31 Frameworks for Dynamic Environments and Neurodiversity. Soft, a Deployable, Stress-Relief and, Adaptive Safe Space

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Abstract

The paper presents the overarching principles, the methods employed, and the preliminary design process for the in-progress project titled *Soft*. *Soft* is a deployable, adaptable prototype for self-regulation positioned at the intersection of interactive technology, digital health, and inclusive design. During the last four decades, emergent theories of the mind, human experience, and computational design have shed light on the potential of dynamic environments. Soft examines the role dynamic environments and can play in redirecting our built environment relationships around the overlooked issue of neurodiversity. How do we design, for whom, and with whom? Soft is a multi-phased project under development by an interdisciplinary team of architects/academic researchers collaborating with medical experts, computer and bioengineers, neurodivergent individuals, self-advocates, and their caregivers. In asking how and where we greet differences, make individuals comfortable, and integrate everyone into the fullness of our systems of choices, the work presented is a vessel for recommendations for various contextual typologies and overlooked experiences. The paper has a dual role; first, to explain the development of Soft as a spatial product that responds to the needs of neurodivergent individuals and second, to put forth a larger research framework that addresses design for inclusive environments. In testing methodologies and technologies in unexpected ways, the project's framework addresses the need for our spaces to leverage conditions of perceptual differences to catalyze change and meet the needs of the neurodiverse population, with proven benefits for the neurotypical. The proposal's vision, as explained under the introduction and frameworks sections of the paper, aligns with seven of the UN's Sustainable Development Goals (SDGs).

Keywords

Inclusive design · Dynamic environments · Sensory design · Biometric feedback

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31.1 Introduction

31.1.1 The Crux

Currently, over 3.5 million people in the U.S. have an autism diagnosis, and roughly 1% of the global population is on the spectrum of autism.[1] Conditions such as autism, ADHD, dyslexia, dyspraxia, and others can affect how people process sensory information, limiting accessibility to the built environment and obstructing—practically and psychologically—their participation in daily objectives as learners and workers, parents, or in other life roles. In alignment with UN's Sustainable Development Goals (SDGs) 3 and 10—*promote well-being for all* and *reduce inequalities*—environments designed to support neurodivergence, with proven benefits for the neurotypical population, can also help everyone's integration into the fullness of our systems and promote quality of life and wellness for all.

We believe that in difference lies potential. It is pivotal to the design discipline to examine neurodiversity as a force of opportunity in rethinking our spaces. In framing novel design methodologies, we explore opportunities to leverage conditions of perceptual and neurological differences to catalyze change and meet the needs of neurodivergent populations. In referencing the UN's 9th SDG, *innovation and infrastructure*, this work also points to the need for a significant transformation in how we view our often-disabling spaces and celebrate and strengthen alternative perceptual models in our civic structures.

The paper has a dual goal; first, to put forth a broader research framework that addresses design for inclusive environments and the critical role of architecture in engaging the UN Sustainable Development Goals (SDGs), and second, to explain the development of *Soft* as a spatial product and a research prototype that responds to the needs of neurodivergent individuals.

[1] Centers for Disease Control and Prevention. 2021. "Data & Statistics on Autism Spectrum Disorder." Centers for Disease Control and Prevention. January 5, 2022. https://www.cdc.gov/ncbddd/autism/data.html.

31.1.2 Embodiment and Enaction: Dynamic Environments of Inclusion

The work presented in this paper is based on scholarly research that unfolds the dynamics observed between scientific methods on cognition and design processes. The theories of human cognition shed light on how the human brain functions concerning its perceptual and neurological processes. Among such theories, the enactivist theories of the mind[2] are most relevant to this paper in describing cognition as a mental function that arises from the dynamic interaction of an organism with its environment (Thompson 2004, 381–398). Enactivism emerged in the second half of the twentieth century from *ecological psychology*[3] and *connectionist psychology,* which have played significant roles in the rise of embodied cognition theories pertaining to the phenomenological tradition. The terms "enaction" and "enactive" are attributed to Francisco Varela, Evan Thompson, and Eleanor Rosch in *The Embodied Mind* (1991). *The Embodied Mind* is influential to the design realm in its effort to place first-person experience at the cutting edge of "the new sciences of mind" (Menary 2010; Rowlands 2013). These theories have been critical in defining the research methods behind the interactive design project, *Soft*, presented in this paper.

