# DESIGNING FOR DECOMPRESSION

Interior architecture: methods for inclusive interior architecture; regulating cognitive arousal through color, light and texture in a neurodiverse school

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*“Social space is complex: it is at once perceived, conceived, and lived.”*
*(Lefebvre, 1974)*

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For my children Ethel and Ludvig

# Abstract

This work responds to the dominance of "efficiency" and "rationality" in interior architecture, which can be counterproductive to mental well-being and productivity. It explores how color, light, and texture can support decompression, understood as physical environments that help restore sensory and cognitive balance.

These spaces function as sensory breaks, allowing the body and senses to relax, adapt, and recalibrate by reducing overstimulation (hyper-arousal) or gradually increasing energy in cases of understimulation (hypo-arousal). Decompression is framed as an active process of sensory and physiological regulation rather than passive rest, and the rooms are designed to support different modes of regulation rather than specific activities.

The project investigates how interior architecture can support cognitive recovery, with particular attention to individuals sensitive to environmental stimuli, and addresses the consequences of neglecting inclusive design principles for human well-being.

The study was applied to an existing school environment and initially involved neurodivergent pupils aged 14-15. Through theoretical studies, participatory workshops, model-based spatial tests, and photography, the project explores how spatial perception is shaped by color, texture, and light. The work is exploratory and could be further developed through future measurements of cognitive arousal.

A prestudy at Lund University (LTH) indicated that color chromaticness may influence perceived cognitive arousal and emotional valence in interior environments, in relation to individual personality traits (Gråmunke, 2024). Perceived comfort emerges through the interaction of color properties, spatial function, exposure time, and individual sensory sensitivity.

As stress-related disorders have increased globally since the early 21st century (Swedish Social Insurance Agency [Försäkringskassan], 2021), the need for architects and designers to understand how spatial design choices can reduce stress has become increasingly urgent.

During the design phase, subjective perception is used to interpret and translate workshop results within a theoretical framework. The main ambition is to develop a perception-oriented design method and to demonstrate how color, texture, and lighting could support decompression.

The study uses the Natural Color System (NCS) as a perceptual framework for color composition.

While the work is developed in dialogue with others, the final synthesis remains a designerly act, grounded in professional judgement and artistic experience.


#neurodiversity #neuroarchitecture #sensorydesign #interiorarchitecture #inredningsarkitektur #architecture #lightingdesign #color #colour #texture #materiality #hapticdesign #tactiledesign #spatialexperience #environmentalpsychology #inclusivearchitecture #universaldesign #participatorydesign #codesign #decompression #lightandcolor #NCS #perception

*Figure 1: Model 2*

*Please note that images in this master thesis differ between digital and printed copies regarding darkness and drawing in dark areas, also that different screens can display different color reproduction. I recommend a digital display of the images on a calibrated screen.*


*Figure 2: This picture is from model 1*

*Figure 3: This picture is from model 2*

# Table of content



Photos: Author (where not other stated)

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Here follows two different psychological models that I have used in my work for better understanding of how an interior architecture could affect its user. The models used are The Circumplex Model of Affect (Russell, 1980) and The Preference Matrix (Kaplan & Kaplan, 1987-88). I have developed Russell's model to better fit interior architectural stimuli.

I also present an illustration from the Natural Color System (NCS, 2019).

