicle for systemic change, empowering autistic professionals and encouraging organizations to adopt inclusive design, universal learning principles, and long-term evaluation metrics.

KEYWORDS

autistic adults, employment, inclusion, neuroinclusion, virtual reality, environments

Introduction

Autism is a neurodevelopmental condition characterized by differences in social communication, sensory processing, and behavioral patterns (APA, 2013) and current estimates suggest there are approximately 1 in 31 autistic children in the United States (Shaw et al., 2025). As part of the broader neurodiversity paradigm, autism represents one of many naturally occurring variations in human cognition (Jaarsma and Welin, 2012). Neurodiversity, a concept introduced by sociologist Judy Singer in the late 1990s, highlights the vast range of human cognitive and behavioral traits (Singer, 2017). It encompasses both neurodivergent (ND) and neurotypical (NT) variations. Neurodivergence includes cognitive profiles such as autism, attention-deficit/hyperactivity disorder (ADHD), and dyslexia, which differ from typical cognitive patterns in areas like verbal skills, working memory, visual abilities, and processing speed (Wilson, 2024). Research indicates that approximately 15%–20% of the population is neurodivergent (Doyle, 2020). Neurodiversity has also evolved into a social movement, emphasizing the unique contributions of neuro-minorities and promoting the inclusion of neuro-minorities in society.

In response to this challenge, this paper offers new insights and perspectives at the intersection of neurodiversity, immersive technology, and workplace inclusion to present an integrated strengths-based framework for applying virtual reality (VR) in support of autistic groups and their workplaces. While prior work has explored VR as a support tool for autistic

individuals, this paper reframes VR as a systemic agent for change, leveraging immersive technology not to "fix" perceived deficits, but to empower autistic strengths in real-world professional contexts. Moreover, by situating the double empathy problem at the core of design considerations, this work uniquely emphasizes mutual adaptation between autistic and neurotypical individuals rather than one-sided accommodation. The paper suggests that participatory co-design methods with autistic stakeholders could help to inform practical equity-centered strategies using VR to address the double empathy problem. Through this approach, this paper makes a novel contribution by: (1) reframing VR as a platform for systemic inclusion rather than individual remediation, (2) advancing a co-produced design ethos informed by the double empathy framework, and (3) offering concrete steps for translating neurodiversity theory into sustainable workplace practice.

Despite increasing awareness and the emergence of neurodiversity hiring initiatives, significant employment disparities remain for autistic individuals (Bruyère and Colella, 2022; LeFevre-Levy et al., 2023). Employment rates for autistic individuals also remain disproportionately low, with only 15% of autistic adults employed, compared to 54% of adults with other disabilities (Ohl et al., 2017). Even when autistic individuals do obtain employment, job retention can often be short-lived, with rates as low as 15% (Wong et al., 2021). These inequities are often driven by a mismatch between the social norms in the workplace and the communication styles of autistic individuals (Black et al., 2020; Bury et al., 2021; Hayward et al., 2020; McKnight-Lizotte, 2018; Pelzl et al., 2022; Stratton et al., 2023). Misunderstandings stemming from differences in verbal and non-verbal communication often create friction between autistic and NT colleagues.