Historically, in the sciences of the mind—psychology, neuroscience, cognitive science, and artificial intelligence—and the design realm, the interdependence between reasoning, perception, and embodiment enriched their original scope. As neuroimaging studies document, our sensory

[2] The concept understands mental faculties to be embedded within neural and somatic activities and to emerge through actions of the organism (Gefter 2018).

[3] Ecological Psychology is an embodied, situated, and non-representational approach to cognition pioneered by J. J. Gibson and E. J. Gibson. Connectionist psychology also sets perception as an extended process involving organisms in motion through their environments and hitherto has played an important role in shaping the embodied turn.

modalities are interconnected and encompass the activation of motor, somatosensory, and emotion-related brain networks (Robinson and Pallasmaa 2015, 164–165). In embracing the unknowns of perception and intuition while including the body, this project aspires to offer a valuable resource for the future of the design disciplines regarding dynamic environments with elasticity designed for all. Environments manifest the capacity to respond to various sensory and perceptual models, call for more intuitive relations and address embodied interactions with the world around us.

31.1.3 Project Soft: A Case Study for Responsive Environments and Neurodivergence

Project *Soft* explores technology and dynamic environments' role in resolving perceptual conflicts and redirecting implementation and evaluation methods. Adults and, more so, children with autism frequently seek out smaller, sensory-friendly spaces to help them self-regulate. The project is an adaptable interior environment of approximately 12' by 12' by 13' in height that meets this need while providing the spatial variability often lacking in public and private spaces.

Using non-invasive technologies, *Soft* examines how purposefully modifying sensory aspects of an interior environment—such as the effect of color, light, and sound and their wavelength, frequency, brightness, and oscillation—can affect occupants' physiological and psychological states within a space. The prototype also incorporates body pressure pockets to modulate intensity, frequency, and topography of pressure in proportion to respiratory rate. The project's goal is to establish a series of spatial parameters that serve as a scaffold and then customize based on the individual, with continuous, real-time adaptation taking place dynamically. The project's ultimate deployment regards a networked technology applicable to various interior spaces, scales, and occupants.

Project *Soft* is developed in multiple phases, with this paper addressing the overarching principles and vision of the project, the methods employed to date, and the preliminary design process. This multi-phased project is under development by an interdisciplinary team of two leading architects/academic researchers as part of the *Synesthetic Research and Design Lab* (SR&DL) they direct at the College of Architecture and the Built Environment, Thomas Jefferson University in collaboration with health experts, computer and bioengineers, textile and industrial designers, advocacy groups, neurodivergent individuals and their caregivers.

The *Synesthetic Research and Design Lab*, SR&DL, is a collaborative research-design platform where interactive design, art, digital culture, and emergent health sciences meet. The lab develops practical and theoretical methodologies that critically frame the interactions between humans, objects, and environments under the scholarly underpinnings of embodied cognition. The lab collaborates with the Jefferson Health Center for Autism and Neurodiversity, the Occupational Therapy and Neurology Departments at Thomas Jefferson University, and the University College Dublin Inclusive Design Research Centre of Ireland in partnership with SMARTlab teams in Dublin and Cahersiveen, Ireland, and Niagara Falls, Canada. It also partners with self-advocacy communities and industry experts to build collective knowledge addressing the all-inclusive ways of perceptually experiencing our spaces. The work presented in this paper is a vessel for interdisciplinary recommendations for various contextual typologies and overlooked experiences.

31.2 Materials and Methods

31.2.1 Frameworks for Cross-Disciplinarity and the Lived Experience

Cross-disciplinarity and lived experience are the guiding principles in creating various workflows and platforms for collective thinking and information sharing. As part of the authors' research lab, the following events and collaborations have been instrumental in shaping the *Soft* project design framework.

Symposia A series of cross-disciplinary international discussions have been organized in the form of yearly symposia on the theme of "Neurodiversity and the Built Environment" (*Building Community*—Fall 2020, *Immersive Experiences*—Fall 2021, and *PlaceMaking*—Fall 2022 are the focused themes for each of the years up to date). The discussions involve voices from diverse cultures across the globe. They include notable architecture practitioners and scholars, medical experts, population health scientists, neuro aestheticists, computer scientists, educators, writers, autistics, parents, autism advocates, and the tech industry. In these international forums, the discussions and actions presented cover a range of scales and goals addressing, more or less directly, seven of the UN's SDGs. These are *good health and well-being*, *quality education*, *gender equality*, *decent work, and economic growth*, *innovation and infrastructure*, *reduced inequalities, and strong institutions*.[4] The range of ideas and approaches varies, from presentations that address strategies for equitable employment opportunities (UN's SDG 8) to infrastructural equity (UN's SDG 9), to equitable quality education (UN's SDG 4), and more.[5]

