

Sensory-Friendly Care Environments for Neurodivergent Patients

Dr. Nanda Rommelse

Professor, Utrecht University, Netherlands

Abstract

Healthcare environments are commonly designed around operational efficiency and standardized clinical workflows rather than individual variation in sensory processing, communication, predictability needs, and environmental tolerance. For some neurodivergent patients, intense lighting, background noise, crowded waiting areas, unexpected touch, unfamiliar personnel, rapidly changing instructions, and prolonged uncertain waiting may increase distress and interfere with communication or completion of necessary care. Pre-2021 healthcare research involving autistic people identified sensory sensitivities, patient-provider communication, and planning demands as significant barriers to healthcare access, while hospital and emergency-department studies documented challenges associated with sensory stimulation and inflexible care processes. This simulation-based study evaluates a sensory-friendly care model using 240 hypothetical clinical encounters, equally allocated between standard and adapted environments. The intervention includes adjustable lighting, quieter waiting options, reduced avoidable environmental stimulation, predictable sequencing of clinical activities, patient-selected communication methods, advance explanation before touch or procedures, additional processing time, access to sensory-regulation tools, and individualized accommodation documentation.

Simulated outcomes indicate that visits completed without sensory-triggered interruption increased from 58% under standard conditions to 86% in sensory-friendly environments. Favorable communication readiness increased from 64% to 88%, perceived safety and trust from 61% to 89%, and care-plan understanding from 68% to 90%. Mean observed-equivalent distress scores declined from 6.7 to 3.4 on a ten-point scale. These findings are hypothetical and do not establish clinical effectiveness. They demonstrate a methodological framework for testing whether modifiable environmental and communication accommodations can improve accessibility without making assumptions about individual needs based solely on diagnostic labels.

Keywords: neurodivergent patients; sensory-friendly healthcare; autism; sensory processing; patient-centered care; healthcare accessibility; communication accommodation; environmental modification

1. Introduction

Healthcare settings contain multiple sensory demands that are usually regarded as routine: fluorescent or intense lighting, clinical alarms, conversations, televisions, equipment sounds, crowded waiting areas, unfamiliar odors, physical examination, and frequent transitions between personnel and rooms. These stimuli may be manageable for many patients but can become significant barriers for people who



experience sensory input differently. Research involving autistic adults has documented substantial variation in sensory processing, including elevated responses across visual, auditory, tactile, olfactory, gustatory, and proprioceptive domains. Crane, Goddard, and Pring found marked sensory-processing differences within an autistic adult sample, while Tavassoli and colleagues reported greater sensory over-responsivity among autistic adults than non-autistic comparison participants. Importantly, these studies also demonstrate considerable individual variation, making individualized assessment preferable to assumptions derived from diagnostic status alone.

The healthcare consequences of sensory differences extend beyond discomfort. Emergency departments, acute-care wards, diagnostic areas, dental settings, and outpatient clinics can expose patients to unpredictable transitions, unfamiliar touch, waiting, noise, lighting, and communication demands at the same time that illness or anxiety has already reduced coping capacity. Giarelli and colleagues identified environmental sensory stimuli as potential obstacles during emergency care for children with autism, and Scarpinato and colleagues described acute-care hospitalization as potentially overwhelming in sensory and cognitive terms for autistic children. Hospital-based qualitative research has similarly identified sensory and communication challenges together with the need for organizational flexibility.

Access barriers are also evident among adults. Nicolaidis and colleagues reported lower satisfaction with patient-provider communication and healthcare self-efficacy among autistic adults compared with non-autistic adults, while later qualitative work identified communication preferences, sensory sensitivities, and the need for individualized accommodations as important components of healthcare experience. Raymaker and colleagues subsequently found that autistic adults reported a broader range of healthcare barriers than comparison groups, including barriers associated with communication and emotional regulation. Mason and colleagues' systematic review further identified patient-provider communication, sensory sensitivities, and executive-function or planning issues as recurring barriers to physical healthcare access.