Milton's (2012) concept of the "double empathy problem" underscores this disconnect, pointing to a mutual difficulty in perspective-taking between autistic and NT individuals rather than attributing social challenges solely to autistic individuals (Khalifa et al., 2020; Lindsay et al., 2021; Petty et al., 2023; Thorpe et al., 2024; Waisman-Nitzan et al., 2021). These challenges in communication with NT employees often lead to anxiety for autistic employees (Bury et al., 2021; Hildebrandt et al., 2024; Khalifa et al., 2020; Petty et al., 2023; Woolard et al., 2021). As a result, the self-confidence of autistic employees in their work performance suffers (Stratton et al., 2023; Woolard et al., 2021). Indeed, recent studies have highlighted the importance of emotional regulation and self-efficacy for autistic individuals, further supporting the relationship between job-related stress and reduced self-confidence in autistic individuals (Cai et al., 2023; Conner and White, 2018; Kim et al., 2024; Kuo et al., 2025). However, and importantly, the double empathy problem also places responsibility on neurotypical (NT) individuals to adapt and engage in more reciprocal, inclusive communication practices (Milton, 2012). Without efforts from NT colleagues and institutions to better understand and accommodate autistic communication styles, the burden is unfairly placed on these individuals: an imbalance that reinforces exclusion rather than mutual understanding (Heasman and Gillespie, 2019). This imbalance in communication responsibilities also demonstrates a broader issue in structuring workplace norms. To address these systemic dynamics, scholars have increasingly adopted the social model of disability, a framework that redirects the focus from individual impairment to societal design, to understand and confront the exclusion experienced by autistic individuals (Woods, 2017). In the broader field of neurodiversity, researchers have recently looked at aspects of the social model of disability to address the needs of autistic individuals (Doyle, 2020; Dwyer, 2022; Dwyer et al., 2024; Whelpley et al., 2023). The social model of disability states that disability is determined by culture and society (Oliver, 1983). This model poses that individuals who differ from the majority are disabled by a society that is structured to accommodate the majority. This perspective challenges the traditional medical model of disability, which views ND traits as conditions requiring treatment or cure (Cox et al., 2021). However, this is not without critique. While the social model of disability offers insights into exclusionary societal structures, it has also faced criticism, particularly in relation to autistic people, for potentially reinforcing a divide between disabled and non-disabled individuals, which may inadvertently contribute to feelings of exclusion among autistic people. Critics argue that the model can oversimplify complex neurocognitive experiences by focusing primarily on external barriers, sometimes neglecting the internal, lived realities of autistic individuals (Woods, 2017). This is especially relevant to discussions of empathy, where over-reliance on the social model may risk reinforcing the false notion that autistic individuals inherently lack empathy, rather than recognizing differences in how empathy is expressed and perceived (Williams et al., 2021). However, and this notwithstanding, there is a growing body of research that explores the role of the social model of disability in the workplace (LeFevre-Levy et al., 2023; Santuzzi and Waltz, 2016; Thorpe et al., 2024). Work environments that favor employees who think and function like the majority often disadvantage autistic employees (Bury et al., 2021; Hayward et al., 2018; Hayward et al., 2020; Hedley et al., 2018; McKnight-Lizotte, 2018; Szechy et al., 2024). Work environments that fail to provide appropriate structures, such as inclusive practices and access to technological supports, create additional barriers to participation and success for autistic employees. Moreover, societal and institutional frameworks often prioritize neurotypical cognitive styles and behaviors, significantly impacting how autistic individuals access meaningful employment. These pervasive barriers go beyond individual interactions, manifesting in hiring protocols, workplace cultures, and organizational policies that frequently overlook the distinct strengths and requirements of autistic and neurodivergent people (Bruyère and Colella, 2022; Walkowiak, 2021). As a direct result, autistic adults can experience disproportionately high rates of underemployment, as highlighted earlier. This situation brings about substantial social and economic repercussions, including financial instability, limited healthcare access, and prolonged exclusion from career progression (Fabritius, 2022).

Given these challenges, it is evident that neurodiverse work environments would benefit from the implementation of policies and technologies that bridge social gaps and promote mutual understanding, while leading to supported and long-term employment. One such potential technology that can support this is virtual reality (VR). Although VR is not a universal solution, its versatility and immersive potential make it an appealing choice among inclusive design tools, particularly when collaboratively produced with autistic individuals (Newbutt et al., 2024). As such VR can promote and provide a safe and predictable platform

(Newbutt et al., 2016) for autistic adults to experience social interactions and develop their social skills in preparation for neurodiverse work environments (Amat et al., 2023; Hall et al., 2024; Kim et al., 2022; Smith et al., 2021). In more recent studies, VR has also been employed to help neurotypical employees better understand the experiences of their autistic colleagues. (Kim et al., 2022; Koniou et al., 2023; Lowy et al., 2023). By addressing both sides of the double empathy problem, VR has the potential to promote more inclusive and supportive work environments for autistic employees. In light of these challenges, recent research has turned to innovative technological solutions such as Virtual Reality to help foster mutual understanding and bridge communication gaps in neurodiverse workplaces. As mentioned earlier, hiring programs aimed at increasing neurodiversity represent an important step toward inclusive workplaces. However, these programs sometimes don't fully address the everyday difficulties autistic individuals encounter in typical work settings (Krzeminska et al., 2019). They may also not provide adequate support for social interactions, reduce anxiety, or foster mutual understanding among coworkers. We next discuss the current challenges and barriers to employment.