Academic Design Studio An advanced interior design studio is shaped as part of a new studio design teaching sequence. From the Fall of 2020 to date, the design studio has been partnering with different community agents and educational programs for neurodivergent students and self-advocates to develop a novel glossary of spatial experiences that celebrate differences and the wide needs of the human spectrum. These partnerships align with the UN's SDGs goal 16 in building effective, accountable, and inclusive institutions at all levels.

Exhibitions Publications and internationally exhibited experimental installations[6] positioned in the intersection of interactive design, art, digital culture, and emergent health sciences have been developed. These provide feedback and applied knowledge for the technological and sensory systems employed to develop project *Soft's* hypothesis.

Collaborations The development of project *Soft,* to date, is being supported by a neurologist, co-director of the *Center for Neurorestoration,* and a lead Research and Development engineer involved in a Brain-Computer Interface for Stroke Clinical Trial from within our academic institution, Thomas Jefferson University in Philadelphia. An electrical and computer engineer from Temple University in Philadelphia specializing in bioengineering is involved in integrating the sensor and biometrics recording systems.

From within our academic institution, a pediatric nurse practitioner, associate director of Nursing Research at the *Jefferson Center for Injury Research and Prevention,* and a developmental and behavioral pediatrician, director of the *Jefferson Health Center For Autism and Neurodiversity,* together with an occupational therapist from the *Department of Occupational Therapy*, College of Rehabilitation Sciences, are also collaborators to the project in supporting the creation of a diverse focus group of neurodivergent individuals. Additionally, in communicating post-occupancy surveys to the focus group of non-verbal, autistic individuals with the use of reading board technologies, their team is developing.

Our current focus group for feedback and assessment consists of a nonverbal young man with AS, a verbal young man with AS and medical conditions, a verbal young woman with

[4] Refer to UN Sustainable Development Goals (SDGs) https://sdgs.un.org/goals

[5] Refer to the recorded presentations and full programs for these annual events: https://www.Jefferson.edu/NeurodiversitySymposium. "3rd International Neurodiversity & the Built Environment Symposium: PlaceMaking," Thomas Jefferson University, accessed December 1, 2022, Jefferson.edu/NeurodiversitySymposium.

[6] The multisensory, interactive, traveling installation *Synesthesia* is a recent project by the *SR&DL* and was conceived as part of the lab's ongoing research agenda. SR&DL. "SynestheticDesignLab." Accessed December 3, 2022. https://www.synestheticdesignlab.com/synesthesia.

AS, an adult woman, an architect with AS and OCD, an autistic adult who uses they/them or he/him pronouns. The selection is based on various differences, abilities, ages, medical conditions, and gender/sexuality. We aim to expand this list to eight individuals as a beginning point.

The project acknowledges that the neurodiversity of voices—across gender, sexual orientation, and diverse abilities—is key in absorbing the growing, bottom-up support networks and the increasingly powerful self-advocacy voices that are vital partners in shaping our spatial visions. In alignment with the UN's SDGs goals, 5—*gender equality*—and 10—*reduced inequalities*—respectively, architecture, intersectionality, and the neurodiverse experience are inseparable in creating inclusive futures that move from awareness and acceptance to celebration and pride. The project explores interaction as valuable design phenomena, of soft disciplinary borders and wider fields of knowledge.

The conceptual development of the project is supported by a 2021–2022 completion grant from the *Research Office* and a 2022–2023 seed grant from the *Center for Smart and Healthy Cities* of Thomas Jefferson University. For future phases of the proposal, further funding opportunities will be sought.

31.2.2 Project *Soft*: Design Aspects

In employing the term *Soft,* the project drives inspiration from three primary references. First, project *Soft* investigates the use of firm combined with flexible materials to explore soft, tactile, and flexible spatial imaginaries. Second, *Soft* engages the notion of *bodily*—of the body—attributes in syntony with Friedrich Kiesler's ovoid-like Endless House (1947–1960), conceptualized as an adaptable microcosm of human development based on the metaphor of the womb as a safe space. The third reference weaves in Nicholas Negroponte's *Soft Architecture Machines* and his inquiry on the disciplinary boundaries of the architect as a professional and the reconsideration of the occupant as an active participant in the design process via computer-aided operations.