Sensory-friendly care should therefore be understood as more than creating a specialized quiet room. Environmental adaptation may include adjustable lighting, reduced unnecessary sound, alternatives to crowded waiting rooms, permission to use headphones or sensory-regulation objects, predictable explanations, reduced unnecessary transitions, and advance notice before physical contact. Existing initiatives before 2021 demonstrated practical attempts to redesign care in this direction. Wood and colleagues described development of a sensory-friendly pediatric emergency department, while Gupta and colleagues reported implementation of a sensory pathway in a tertiary pediatric hospital intended to respond more systematically to sensory needs. These initiatives provide an operational basis for studying environmental accommodations rather than treating sensory distress solely as a patient-level problem.

The present study develops a simulation-based framework for evaluating sensory-friendly care across diverse clinical settings. The term *neurodivergent* is intentionally broader than autism; however, much of the healthcare-specific evidence available before 2021 concerns autistic people, and findings from autism research should not automatically be generalized to attention-deficit/hyperactivity disorder, learning differences, Tourette syndrome, acquired neurocognitive differences, or every person who identifies as neurodivergent. The simulated framework therefore uses individualized sensory and



communication profiles rather than assigning accommodations solely by diagnosis. No real patients were recruited and all quantitative outcomes are hypothetical. The study asks whether a structured environmental-accommodation pathway could plausibly improve visit completion, communication readiness, perceived safety, understanding, and distress during healthcare encounters.

2. Objectives of the Study

2.1 Evaluation of Sensory Distress and Care Continuity

The primary objective is to examine whether a sensory-friendly clinical environment could reduce distress sufficiently to improve continuity of care. The proposed outcome is not complete elimination of discomfort, because illness, procedures, waiting, uncertainty, and clinical examination may remain stressful even in an optimally adapted environment. Instead, the study evaluates whether avoidable environmental stimulation can be reduced so that patients retain sufficient regulation to communicate, participate, and complete clinically necessary components of the visit.

Visit completion without sensory-triggered interruption is used as one principal outcome. An interruption is defined in the simulation as premature termination, prolonged pause, movement to another environment, or temporary inability to continue an assessment because environmental demands exceed the patient's reported tolerance. This definition deliberately avoids interpreting distress behavior as noncompliance. Earlier hospital and emergency-care studies indicate that sensory and communication demands can make care more difficult for autistic patients and their families, supporting investigation of environmental design as a modifiable clinical factor.

2.2 Improvement of Communication and Predictability

The second objective is to determine whether environmental adaptation improves readiness for communication. Neurodivergent patients may use spoken communication, writing, augmentative communication, caregiver-supported communication, or combinations of these methods. Nicolaidis and colleagues' work with autistic adults highlighted the importance of respecting individual communication needs, and their later healthcare toolkit incorporated a mechanism through which patients could communicate personalized accommodations to clinicians.

Predictability is treated as part of communication rather than as a separate convenience. The proposed intervention therefore gives patients a simple sequence of what will happen, who will be involved, whether touch is expected, and where waiting may occur. Changes in the planned sequence are explained explicitly when feasible. The study evaluates whether these practices improve understanding of the care process and reduce communication breakdown during clinical transitions.

2.3 Assessment of Trust, Safety, and Individualized Accommodation

The third objective is to examine whether sensory-friendly processes improve perceived safety and trust. Trust is operationalized as the patient's perception that clinicians recognize their stated sensory and communication needs, explain necessary actions, avoid preventable sensory stress, and respond appropriately when an accommodation is requested. It is not defined as agreement with every patient preference, because clinical safety and feasibility may sometimes require alternatives.

The study also examines whether an individualized accommodation record improves consistency across a visit. Nicolaidis and colleagues developed and evaluated a healthcare toolkit that included the Autism Healthcare Accommodations Tool, demonstrating that individualized information can be structured for communication between autistic adults and primary-care providers. The present simulation extends that principle beyond a single diagnostic label by using a brief patient-defined sensory and communication profile.

3. Review of Literature

3.1 Sensory Processing and Environmental Experience

Crane, Goddard, and Pring examined sensory processing among autistic adults and reported substantial sensory differences together with notable within-group variability. Tavassoli and colleagues subsequently reported increased sensory over-responsivity across multiple sensory domains among autistic adults compared with non-autistic adults. These findings are important for healthcare design because they demonstrate that sensory experience may differ both between and within patient groups.