Challenges to employment and existing research

Job interviews often constitute a primary barrier to employment for autistic individuals, as success frequently depends on interpreting social cues and managing anxiety (Finn et al., 2023; Hildebrandt et al., 2024; Whelpley & May 2023). To evaluate the efficacy of a VR interview training platform, Smith et al. (2021) conducted a randomized controlled trial with autistic individuals, aged 16–26, transitioning to the workforce. The study's experimental group was provided with the Virtual Interview Training for Transition Age Youth (VIT-TAY) intervention and conventional pre-employment transition services (Pre-ETS), while the control group was provided with Pre-ETS only. VIT-TAY allowed participants to complete mock interviews with a virtual interviewer with the option to rehearse within a low-stakes setting. The researchers used a structured mock interview assessment, the Adapted Mock Interview Rating Scale, to measure performance among participants. The results indicated that participants using VIT-TAY had significantly greater improvements in interview performance (e.g., demonstrating confidence and professionalism; sharing strengths and skills), reductions in interview-related anxiety compared to the control group, and were more likely to obtain competitive employment within 6 months. These findings highlight the capacity of VR to provide autistic individuals with structured, repeatable opportunities to build confidence and develop communication skills for high-stakes work contexts.

Even after securing employment, managing stress and anxiety in the workplace presents significant challenges for autistic employees. Building on this, a recent mixed-methods study introduced WorkplaceVR, a platform designed to immerse autistic adults in realistic workplace social scenarios that allowed autistic adults to engage in realistic workplace social scenarios such as small talk, asking for help, and receiving feedback from a supervisor (Kim et al., 2024). These are typical work situations that may induce anxiety for autistic employees. WorkplaceVR tracked physiological indicators like heart rate and skin conductance to measure the stress levels of participants. Following the WorkplaceVR training, post-session feedback was delivered to participants based on individualized sensor data collected during social interactions. This personalized feedback allowed participants to better understand their physiological responses to stress and gradually learn strategies to regulate their anxiety within the safety of a virtual environment. As a result, there was a statistically significant increase in self-efficacy among participants in their social skills at work. VR can guide autistic employees in managing workplace stress and social anxiety through immersive training within repeatable learning environments.

Promoting collaboration between NT and autistic employees remains a critical area of focus, as differences in communication styles can create misunderstandings and hinder effective teamwork. To address this need, the ViRCAS platform developed by Amat et al. (2023) provides a shared virtual environment to engage in collaborative tasks (e.g., furniture assembly and warehouse packaging simulations). These collaborative activities are designed to mirror workplace scenarios and emphasize communication, joint problem-solving, and mutual understanding. With the use of multimodal data (i.e., gaze behavior and dialogue between team members), the study found that the platform's VR team-building activities effectively promoted collaboration between NT and autistic individuals. ViRCAS provided a low-pressure setting for autistic individuals to improve their collaboration skills and NT individuals to learn about the communication styles of their autistic peers. By using VR to support inclusive teamwork, the platform promotes mutual understanding and shared responsibility, which is often overlooked in neurodiversity initiatives. Given the study's limitations, including a small sample size and single-session exposure, the authors recommend longitudinal research to better understand the long-term impact of ViRCAS. Ultimately, this approach addresses the double empathy problem by emphasizing the need for bidirectional adaptation in neurodiverse work environments and challenging workplaces to structure team processes to accommodate a broader range of collaboration styles.

Beyond supporting autistic individuals in developing social skills and collaborating in neurodiverse work environments, VR can also serve as an effective tool for educating NT employees about the experiences of their ND colleagues. Lowy et al. (2023) explore how VR can be used to promote inclusivity by helping NT employees better understand the experiences of their ND colleagues through perspective-taking simulations. By illustrating specialized skills of ND employees such as attention to detail, systematic problem solving, and pattern recognition, these simulations can allow NT employees to appreciate the value of ND colleagues in the workplace. Additionally, VR can immerse NT employees in scenarios that replicate the challenges faced by ND individuals in the workplace, such as navigating sensory overload in open-floor offices or managing social interactions shaped by unspoken NT norms (Lowy et al., 2023; Morris et al., 2015). This cultivates empathy within neurodiverse work environments, promoting a deeper understanding of ND peers through narrative-driven scenarios co-designed with ND participants. These experiences foster an inclusive mindset, improving communication and mutual respect by encouraging NT employees to share the responsibility of adaptation and accommodation.