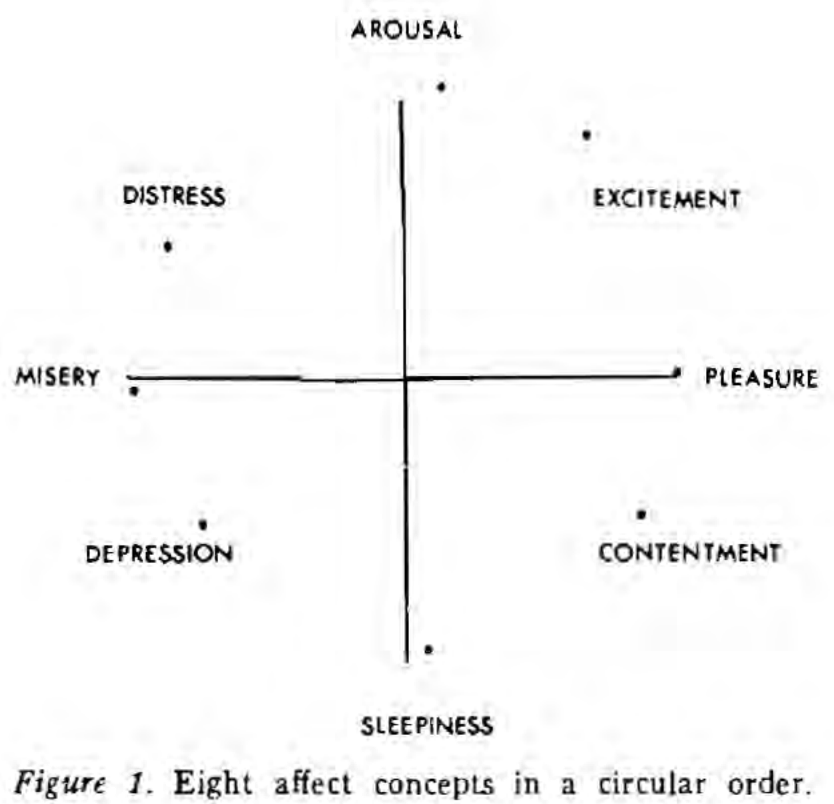
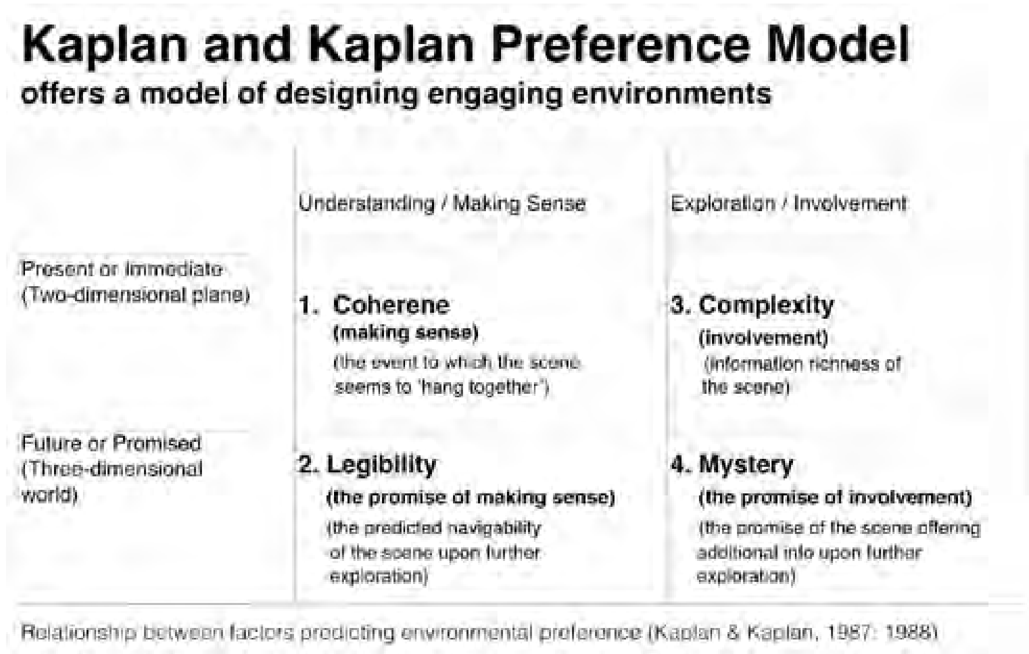



*Figure 4: Russell, Circumplex Model of Affect*



**Kaplan and Kaplan Preference Model**

**offers a model of designing engaging environments**

| | Understanding / Making Sense | Exploration / Involvement |
|---|---|---|
| Present or Immediate (Two-dimensional plane) | **1. Coherene** **(making sense)** (the event to which the scene seems to 'hang together') | **3. Complexity** **(involvement)** (information richness of the scene) |
| Future or Promised (Three-dimensional world) | **2. Legibility** **(the promise of making sense)** (the predicted navigability of the scene upon further exploration) | **4. Mystery** **(the promise of involvement)** (the promise of the scene offering additional info upon further exploration) |

Relationship between factors predicting environmental preference (Kaplan & Kaplan, 1987: 1988)