Project *Soft* develops its research and design inquiry into two distinct realms: a physical and a virtual/responsive. Both can be evaluated independently at first, converging into one integrated solution.

Magda Mostafa's autism ASPECTSS™ design index[7] has guided the project's design decisions. Notably, the "*sensory zoning* index" is referenced in more detail in this paper and about the project's "responsive system." In contrast, the other index points are referenced for the physical and morphological systems at play.

31.2.2.1 Physical System: Firm Versus Soft Matter

From a physical, material, and morphological consideration, project Soft is measured by the principal design operations outlined below.

Memory and material research We think of *soft* architecture as a place in which memory defines structure. The lines dividing the interior and exterior are diffused, creating an uncanny relationship between organic forms and manufactured materials. We associate *soft* architecture also with material characteristics—yielding readily to touch or pressure; deficient in hardness; smooth; pliable; and malleable. The project is iterating on large-scale steam-bending wood techniques to achieve complex space curvatures in combination with textile and tensile interior moments to create a hybrid environment for various tactile needs.

Transitional entry sequence Project *Soft*'s curvilinear, nature-inspired geometry and tectonic language create a smooth transition from a larger space into its soft interior (Fig. 31.1a).

Variability and Flexibility Soft provides options for users with various needs. The project is inclusive of multiple ergonomic factors; it

[7] "The Autism ASPECTSS™ Design Index is the first set of evidence-based design guidelines worldwide to address built environments for individuals with Autism Spectrum Disorder. It was developed over a decade of research and consists of seven criteria proposed to be facilitative for ASD design. It is used as both an assessment and design development tool. The index refers to Acoustics, Spatial Sequencing, Escape Space, Compartmentalization, Transitions, Sensory Zoning, and Safety." (Mostafa 2015).

