Exploration of Neuroprotective Therapy

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Neurodivergence as environmental adaptation

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Abstract

Apparent increases in autism and other forms of neurodivergence are often interpreted as a rise in incidence. Yet demographic expansion, diagnostic broadening, and growing cultural awareness all contribute to higher prevalence estimates. At the same time, contemporary sensory and digital environments have become increasingly overstimulating, characterized by persistent noise, visual saturation, hyperconnectivity, and unpredictable social rhythms. These conditions heighten sensory and cognitive load for many individuals, making neurodivergent traits more visible and increasing the urgency of diagnosis. Drawing on cognitive ecology, sensory neuroscience, and neuroaffirmative scholarship, this perspective proposes that neurodivergence can be understood as an adaptive response to environments that exceed nervous-system thresholds. Autistic regulatory behaviors—including withdrawal, shutdown, sensory avoidance, and monotropism-driven focus—may serve as mechanisms for maintaining coherence in overstimulating contexts. Interpreting neurodivergence as an ecological signal offers new pathways for public health, accessibility design, and social policy. It reframes autistic embodiment not as internal dysfunction but as meaningful information about the livability of contemporary environments.

Keywords

neurodivergence, autism, sensory ecology, environmental mismatch, monotropism, cognitive ecology

Introduction

Reported prevalence rates of autism and other forms of neurodivergence have increased substantially over recent decades. These trends are often interpreted as evidence of a real rise in neurodevelopmental conditions. However, demographic growth, broadened diagnostic criteria, and improved access to assessment all contribute to higher numbers [1, 2]. Increased public awareness and digital self-identification also influence visibility across communities.

Simultaneously, many individuals are navigating environments that place unprecedented demands on sensory, cognitive, and emotional regulation. Urban contexts expose people to chronic noise, visual density, and continuous social unpredictability, all of which are associated with cognitive fatigue and physiological stress [3–5]. Digital hyperconnectivity further intensifies attentional fragmentation, rapid information flow,

and the pressure to remain constantly responsive [6–9]. These environmental stressors collectively reduce opportunities for restorative regulation and amplify the visibility of autistic traits, particularly those related to sensory sensitivity and the need for predictability [10, 11].

This perspective draws on cognitive ecology, sensory neuroscience, and neuroaffirmative frameworks to argue that many neurodivergent expressions are adaptive responses to environmental mismatch. Monotropism—an autistic tendency toward deep, single-channel focus—can be understood as a stabilizing strategy in overstimulating contexts, rather than a deficit [10, 11]. Lived-experience accounts emphasize that shutdowns, withdrawal, sensory avoidance, and structured routines are forms of embodied regulation shaped by environmental demands [10–13]. By situating neurodivergence within its ecological and relational context, this article aims to reframe autistic embodiment as an ecological signal rather than a pathology. This shift highlights the importance of environments that support sensory modulation, predictability, and cognitive diversity, offering new directions for accessibility, public health, and social design.

Sensory overload and environmental stressors

Contemporary environments expose individuals to continuous sensory, cognitive, and social stimulation. Urban settings, in particular, are characterized by persistent noise, dense visual fields, unpredictable social encounters, and constant informational flow. Research in environmental psychology demonstrates that chronic exposure to noise and urban overstimulation contributes to cognitive fatigue, dysregulation, and stress-related health effects [4, 5]. Sensory neuroscience likewise shows that high-intensity environments can exceed the thresholds of many nervous systems, especially those of autistic individuals, who often exhibit heightened sensory responsivity [10, 11]. Neurophysiological models such as predictive-coding/sensory-prediction-error frameworks—proposed in studies of "sensory ecology"—suggest that many neurodivergent people live in a state of chronic mismatch between environmental stimulation and internal sensory processing.

Digital environments amplify these pressures. Hyperconnectivity, rapid social-media cycles, and information overload increase attentional fragmentation and reduce access to restorative states [8, 9]. For autistic people, whose sensory systems often tend toward high precision and lower tolerance for unpredictability, digital overstimulation further complicates sensory load and contributes to chronic dysregulation [8–11].

Under such conditions, behaviors such as shutdown, withdrawal, social avoidance, or temporary reductions in speech and executive function can be understood as adaptive regulatory responses rather than deficits—adjustment mechanisms for maintaining coherence in environments that demand more than the nervous system can manage [10, 11].