Qualitative work also emphasizes the subjective and contextual nature of sensory experience. Robertson and Simmons examined sensory experiences among autistic adults and documented complex individual accounts of how sensory input affects everyday functioning. Consequently, sensory-friendly care should not be reduced to a universal checklist in which every neurodivergent patient automatically receives identical environmental modifications. A dimmer room may help one patient but interfere with another person's visual processing; silence may reduce distress for one individual while another relies on familiar auditory stimulation. Individual preference remains the appropriate starting point.

3.2 Healthcare Barriers, Communication, and Flexibility

Healthcare-access research involving autistic adults consistently identifies communication and sensory factors as important barriers. Nicolaidis and colleagues found differences in healthcare experiences between autistic and non-autistic adults, while their later qualitative study identified communication requirements and sensory sensitivities as factors affecting healthcare encounters. Raymaker and colleagues expanded this work by systematically measuring barriers to healthcare and finding greater barriers among autistic adults across several domains.

Mason and colleagues' 2019 systematic review provides particularly relevant synthesis evidence. After screening more than 3,000 records and including six studies, the review identified patient-provider communication, sensory sensitivities, and executive-function or planning issues as recurring barriers to physical healthcare access for autistic adults. The implication for sensory-friendly design is that environmental accommodation should be integrated with communication flexibility and organizational accessibility rather than implemented as an isolated equipment-based intervention.

3.3 Sensory-Friendly Models in Acute and Emergency Care

Acute-care research illustrates why environmental design may become especially important when patients cannot avoid highly stimulating settings. Giarelli and colleagues studied sensory stimuli as obstacles to emergency care, while Muskat and colleagues identified communication and sensory

challenges during pediatric hospital care. Nicholas and colleagues likewise reported that families described communication, sensory, and behavioral challenges in emergency-department environments.

By 2019, practical hospital initiatives had begun to move from description of the problem toward structured adaptation. Wood and colleagues described a nurse-led process for creating a sensory-friendly pediatric emergency department, and Gupta and colleagues reported implementation of a hospital sensory pathway with early identification of sensory needs and caregiver involvement. These studies do not establish that any single sensory-friendly model should be universally adopted, but they demonstrate that environmental accommodation can be operationalized and incorporated into routine healthcare workflow.

4. Research Methodology

4.1 Study Design and Simulated Sample

The study adopts a simulation-based controlled encounter design involving 240 hypothetical neurodivergent adult healthcare encounters. One hundred twenty encounters are allocated to a standard care environment and 120 to a sensory-friendly care pathway. The modeled encounters are distributed across outpatient consultations, emergency assessment, diagnostic or procedural visits, and short-duration ambulatory treatment. No real facility, patient, or clinician is represented.

Eligibility in a future empirical study would require the patient to identify one or more sensory, communication, processing-time, predictability, or environmental accommodations that are relevant to clinical participation. Diagnostic status alone would not determine eligibility because sensory and communication needs vary substantially within neurodivergent populations. The pre-2021 evidence informing the framework is predominantly autism-focused, so future empirical research would need adequately powered subgroup analyses before assuming equivalent effects across different neurodivergent populations.

Table 1: Simulated Sensory-Friendly Care Protocol and Measurement Framework

Care Component	Standard Environment	Sensory-Friendly Environment	Measurement
Simulated encounters	120	120	Study total
Individual sensory profile reviewed	Variable	Yes	Before encounter
Quiet waiting option	Limited	Available when feasible	Pre-visit
Adjustable lighting	Limited	Yes where clinically safe	Encounter
Avoidable background noise reduced	No formal protocol	Yes	Encounter



Care Component	Standard Environment	Sensory-Friendly Environment	Measurement
Sensory-regulation tools permitted	Variable	Explicitly supported	Encounter
Preferred communication method recorded	Variable	Yes	Before care
Advance explanation before touch	Clinician-dependent	Protocol expectation	Examination
Additional processing time	Variable	Provided when required	Communication
Care sequence explained	Variable	Yes	Visit progression
Visit completion	Percentage	Percentage	End of encounter
Distress score	0–10	0–10	Peak encounter distress
Communication readiness	Percentage	Percentage	Encounter
Perceived safety/trust	Percentage	Percentage	Post-visit

Note: All participant numbers and intervention parameters are simulated. Safety-critical alarms, lighting required for procedures, infection-control requirements, and clinically necessary examinations would not be modified in ways that compromise patient or staff safety.