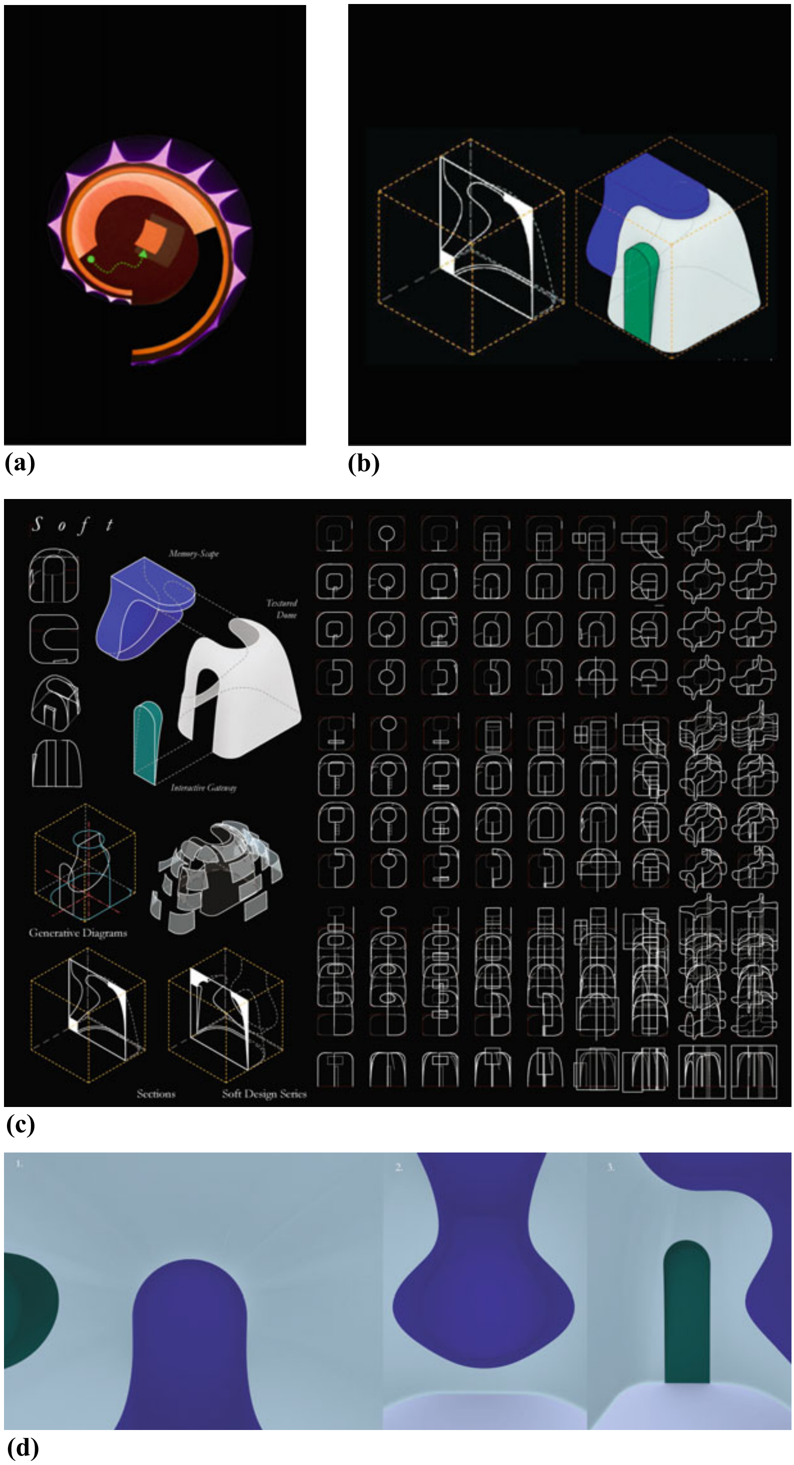

Fig. 31.1 **a** Project's *Soft* design approach as a standalone space (approx. 12' by 12' by 13' h) within a larger context. The planar diagram indicates a smooth transition zone from the larger space the prototype is placed into its soft interior. **b–d** Project's *Soft* early design iterations for integration within a typical existing exam or calm down hospital room (approximately 10' by 10'). Perspective views showcase various concepts for microzones: a textured dome, a memory scape, and an interactive gateway, respectively. All iterations are based on feedback from ASD advocacy groups and health experts. Currently, the first stand-alone option is under fabrication and further development

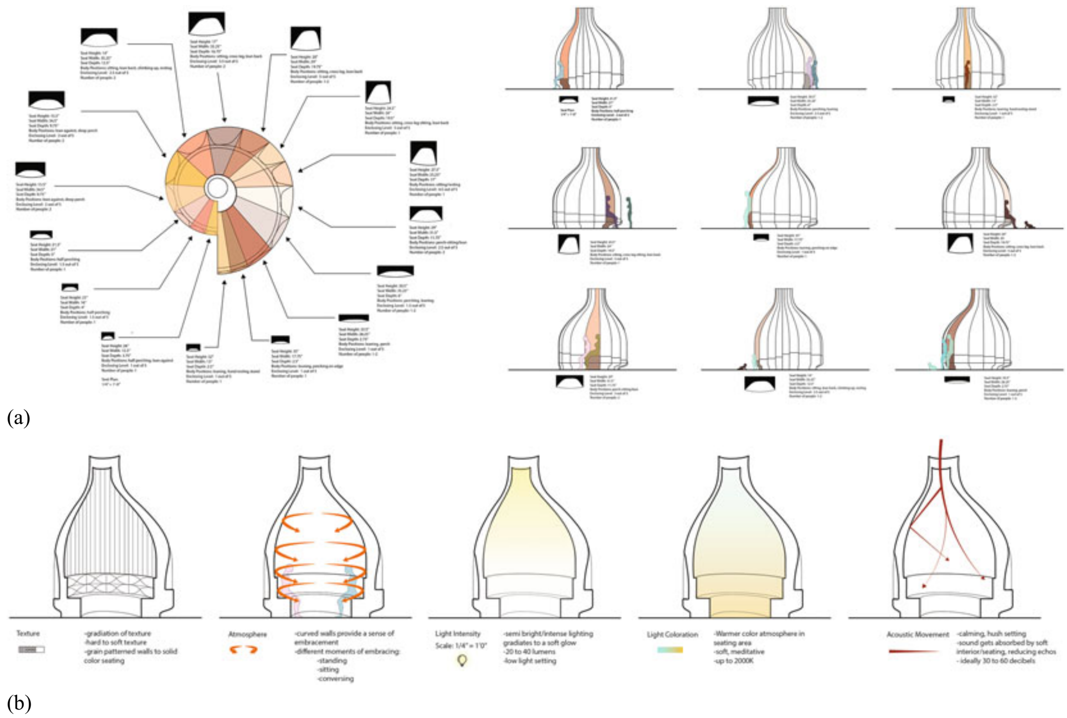

Fig. 31.2 Project's *Soft* design iteration as a stand-alone space within a larger context, **a** Project's *Soft* planar and elevational diagrams indicate provision of variability and flexibility aspects, via various microzones, resting options, and intimate nooks inclusive to various ergonomic factors, **b** Environmental aspects dynamically adapting in real-time in response to body-based biometrics