*Figure 5: Kaplan&Kaplan, Preference matrix*

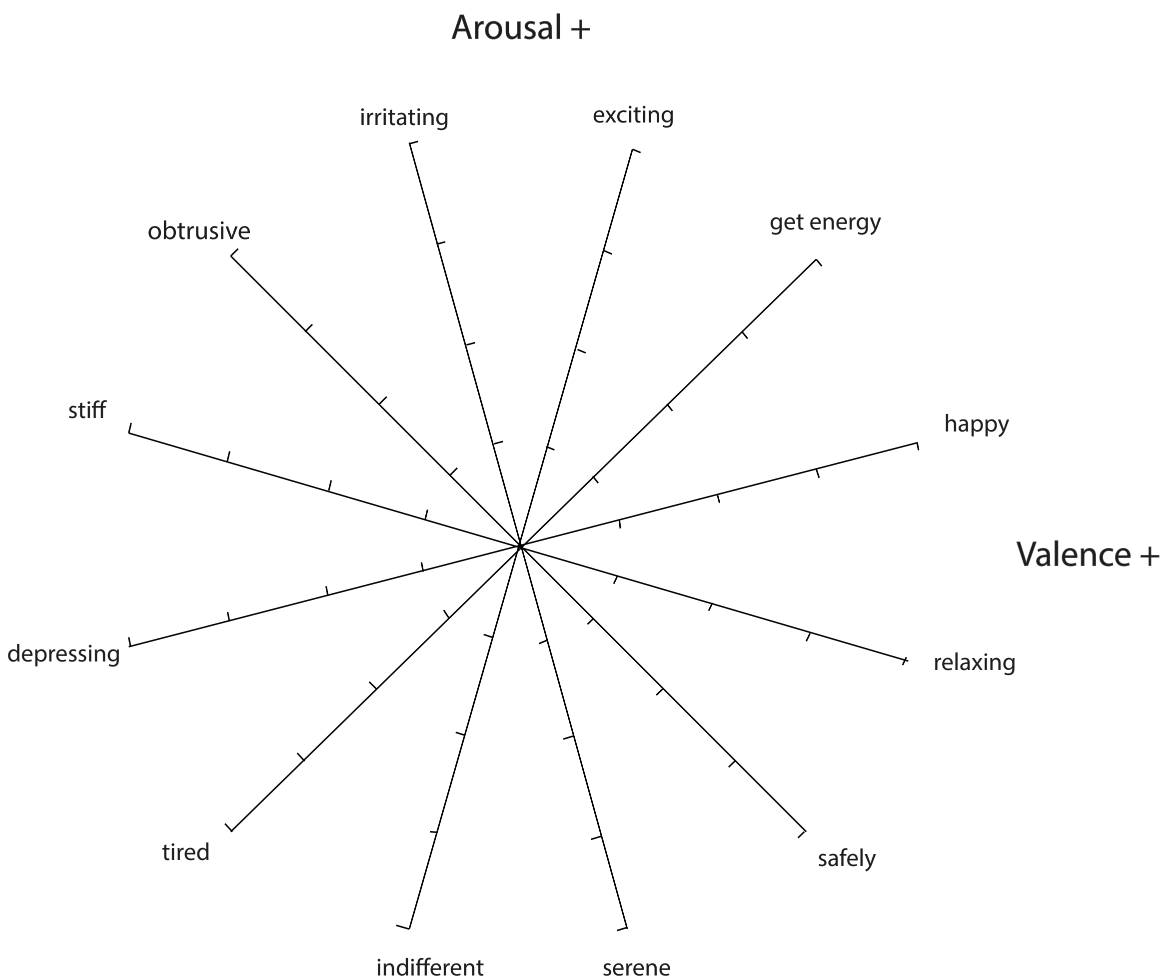



*Figure 6: Slightly developed Russell model, out of my interpretation of interior architecture*