There is a growing emphasis in the literature on the necessity of inclusive design for VR. Wehrmann and Zender (2024) underscore that grounding VR design in the Universal Design for Learning (UDL) framework is essential for accessibility and engagement, proposing that VR applications offer multiple means of representation, interaction, and customization to accommodate diverse needs. Recent studies have emphasized incorporating autistic individuals in the co-design process to ensure VR interventions are effective and practical (Dahlstrom-Hakkim et al., 2021; Gabrielli et al., 2023; Kim et al., 2022; Newbutt et al., 2024). Specifically, Kim et al. (2022) present a VR design approach that co-designs VR experiences to help autistic individuals develop workplace social communication skills, while also fostering NT employees' understanding of autistic experiences. To ensure the virtual experiences reflect real workplace challenges, the study actively involved autistic employees in the co-design process, promoting the sense of agency for the participants. The simulations allow autistic users to safely explore responses, rehearse boundary setting, and assert needs—skills crucial for self-advocacy and mutual adaptation in neurodiverse teams. Consistent with Wehrmann and Zender's guidelines, these VR environments include features such as active exploration, learner autonomy, and authentic role-playing, increasing engagement and self-efficacy of VR users. Controlling pacing, replaying scenarios, and making choices empowers users to shape their experience and reflect on different strategies for communication and problem solving within a controlled environment that is aligned with their unique needs.

A strengths-based approach

Strength-based approaches have been explored by researchers to help develop VR applications to support strengths rather than correcting assumed deficits of autistic individuals (Genova et al., 2023; Hall et al., 2024; Schmidt et al., 2024; Vellonen et al., 2015). In alignment with the neurodiversity paradigm, strength-based approaches emphasize the value of diverse cognitive styles rather than viewing them as deficits. For example, Wong et al. (2018) suggest that "[autistic] individuals gain more when they build on their talents rather than focusing on improving weaknesses" (p.15). Taken together, the strengths-based approach is particularly appropriate because it can help to foster empowerment among autistic employees and workplace inclusion by embracing the unique strengths of autistic employees. Notably, Hall et al. (2024) explore how VR can be tailored to leverage these unique strengths (e.g., attention to detail, pattern recognition, innovative problem-solving) in the workplace, where their platform integrated interactive scenarios simulating workplace challenges such as customer interactions, task management, and emotional regulation. The platform featured step-by-step task breakdowns, guided breathing exercises, and customizable prompts that align with the users' self-reported strengths (e.g., perseverance and relational problem-solving). Implementing a co-design approach, the authors actively engaged ND employees in the development of VR tools to meet the real-world needs and preferences of autistic individuals, leading to more effective solutions that enhance independence, self-regulation, and job-related skill development. By focusing on these strengths, VR applications can be designed to support autistic employees in utilizing their unique capabilities, contributing to their success in the workplace. This approach parallels the Social Communication, Emotional Regulation, and Transactional Support (SCERTS) framework used in the development of interventions for autistic individuals, which prioritizes individualized supports and emotional regulation strategies to empower autistic individuals to participate more fully and successfully in diverse environments (Rubin et al., 2013).

This strength-based VR design approach aligns with broader AI applications in autism support, where machine learning models analyzing user patterns have demonstrated the effectiveness of personalized strategies for individual needs (Adako et al., 2024; Khalid et al., 2024; Lampos et al., 2021). By utilizing an individual user's progress and preferences, AI-driven VR platforms dynamically adapt interactive scenarios and offer real-time feedback. Specifically, VR systems implementing machine learning models have been proposed to continuously adapt cognitive therapy sessions, ensuring that interventions are personalized, relevant, and strength-based (Khalid et al., 2024). In the area of autism education, machine learning models analyzing student interaction patterns have provided teachers with actionable data for tailoring communication strategies to autistic students (Lampos et al., 2021). These adaptive systems increasingly inform neurodiversity-affirming interventions by matching strategies to individual profiles (e.g., cognitive level and sensory preferences), ensuring AI tools augment, rather than replace human expertise, to maintain user-centered support (Adako et al., 2024).