provides flexibility and variability via various microzones, resting options, intimate nooks, and the ability for the individual to organize various components of the interior space, such as movable furniture pieces (Fig. 31.2). It, therefore, provides multiple, nested scales within its larger approx. 12' curvilinear footprint that progressively narrows as it develops vertically. Its geometric composition, gender-neutral material finishes, color, light, texture, acoustics, and overall detailing follow evidence-based research to provide multiple options and space personalization.

Deployability Efficiency in fabrication can ensure an automated, cost-efficient construction and assembly process. Its fabrication method entails a construction based on detachable pieces for easy placing and dismantling, making it viable for various environments. *Soft* is scalable, variable and serves several contexts, such as sensory-loaded lobbies, hospitals' calm-down spaces, and, oncology units, amongst others.

Adaptability The inclusion of responsive design components regulates the environment via biometric input. The research evaluates the impact of the designed overall geometry, materiality, and acoustics to provide options to its users in their self-regulation process.

31.2.2.2 Responsive System: Dynamic Matter

Soft is an encapsulated environment where neurodiverse individuals can safely retreat when overwhelmed or overstimulated. Unlike other notable work in this field, we seek to use distant-to-the-body technology to adapt the environment in real-time in response to body-based biometrics. Closed-loop biofeedback is a well-established concept in which an individual's biomedical data is used to modify external stimuli in real-time to achieve a desired outcome. Biofeedback-mediated relaxation techniques have shown benefits for sufferers of migraines, ADHD, and anxiety. Our methodological goal is to create a reactive environment that can assess an individual's sympathetic nervous system activation levels and respond by intelligently modifying their environment to soothe, calm, and relax.

To date, our team has conducted a literature review and feasibility study for the placement of sensors and interactive electronics in a neuro-protective space. We have looked at existing such spaces and studied their choices of instrumentation. We have also looked at over-the-horizon sensor technology that may become feasible to integrate in the medium term. We have also researched a scientifically backed set of surveys and test instruments that can be used for assessment. In alpha-testing the ideas, we are creating basic proof-of-concept tabletop demos to integrate them with the physical structure at a later phase. The idea is to work closely with focus groups of neurodivergent individuals to test the surveys and our test instruments and get feedback on the proof-of-concept demos.

Biometric Recordings There are many biometric measurements that can reliably yield actionable information on an individual's level of stimulation. Heart rate variability (HRV), galvanic skin response, and body temperature are the most reliable. Heart rate variability measures fluctuations in beat-to-beat duration, which can change when an individual becomes scared, nervous, or anxious. Increasing heart rate typically suggests an adrenaline-mediated fight-or-flight response (Ihmig et al. 2020; Persiani et al. 2021). Galvanic skin response (GSR) measures the skin's electrical impedance. Skin impedance tends to decrease in response to elevated emotional arousal due to changes in sweat gland activity (Persiani et al. 2021). Rapid changes in body temperature are also linked to fear or anxiety-based physiological reactions. These changes are most commonly related to changes in vasoconstriction (Tattersall 2016; Chudecka and Lubkowska 2018; Lin et al. 2019). Brain activity is also used to assess the mental or emotional state, typically in the alpha band (8–12 Hz) (Bower et al. 2019; Higuera-Trujillo et al. 2020). Pupil dilation is yet another potential indicator of aroused emotional state (Higuera-Trujillo et al. 2020). Movement-based activities such as fidgeting, tapping, or rocking are also signs of emotional self-soothing (Essary et al. 2020; Motti 2019; Munir and Takov 2022; Park et al. 2020; Reinecke et al. 2020; Ringman and Jankovic 2000).