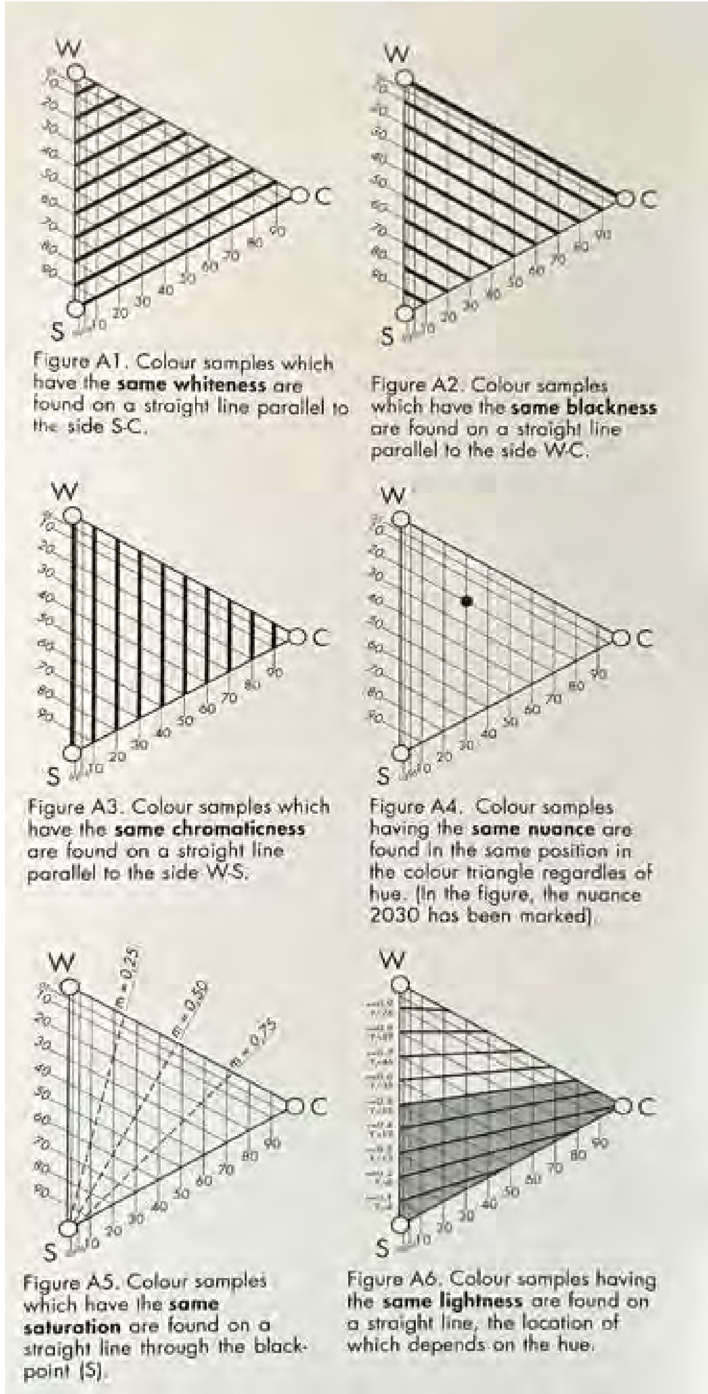



*Figure 7: NCS definitions (NCS, 2019)*

# Glossary of terms

In order to read this thesis, it is important that it is read it out of the same definition of concepts. Therefore a list of the most important concepts used.

## Psychological and environmental psychology terms

Unless otherwise stated, the definitions in this chapter are derived from PAS 6463:2022. The mentioned concepts will be significant throughout my master thesis.

**Decompression room (expanded definition)**
In this thesis, the term is used to describe a spatial environment that supports dynamic modulation of cognitive energy, including both downregulation and gradual upregulation. In line with the Yerkes- Dodson law (1908), interior architecture can support both downregulation during overstimulation and upregulation during low arousal through control of sensory parameters such as light, color, sound and spatial complexity.

**Hyposensitivity**
Reduced responsiveness to environmental stimuli.

**Hypersensitivity**
Heightened reaction to physical and/or emotional stimuli, and a tendency to become easily overwhelmed; sometimes referred to as high sensitivity.

**Multisensory room**
An environment designed to support sensory experiences or activities in a controlled manner.

**Neurodivergent (ND)**
Refers to cognitive profiles that function differently from dominant neurotypical standards. This includes conditions such as Autism Spectrum Disorder (ASD), Attention Deficit Hyperactivity Disorder (ADHD), dyslexia, dyspraxia, and Tourette syndrome. Neurodivergence is an umbrella concept, and multiple diagnoses may coexist within the same individual, sometimes resulting in conflicting sensory needs. Whether ND is understood as a disability or as a variation differs between individuals and is not assessed here.

In a Swedish context, neurodivergence is commonly associated with the term neuropsychiatric conditions (NPF), translated from the Swedish term neuropsykiatriska funktionsnedsättningar (literally "neuropsychiatric disabilities") (Attention, n.d.).