VR has emerged as a transformative tool for addressing persistent employment disparities among autistic individuals, not by correcting social differences, but by fostering mutual understanding and bidirectional adaptation in neurodiverse workplaces. By integrating insights from the social model of disability and the double empathy problem, this perspective demonstrates how VR applications grounded in strength-based principles can reframe workplace challenges as opportunities for systemic change. VR platforms like VIT-TAY, WorkplaceVR, and ViRCAS empower autistic employees to develop social and self-advocacy skills, while also educating NT colleagues to recognize and value ND strengths. The participatory design process is critical to this shift, ensuring VR tools reflect autistic employees' lived experiences, preferences, and self-identified goals. Paired with AI-driven personalization such as adaptive feedback and physiological monitoring, these interventions have the potential to tailor support that promotes skill generalization to real-world settings. To sustain this progress, future initiatives must prioritize longitudinal studies on VR's impact on employment outcomes for autistic employees and policy reforms that incentivize employer adoption of neurodiversity-affirming technologies. With these enriching immersive technologies, neurodiverse workplaces can fully leverage the untapped potential of autistic talent.

Conclusion: the value of virtual reality and what's at stake

We have outlined how autistic individuals face significant employment, in part due to challenges and mismatches between

workplace norms and ND communication or sensory needs. We have also outlined how VR can offer immersive, repeatable, and low-pressure environments for skill-building, stress management, and mutual understanding. As employment remains one of the most urgent and inequitable domains for autistic inclusion, the stakes are high: persistent unemployment and underemployment carry social, economic, and psychological costs, including increased anxiety, reduced self-confidence, and lost opportunities for autistic individuals to contribute their strengths to society (Hildebrandt et al., 2024; Solomon, 2020; Woolard et al., 2021). For employers, failing to include neurodivergent talent means missing out on innovative problem-solving, attention to detail, and creative thinking—traits often found among autistic professionals.

Critically, the mismatch between workplace norms and autistic communication, described by Milton (2012) as the double empathy problem, suggests that many current workplace barriers are systemic rather than individual. These barriers are often reinforced by ableist assumptions and deficit-based views of autism. Instead, embracing the social model of disability can help reshape how we design work environments, practices, and technologies. Therefore, we suggest the following opportunities and actionable steps moving forward as a way to connect the design and use of VR for both neurotypes as a means to support greater workforce inclusion:

1. Co-designing VR technologies with autistic individuals in the creation of VR training tools to help ensure supports reflect lived experiences, preferences, and strengths. Participatory design ensures tools are not only usable, but also empowering.
2. Expanding VR-based workplace supports to help acclimatize autistic adults to employment by simulating interviews, feedback sessions, and collaborative tasks. These environments reduce anxiety, provide repeatable practice, and build confidence in a low-stakes setting.
3. Training NT colleagues through perspective-taking-VR. Integrate VR modules that help NT employees experience common barriers autistic colleagues face (e.g., sensory overload, miscommunications), thus promoting mutual understanding and reducing bias.
4. Apply Universal Design for Learning (UDL) guidelines and AI personalization to VR supports. Embed UDL principles and adaptive AI to customize VR scenarios based on individual strengths, sensory preferences, and progress. This ensures equitable access and maximizes learning.
5. Conduct longitudinal research on impact by investing in long-term studies that help evaluate real-world outcomes of VR training, including job acquisition, retention, wellbeing, and self-efficacy. Leveraging these data will inform evidence-based policy and practice.

By advancing these efforts, VR technologies can become not just tools for training, but catalysts for cultural change where employment systems evolve to meet the needs of all workers (Rotatori et al., 2021). Adopting a strengths-based approach rooted in neurodiversity perspectives will also allow for the [co] design of VR tools that recognize and amplify the skills and contributions of autistic individuals. By framing inclusion as both a moral driver and an innovation strategy, our perspectives contribute to broader efforts to reimagine accessibility and equity in the future of work and workforce. Therefore, at stake is the full inclusion of autistic people in the economic and social fabric of society, an inclusion that not only advances equity, but also enriches innovation, empathy, and collective productivity.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

RT: Writing – original draft, Writing – review and editing, Conceptualization. NN: Writing – review and editing, Methodology.

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The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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The author(s) declare that no Generative AI was used in the creation of this manuscript.

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