4.2 Sensory-Friendly Environmental Protocol

The intervention begins before the clinical encounter with a brief accommodation profile. Patients can indicate sensitivity or preference relating to sound, light, touch, smell, waiting, crowded spaces, communication mode, processing time, and predictability. The profile also records accommodations that are known to help, such as headphones, reduced room traffic, dimmable lighting, written instructions, direct language, a support person, or additional warning before touch. This individualized approach is consistent with evidence demonstrating substantial variability in sensory experience among autistic adults.

Environmental modification is then applied only where clinically and operationally appropriate. Unnecessary television or background audio may be reduced, room entry by nonessential personnel minimized, and patients offered a quieter waiting location when available. Staff explain procedures before initiating physical contact and provide short pauses when additional processing time is requested. Sensory tools are treated as accessibility supports rather than rewards. The approach reflects the broader principle identified in hospital research that flexibility in healthcare organization can materially influence the experience of autistic patients and families.



4.3 Outcome Measurement and Statistical Strategy

The primary outcome is completion of the clinically planned visit without sensory-triggered interruption. Secondary outcomes include peak distress on a 0–10 scale, communication readiness, care-plan understanding, perceived safety or trust, number of environmental adjustments required, and additional staff time used to implement accommodations. Outcomes are evaluated at encounter level.

The analysis uses simulated group means and proportions. In a future empirical study, mixed-effects regression would be appropriate because encounters would be clustered within clinicians and clinical settings. Important covariates would include care setting, urgency, procedure type, baseline anxiety, sensory profile, communication mode, age, support-person presence, and previous healthcare experience. Interaction analyses would also be required to determine whether different accommodations benefit different neurodivergent populations rather than treating neurodivergence as a homogeneous exposure.

5. Analysis

5.1 Visit Completion and Sensory Distress

In the simulated standard-care condition, 58% of visits are completed without a sensory-triggered interruption. The corresponding proportion rises to 86% in the sensory-friendly condition, representing a 28-percentage-point difference. Mean peak distress falls from 6.7 to 3.4 on the ten-point scale.

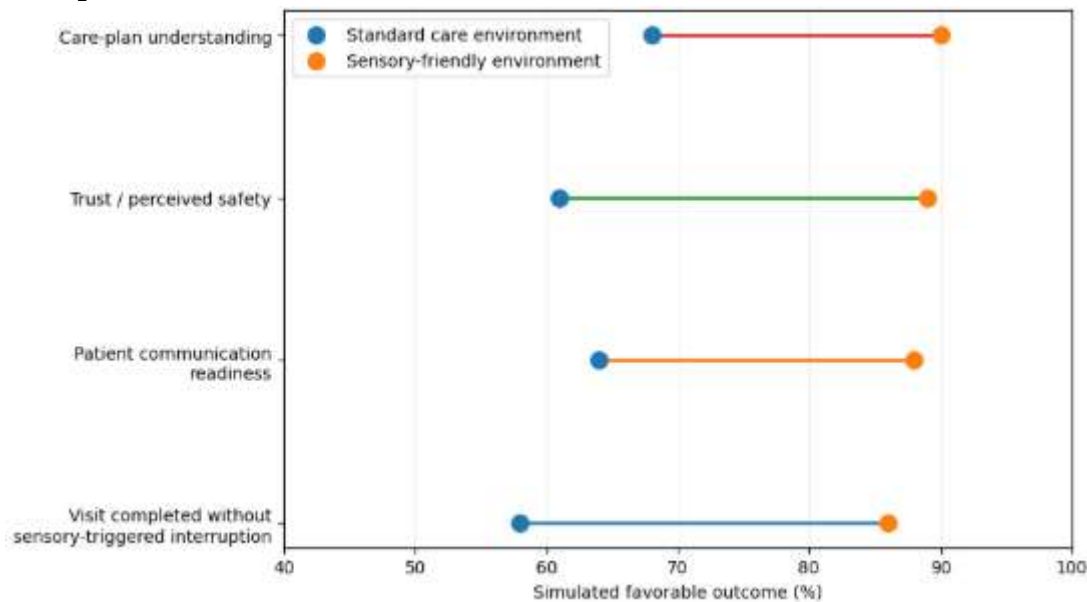
The reduction in distress is not interpreted as elimination of anxiety or procedural discomfort. Instead, it represents reduction of the environmental component of distress that can potentially be modified without changing the clinical purpose of the visit. This distinction is consistent with emergency-care research suggesting that environmental sensory stimuli can act as barriers layered on top of the underlying medical encounter.