In principle, each state can be used separately or in combination to drive a closed-loop biofeedback system. The system would then modulate environmental factors such as lighting, sound, temperature, or movement to elicit biometric recordings suggesting reduced emotional arousal. However, this ideal model is limited by several practical aspects. The most substantial of these is the ability to acquire biometric signals without directly placing electrodes on the subject. Each biometric recording would typically require one or more electrodes placed in direct skin contact. For example, electrodes placed on the chest (a direct measure of cardiac muscle electric fields) or the hands or wrists (electrically or optically measuring changes in blood flow) measure heart rate. Recordings of brain activity require a minimum of two electrodes, touching on or around the scalp; specific sensor location significantly impacts signal validity.

Some measures, such as temperature or movement, can be taken without direct body contact. However, even in these cases, sensors must be appropriately located and calibrated. For example, while hand-held, non-contact skin temperature sensors are commonly used in healthcare environments, they still require a human operator to aim, trigger, and read the measurement. Likewise, movement sensors such as pressure or visible-infrared hybrid cameras must be located in areas with consistent and unobstructed access to the individual under measurement. Therefore, a degree of automation is necessary even for non-contact measurements.

Another layer of complexity necessitated by the proposed work is that sensor systems should be constructed from off-the-shelf technology whenever possible. Commercially available sensors have the advantage of being packaged and calibrated for use with standardized connections, power, and data transfer protocols. While certain remote-sensing technologies are in development, it would be impractical to integrate them into a production-quality system like what we are currently designing. For example, researchers are studying whether high-sensitivity video recordings can be used to measure heart rate based on subtle changes in face color as the heart pumps blood through the body (Barbosa Pereira et al. 2018; Wang et al. 2018). Despite promising initial results, such lab-based systems typically require precisely controlled environmental conditions, such as lighting and distance to the camera. Variations in hair, glasses, or skin tone may confound them. Consequently, any closed-loop biofeedback system we are proposing will be more robust if based on commercially available sensors whenever possible.

In this design, we pursue a partial data approach in which not all biometric signals may be accessible at any given moment. This is necessitated by the restriction that the user should not be asked to place any electrodes on their body. Instead, electrodes and sensors can be dispersed strategically throughout the environment of the prototype with the expectation that the user achieves sufficient physical proximity to them without even being aware of their presence (Fig. 31.3). For example, electrodes that are responsive to the heart's relatively strong electric field can be embedded within the fabric of a cushion or seat that the user will see as a desirable place to rest. Likewise, GSR sensors can be placed in multiple locations, such as a hand-rest, or fidget toy, and pressure sensors can be placed within the floor, seating area, and walls. One or more remote infrared sensors can be placed in elevated areas with unobstructed line-of-sight access to common seating locations in an attempt to assess body temperature.

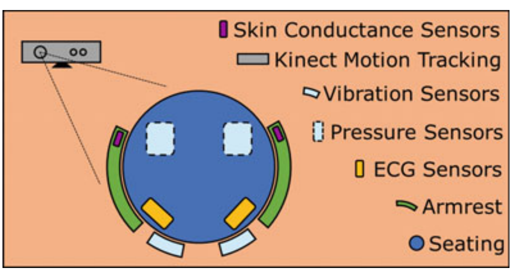

Fig. 31.3 Different types of sensors and technologies built into the environment in various scales to create different opportunities for signal measurement

By design, this strategy's expected outcome is inconsistent biometric data. The user is unconstrained from moving freely within the space; consequently, they will come in and out of contact with the various sensors. It is hypothesized that as long as some sensors can acquire meaningful data at any given time, it will still be possible to modulate the environment to reduce stress and anxiety.

A baseline system includes the sensors that produce raw data at varying rates. It is, therefore, necessary to collate and summarize data at some regular rate, likely every 1–5 s, to provide meaningful and coordinated biofeedback to the environment.

A body motion sensor, such as the Microsoft Kinect, detects body posture and movement (Essary et al. 2020). These systems typically have a broad field of view and can extract body coordinates (arms, legs, hips, head), eyes open/closed, and hands open/closed. Raw body measurements are produced between 20 and 60 times per second. These will need to be summarized into score-describing behaviors such as pacing, fidgeting, tapping, and rocking. Similarly, pressure sensors can be built into various floor and seating locations and can also be used to assess stereotypical anxiety movements.

Heart and GSR measurements within the prototype will be made via electrodes embedded into furniture, fabrics, armrests, and cushions. Heart rate estimates can generally be updated once per second and GSR measurements every 4–5 s. We will attempt to retrofit off-the-shelf touchless thermometers for body temperature measurements, although these must typically be used within 5 inches of a person's forehead.