**Neurodiversity**
The concept that variations in brain structure and function are a natural part of human diversity.

**Neurotypical (NT)**
Refers to dominant or societally normative neurocognitive functioning.

**Reticular Activating System (RAS)**
The RAS regulates alertness and attention by filtering sensory information before it reaches consciousness. In architectural environments, factors such as light, color, sound, and visual complexity influence how the RAS is activated or loaded. Overstimulation may lead to stress and cognitive fatigue, while balanced sensory input supports orientation and focus. In individuals with neuropsychiatric functional variations, the RAS is often more sensitive, making architecture a regulator of arousal and perception. (Moruzzi & Magoun, 1949)

**Sensory-perceptual**
Refers to how sensory input is received and processed by the brain to form perception. Differences in sensory-perceptual processing, including hyper- or hypo-sensitivity to stimuli such as light, sound, touch, or taste- are commonly described in autism spectrum conditions (American Psychiatric Association, 2022; Bogdashina, 2016).

## Color terms

Unless otherwise stated, the definitions in this chapter are derived from NCS Colour Academy (n.d.).

**Color**
1) Basic color perception is determined by the wavelength of light incident on the retina (hue).
2) Material containing pigments of a specific color: paint (Norstedts, 1999).

**Saturation**
”Within the NCS system, saturation is used, somewhat confusingly, for a property that does not correspond to the everyday use of the term or to its use in many other colour systems. In NCS, saturation refers to the ratio between a colour’s chromaticness and its whiteness” (Swedish Standard, 1997, cited in Anter, 2014).

“The word saturation comes from the Latin word saturare (satur full). In everyday language, saturation is not a common colour term, but in art and design parlance, it is widely used, most often referring to the ”intensity” or ”vividness” of a colour much in the same sense as NCS chromaticness and Munsell chroma.” (Anter et al., n.d., p.1). ”Also referred to as strength, intensity, or chroma, it designates the purity of a given color...” (Mahnke, 1996, p. 85).

The different uses of the word saturation can be problematic and needs to be thought of.

**Chromaticness**
Based on my reading of NCS Colour Academy (n.d.) illustrations and explanations, it can be understood as chromaticness in the NCS system refers to the proportion of chromatic content in a color relative to its whiteness and blackness. As a formal attribute within the NCS model, it provides a standardized description of color composition, but it does not necessarily correspond directly to perceived intensity, vividness, or visual strength.

**Lightness (v)**
Lightness refers to the perceived lightness of a color.

**Elementary colors**
In the NCS system, elementary colors are perceived as pure color tones. These include the four chromatic colors- yellow (Y), red (R), blue (B), and green (G) and the two achromatic colors, white (W) and black (S).
The person used to mixing color can relate green as a mix of blue and yellow, but from a purely perceptual perspective, greenness is an equally fundamental and unblended color attribute, alongside redness, blueness, and yellowness (Anter et al., 2011).

**Color circle**
A horizontal section through the center of the NCS color space. It describes the hue in relation to the four elementary colors.

**Color space**
Imagined colours in a three-dimensional (3D) space. White and black are on a vertical axis while the other four elementary colors are plotted in a circle around it.

**Color triangle**
Describes the vertical dimension of the color space; the NCS Color Triangle defines the nuance of each hue.

In the NCS color system, the color triangle is a graphic illustration of the hue of a color, i.e. its blackness, whiteness, and chromaticity (Anter, 2014).

**Neutral colors**
All pure grey nuances are considered neutral. They run along the back of the triangle and lack a hue. They are coded with N as neutral.

**Contrast**
Contrast can be of different kinds, simultaneous contrast or induction, boundary contrast, successive contrast, contrast range between colors in the field of view. ”A room with contrasting accent colors has a greater contrast range than one where all colors are within a limited scale.” (Anter, 2014, p. 85).

# Prologue

For several years, I worked as a trained teacher in different levels of education. I taught in white classrooms where the light was even, correct, and standardized. It was perceived as neutral, functional, unproblematic. Years later, I worked at a special education school. There, it became evident that the environment is not neutral. Some pupils were not merely distracted, but operating under significant cognitive load, to which the physical environment contributed. I have brought this former experience with me into this project. As this thesis argues- color, light, and visual complexity are some of the factors that can become cognitive resistance rather than background.

At the same time, I carried my own skepticism. Questions of color, light, and atmosphere as cognitive influences rather than as aesthetic concepts long appeared to me as diffuse, almost vague. Difficult to measure. Difficult to legitimize in relation to efficiency and pedagogical structure. And I was, after all, aesthetically aligned with modernist purism.