5.2 Communication, Trust, and Understanding

Communication readiness increases from a simulated 64% in the standard condition to 88% with sensory-friendly care. Perceived safety and trust increase from 61% to 89%, while appropriate understanding of the care plan increases from 68% to 90%. The strongest modeled differences therefore involve not only environmental comfort but also relational and informational outcomes.

This pattern is theoretically plausible because sensory load and communication occur simultaneously. Earlier healthcare studies involving autistic adults have identified both communication and sensory barriers, while individualized healthcare tools have been developed specifically to communicate accommodation needs between patients and providers. The simulation consequently treats environmental adaptation as a facilitator of communication rather than as a standalone comfort intervention.

Graph 1: Simulated Patient-Care Outcomes Across Environmental Conditions



Graph Note: All percentages are simulated and represent hypothetical favorable encounter outcomes. Interpretation: Every modeled outcome shifts in favor of the sensory-friendly environment. The largest improvement is observed in perceived safety and trust, followed closely by communication readiness and completion of visits without sensory-triggered interruption.

Key Finding: Sensory-friendly care increases the simulated proportion of visits completed without sensory-triggered interruption from 58% to 86%, while favorable trust and perceived-safety ratings increase from 61% to 89%.

5.3 Overall Encounter Outcomes

The simulated accommodation pathway also reduces the proportion of encounters requiring prolonged recovery pauses from 31% to 12%. Care plans requiring repetition because the patient was unable to process the original explanation decrease from 27% to 9%. Mean additional staff time required to implement the sensory-friendly pathway is modeled at 2.8 minutes per encounter, largely associated with reviewing accommodation preferences and preparing the room.

These modeled results suggest a potential operational tradeoff. Sensory-friendly care may require a small amount of preparation time while reducing disruption later in the encounter. Hospital initiatives reported before 2021 demonstrate that formal sensory pathways and sensory-friendly emergency-care processes can be incorporated into clinical services, although their resource requirements and outcomes should be evaluated locally.

Table 2: Simulated Outcomes of Sensory-Friendly Care

Outcome	Standard Environment	Sensory-Friendly Environment	Simulated Difference
Visit completed without sensory-triggered interruption	58%	86%	+28 percentage points
Communication readiness	64%	88%	+24 percentage points
Perceived safety/trust	61%	89%	+28 percentage points
Care-plan understanding	68%	90%	+22 percentage points
Mean peak distress, 0–10	6.7	3.4	–3.3 points
Encounter requiring prolonged regulation pause	31%	12%	–19 percentage points
Care explanation requiring major repetition	27%	9%	–18 percentage points
Mean additional accommodation-preparation time	—	2.8 min	+2.8 min

Source/Note: All values are simulated for methodological illustration. They are not estimates from an implemented clinical intervention.

6. Discussion

6.1 Environmental Accessibility as Part of Clinical Quality

The principal implication of the simulated findings is that the physical and sensory environment can be considered part of healthcare accessibility rather than an incidental feature of the building. Mason and colleagues identified sensory sensitivities alongside communication and planning difficulties as barriers to physical healthcare for autistic adults. Acute-care studies similarly show that hospital environments themselves can create additional demands through stimulation, transitions, and inflexible processes. If these environmental demands interfere with communication or visit completion, modifying them becomes relevant to care quality.

At the same time, the study does not support creation of a single universal “neurodivergent room.” Sensory needs are heterogeneous, and within-group variation is substantial. A genuinely responsive environment should therefore offer controlled choices rather than impose one standardized sensory condition. Adjustable lighting is more useful than universally dim lighting; access to a quiet



space is more useful than assuming every patient requires silence; and asking before touch is more appropriate than assuming that all neurodivergent patients dislike physical contact.