In summary, some subset of the embedded and remote sensors will be capable of recording meaningful data that can be summarized every

1–5 s. Those data can be saved to a file and sent to a processor that determines how to modify the environmental controls.

As a preliminary phase, once the prototype is constructed, the measurements will take place upon the individual's entry to the space and in regular time intervals as mentioned above for the time duration the individual is inside the space. Another focus group will include a neurodivergent individual together with a caregiver. In exiting the space, we will conduct post-occupancy surveys and interviews with our focus groups to evaluate whether the positive spatial impact is long-lasting.

31.2.2.3 Evaluation Methods Principles

In developing our hypothesis for evaluation methods, we pose the following questions: How do we design without overtly codifying? For whom and with whom? How do we implement, and how do we continuously evaluate our frameworks? In examining possibilities of data-driven metrics to evaluate a design environment, on the one hand, the space has the capacity to sense and respond to accommodate a set of comfort thresholds for the human body. The human body serves as the entity being measured to evaluate an environment and inform design decisions. In our hypothesis, the simultaneous employment of metrics for both the space and the body is a multilayered approach; the goal is a human–environment conversation that brings sensory aspects to the forefront.

In addition to the biometric recordings via sensor systems and a data-driven evaluation approach, we are examining methods for ethnographic impact and observational research analysis. Therefore, our evaluation hypothesis is based on mixed methods, including shaping focus groups to conduct observation sessions, interviews, and surveys. In survey methods, our research has revealed that the phrasing of questions and the semantic and social-psychological aspects are critical. Survey data are particularly affected by the respondents' sensitivity—furthermore, in the case of neurodivergent individuals—to the framework in which a question is asked.

We have reviewed survey instruments commonly used to assess anxiety, especially in youth. Such instruments measure how effectively a neuroprotective environment reduces anxiety field settings. There are a large number of survey instruments that psychologists use to assess anxiety, both for adults and children. Importantly, all these surveys measure an individual's overall anxiety level over months. They are not designed to determine whether an individual is having an acute stressful episode. Also, surveys are rarely used in a standalone capacity. Psychologists integrate personal observations with results from numerous tests and surveys to generate an overall assessment of anxiety. One child psychologist we interviewed suggested the SCARED survey, which consists of 38 questions ranked on a 3-point scale (Birmaher et al. 1997).

The above-mentioned combinatorial evaluation approaches, surveys, and instruments will be tested in the months to come with the focus groups, as described in Sect. 2.1, and within the actual research prototype that is currently under construction. The research paper presents the evaluation hypothesis the team has put forth regarding how outcomes will be measured once the focus groups physically engage in the prototype space.

Considering the challenge of finding resources and ensuring funding, the project has been structured in multiple phases. The paper presents the overall project's vision and the development of current methods to get feedback from a larger audience and possibly expand its reach of collaborators while the project enters its prototype construction phase and proof of concept.

In a future phase, and before the working prototype gets deployed to various contexts, the goal is to study the resulting environment as a research platform, thus redefining, as needed, the research that drove the initial design decisions of the project's outline. With that, we will conduct a post-examination analysis of the prototype built.

31.3 Conclusion

As architects and designers, we need to interact with more potency and contribute more effectively to the cultivation, preservation, and claim to dignified space. The *question of inclusion* has no one answer, but the methods and framework established in the *Soft* experiment can be used to promote integration and implement change. This work—a physical prototype and a framework for inclusive design—responds to the ongoing, overlooked critical issues of access, safety, and comfortability and our current spatial reality that constitutes edges and exclusions for various sensory perceptual models.

The research trajectory of this work in progress must be manifested in a cross-disciplinary realm. In mapping flows of knowledge, as well as importing and exporting concepts, operations, tactics, and methods traditionally in the periphery of the design field, we stand for dialectical design thinking. All agents involved in making our built environments are encouraged to think about how our proposals could be attuned to the environment by interrogating the theories of what architecture does for society and the life after architecture. It also actively expands architecture's ideological and critical role in creating multivalent environments that embrace diversity.

With *Soft,* we ask: How do we, as practitioners and theorists of the design disciplines, advance the efficacy of our engagement in inclusive spaces without resorting to an overtly codified set of practices that can still reshape our environments and ultimately change the way we work? Malleable, flexible, and adaptable contexts that provide options while keeping a certain structure represent more diversity and reality on the spectrum.

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