Neurodivergence as an adaptive strategy

Autistic and other neurodivergent manifestations often function as intelligent responses to environmental mismatch. Monotropism—a theory of autistic cognition—describes the tendency toward states of deep and focused attention [10]. In overloaded contexts, monotropism acts as a stabilizing strategy, reducing exposure to unpredictable inputs and preserving coherence. Far from being inflexible, this attentional style can support creativity, regulation, and persistence in meaningful activities [11].

Routines, sensory behaviors (seeking or avoidance), and the need for predictability are similarly adaptive. Lived-experience accounts describe these strategies as essential for protection against sensory harm and emotional overload [10, 11]. Neuroaffirmative research highlights that many traits traditionally labeled as "symptoms" can be reinterpreted as ecological intelligence—embodied ways of maintaining stability in environments that do not respect the diversity of neurosensory thresholds [14–16].

Reframing neurodivergence as adaptive destabilizes the assumption that autistic people "cannot adapt to the world". Instead, it suggests that the world is often not adapted to natural variations in perception, attention, and embodied experience.

From pathology to ecological signal

Biomedical frameworks often treat neurodivergence as an individual deviation. This view obscures the relational and ecological dimensions of cognitive distress. The double empathy problem—a theory demonstrating that communicative breakdowns occur mutually between autistic and non-autistic people—shows that difficulties are often systemic, not "within the autistic person" [16].

From an ecological perspective, neurodivergent manifestations function as signals that environments demand unsustainable levels of adaptation. Shutdowns, withdrawal, scripting, sensory avoidance, or deep focus are not "maladaptations": they reveal accumulated sensory overload, lack of predictability, and social structures that privilege speed and multitasking over embodied regulation. Recent studies on health and mortality in autistic people also show that environmental mismatch and lack of support systems contribute to health inequities [1]. Recognizing neurodivergence as an ecological signal invites reconsideration of how spaces, institutions, and cultural norms shape human nervous systems.

Environmental variation: urban, rural, and digital spaces

Apparent differences in autism prevalence between rural and urban areas often reflect disparities in diagnostic access and sociocultural factors rather than real differences in prevalence [1, 2]. Rural environments may involve lower sensory intensity but limited infrastructure designed for neurodivergent needs, generating other forms of strain.

Digital environments now produce sensory and cognitive demands independent of geography. Studies show that the intensity of social-media engagement, constant notifications, and algorithm-driven attentional fragmentation increase emotional stress and dysregulation [8, 9].

Educational institutions add another layer of complexity. While some schools implement quiet spaces, flexible seating, and sensory supports, others intensify sensory and cognitive load through large class sizes, rapid transitions, standardized testing, and continuous digital integration [11, 12]. As a result, the school environment cannot be assumed to be calm or supportive; sensory load varies widely.

Designing more livable environments

If neurodivergence is understood as an ecological signal rather than a pathology, it becomes possible to redesign environments to support both neurodivergent and neurotypical well-being. Research on healthcare accessibility highlights chronic barriers for autistic people: unpredictable wait systems, intolerable sensory conditions, communication challenges, and unfriendly architectural design, among others [13–15].

Nervous-system-sensitive public design may include reduced ambient noise, regulated lighting, predictable spatial layouts, access to low-stimulation zones, flexible social rhythms, and sensory-rest spaces. Schools can implement predictable routines, sensory retreats, structures compatible with monotropism, and pedagogies that respect sensory and cognitive diversity. Urban planners can integrate restorative zones, quiet areas, slow-mobility spaces, and visually uncluttered environments.

Interpreting neurodivergent expressions as meaningful data about environmental mismatch allows for more humane, ecological, and diverse societies—promoting collective well-being.

Conclusions

The growing visibility of neurodivergence reflects intertwined demographic, cultural, and environmental dynamics, not necessarily a real increase in underlying neurodevelopmental conditions. Contemporary environments place sustained demands on sensory, cognitive, and emotional regulation. For autistic and neurodivergent individuals, these pressures make adaptive strategies—withdrawal, monotropism-driven focus, sensory avoidance, need for predictability—not only logical but necessary.

Reframing neurodivergence as an ecological signal rather than a pathology challenges biomedical assumptions that locate dysfunction solely within the individual. Instead, it situates the cause in the incompatibility between environments and neurosensory diversity. This perspective opens new possibilities for public health, educational and urban design, accessibility policies, and collective well-being. Environments that prioritize sensory modulation, predictability, and cognitive diversity promote health and quality of life for all.

Declarations

Author contributions

LC: Conceptualization, Investigation, Writing—original draft, Writing—review & editing. The author read and approved the submitted version.

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The author declares that there are no conflicts of interest.

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