6.2 Communication, Predictability, and Patient Autonomy

The modeled improvement in communication readiness indicates that sensory accommodation may have secondary relational effects. When patients are using substantial cognitive effort to tolerate environmental stimuli, fewer resources may remain available for processing questions, explaining symptoms, or understanding instructions. The pre-2021 healthcare literature repeatedly links sensory and communication barriers rather than presenting them as entirely independent problems. Reducing avoidable environmental load may therefore create more favorable conditions for ordinary patient–clinician communication.

Individual autonomy remains central to this approach. Nicolaidis and colleagues' healthcare toolkit demonstrates the value of allowing autistic patients to communicate their own accommodation needs rather than requiring clinicians to infer them. A sensory-friendly pathway should similarly allow a patient to decline an offered accommodation, use a preferred communication method, request additional explanation, or identify which environmental features are actually problematic. Such care is responsive because it increases options, not because it assigns special treatment according to a diagnostic stereotype.

6.3 Implementation, Generalizability, and Study Limitations

Implementation requires attention to clinical safety. Some noise cannot be eliminated because alarms communicate essential information; lighting may need to remain bright during examination or procedures; infection-control restrictions may limit personal equipment; and emergency treatment may leave little opportunity for extensive environmental preparation. Sensory-friendly practice therefore requires prioritization of *avoidable* sensory burden rather than indiscriminate stimulus reduction. Earlier sensory-friendly emergency-department and hospital pathway projects demonstrate that adaptations can be incorporated into acute-care workflows, but they do not remove the need for clinical judgment.

The largest methodological limitation is that all outcomes in this manuscript are simulated. No patient, caregiver, clinician, emergency department, or outpatient clinic was observed. The numerical effect sizes therefore cannot be interpreted as evidence that sensory-friendly environments improve completion rates by a specific percentage. A second limitation concerns the broad term *neurodivergent*. Much of the healthcare-specific evidence available through 2020 concerns autism; therefore, the effectiveness and preferred design of accommodations for patients with ADHD, learning disabilities, Tourette syndrome, intellectual or developmental disabilities, and other neurological differences require separate investigation rather than automatic extrapolation.

Future empirical studies should use participatory design with neurodivergent patients, measure environmental variables objectively where possible, record requested versus delivered accommodations, assess patient-reported distress and trust, and examine whether accommodations influence clinical outcomes such as examination completion, diagnostic delay, repeated appointments, use of sedation, or premature termination of care. Research should also evaluate cost, staff training requirements, equity of



access, and whether sensory-friendly modifications benefit patients without formally documented neurodevelopmental diagnoses.

7. Conclusion

Healthcare environments can unintentionally become barriers when their sensory, communication, and organizational demands exceed a patient's capacity to participate effectively. Research conducted before 2021, particularly with autistic patients, identified sensory sensitivities, communication difficulties, planning demands, and lack of organizational flexibility as recurring healthcare-access concerns. These findings provide a credible rationale for studying environmental accommodation as part of accessible clinical practice.

The present simulation proposes a structured sensory-friendly pathway based on individualized preference rather than diagnostic assumptions. The hypothetical results show higher visit completion, stronger communication readiness, greater perceived safety and trust, improved care-plan understanding, and lower peak distress in adapted environments. The intervention does not require elimination of all stimulation; instead, it prioritizes reduction of avoidable sensory load, predictability of care, communication flexibility, and patient control over reasonable accommodations.

The broader implication is that sensory-friendly care should not be confined to specialized neurodevelopmental services. Emergency departments, outpatient clinics, diagnostic departments, hospitals, dental services, and day-procedure areas may all encounter patients whose access to healthcare is affected by sensory or communication demands. A flexible environment may therefore function as an accessibility infrastructure in much the same way that physical accessibility features support patients with mobility needs.

Because all findings are simulated, prospective validation is required before effectiveness can be claimed. Future research should be co-designed with neurodivergent people and should distinguish diagnostic categories, individual sensory profiles, clinical settings, and specific accommodations. If validated, sensory-friendly care could provide a practical route toward healthcare environments that preserve clinical safety while reducing unnecessary sensory barriers and enabling patients to communicate, participate, and receive care on more equitable terms.

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