This work is therefore also a repositioning. A shift from seeing spatial experience as secondary to understanding it as cognitive infrastructure. During the process, my son looked at the models I had developed and said: "Imagine if there were rooms like these in my school, where the lighting doesn't feel like it's corroding you.". The word corroding conveys more than discomfort. It suggests an environment that does not merely surround the body, but actively interacts with it.

This thesis investigates how color, light, and texture can be shaped to support decompression and cognitive restoration. It explores how architectural design can contribute to environments that are not only efficient, but genuinely functional and sustainable for different nervous systems.

# 1 Introduction

This work in interior architecture will explore how color, light, and texture can support neurodivergent pupils (14–15 years old) in school environments by creating atmospheres that enable recovery and regulation. Throughout the project, I aim to learn that there is no simple solution and no single environment that suits everyone, even within neurodivergent groups.

The design process will begin with participatory work with pupils and continue through my own practice, where theory will be reflected upon through an artistic process grounded in subjective perception. Model studies are going to be documented through photography, although the full experience can only be perceived through the physical models, as color rendering remains highly sensitive. Working with layered colors and textures means that exact NCS tones cannot be fixed through codes.

The project will be grounded in neuroarchitecture, an interdisciplinary field combining neuroscience, psychology, and architecture, which examines how the built environment affects cognition, emotions, and behavior. Architectural design influences mental states through sensory, cognitive, and emotional responses (Santos, 2023).

Neuroarchitecture, often described as evidence-based design, applies scientific methods to study how factors such as light, sound, color, and form affect brain activity and emotional states. Methods may include physiological measurements or subjective assessment tools, as in a preliminary study at LTH using semantic differential methods.

At Konstfack interior architecture department, the project takes an artistic approach, where theory functions as the engine of the investigation. The final work could later develop into a deeper participant-based study.

My understanding of the relationship between neurodiversity and interior architecture draws on my background as a teacher at a special education school with pupils aged 13-16 years old, together with literature on neurodiversity and sensory sensitivity. The school where my study is situated is located in southern Stockholm.

Recovery does not look the same for everyone, highlighting the need for diverse and optional spaces in public environments, places that invite breaks not only after fatigue, but proactively throughout the day. While nature remains the most effective restorative environment (Ulrich, 1984; Kaplan & Kaplan, 1989), indoor alternatives need to support regulation. Interior architecture acts as a subtle guiding force by reducing unnecessary stimuli, clarifying function, and lowering cognitive load (Thaler & Sunstein, 2008).

Stress-related disorders have increased significantly, reports Försäkringskassan (Swedish Social Insurance Agency, 2021), while people spend the majority of their waking time indoors (European Commission, 2003). Visually chaotic, noisy, or overstimulating environments can cause mental and physical strain, particularly for sensitive individuals (Evans, 2003). Despite growing awareness of accessibility, a gap remains between meeting minimum standards and achieving inclusive design that accommodates a wider range of sensory and cognitive needs (Imrie, 2012).

For autistic individuals, sensory overload can result in exhaustion or pain and may lead to anxiety or withdrawal (Baron-Cohen et al., 2009). Public interiors therefore need to combine aesthetics with functional diversity and integrated spaces for rest and recovery.

This master's thesis builds on my bachelor's thesis in Interior Architecture at Konstfack (Gråmunke, 2020), as well as on a later essay written at Lund University of Technology in 2024, within a course in environmental psychology, which can be regarded as a preliminary study. It is further informed by literature in environmental psychology and human-environment interaction. In this continuation, I will explore interior architecture as dynamically linked to cognition and sensory experience, showing how the same space can be perceived differently through changes in color, light, and texture. The project remains descriptive overall, carried out through an artistic, research-based process grounded in theory.

## 1.1 Purpose and aims

Despite growing research in environmental psychology and neuroarchitecture there is still a lack of evidence-based application of sensory knowledge in the design of public environments such as schools, hospitals and office buildings. Traditionally in the 20th century, architectural function has often been interpreted from a technical perspective, rather than psychological or sensory (Malnar & Vodvarka, 2004). It is crucial that environments are consciously designed based on sensory parameters such as color, texture, acoustics, ventilation, orientability, and the experience of demarcation or closure (sense of completion) (Mostafa, 2014; Ulrich et al., 2008).

Open floor plans, low tactile variation, and a lack of clear visual and spatial boundaries can lead to sensory overload, disorientation, or understimulation. This is especially (but not only) clear for individuals whose way of experiencing and processing the world around them differs from the neurotypical perspective (Mostafa, 2014). Architecture should therefore be understood as one of the conditions for human functioning. I also want to highlight how certain ideals within modernist or contemporary architecture, such as purity, minimalism and visually sparse environments, have often proven to be counterproductive to human functioning.

The decompression rooms are referred to in this study as supporting different levels of cognitive arousal. Instead of the terms "active" and "passive", which risk being misleading, the concepts that will be used here are hyper-arousal and hypo-arousal interior architecture. Hyper-arousal rooms aim to help pupils who are in a state of overstimulation to regulate their energy, while hypo-arousal rooms aim to support pupils in a low energy level to regulate their alertness. Both rooms are thus active in the sense that they offer strategies for self-regulation, but in different directions.

In summary: Color, light, and texture are not secondary aesthetic choices, but central functional factors in supporting human function, especially for sensory-sensitive individuals. Incorrectly designed environments risk increasing stress and creating obstacles, while consciously designed environments can contribute to a reduced sense of strain and increased security, orientation, and recovery. This is especially true in decompression rooms, where conscious choices of color brightness, dominance and chromaticness, as well as lighting and tactile materials, can make the rooms clearer and more functional for the target group. My purpose and aim with this thesis is to investigate, and later raise the issue in different channels.

## 1.2 Questions

I have not searched for answers in the literature based on specific questions, but the literature has shaped my design direction by giving me a background. It may still be good to present my questions even before the theory presentation.

• How can users' subjective experiences and narratives, gathered through a participatory process, inform design parameters for three spatial models, each based on a coherent combination of color, texture, and lighting, and each incorporating both hypo- and hyper-decompression spaces?

• Can an initial participatory process, combined with theoretical studies and an artistic design methodology, help identify architectural tonic design components that are particularly relevant for neurodivergent users?

• How can my own perceptual analysis of spaces, using The Circumplex Model of Affect (Russell, 1980) and The Preference Matrix (Kaplan & Kaplan, 1989), be applied and translated into this project?

• How can physical models be used to explore and evaluate different combinations of color, texture, and light?

## 1.3 Hypothesis

People require different types of spaces for recovery. By addressing both hyper- and hypo-arousal, pupils' ability to regulate energy levels can be supported through deliberate choices of color lightness, chromaticness, dominance, and relational composition, combined with conscious lighting and texture. Through these design components, spaces for decompression can become more functionally effective and better aligned with the needs of the target group.

Architecture can either hinder or support cognitive and emotional functioning, particularly for individuals with sensory sensitivities. Poorly designed environments may increase stress and create barriers, while consciously designed spaces could promote reduced stress, a sense of safety, orientation, and recovery. My hypothesis is therefore that color, light, and materiality are not merely aesthetic considerations, but architectural tools for supporting human function.

## 1.4 Delimitation

Interior architecture constantly presents sensory stimuli where multiple senses interact- visual, auditory, tactile, kinesthetic, and olfactory. This study focuses on the visual and tactile/ haptic aspects of stimuli.
I have mainly excluded furniture and artifacts to isolate and deepen the analysis of how color, light, and texture as a base layer affect perception and recovery. But at some points I have included artifacts and color samples for showing how these elements can introduce variation, accents, and points of focus, and either reinforce or contrast with the base layer. In my thesis the normally called ”background colors” play the main character.

I have not changed the initial floor plan, even though it is problematic from several aspects. I have done some smaller adjustments in details to be able to concentrate on the central issue.

The physical properties of light such as spectral energy, flicker (visible and invisible), color rendering etcetera are important for ND individuals but are outside this study. Also light as a powerful neurobiological stimulus that affects circadian rhythms, hormone production, cognition, and emotional regulation (Moore-Ede, 2024) is not included even if important for ND users.

"Color" is a vast field with many approaches. I mainly used latex paint (acrylic) as a medium, allowing for quick tests, but also gives some quality loss. A few samples demonstrate this loss and suggest alternatives like egg tempera and linseed oil paint, which are also more environmentally friendly (Ekobyggportalen, n.d). Of course walls in schools need durability and wipeability, but the quality loss should still be discussed as an aspect.

Texture is one aspect of materiality, which encompasses several sensory qualities. Materiality involves weight, temperature, acoustics, and scent, but these cannot be reliably represented in scale models. Texture, however, enables exploration of light interaction, visual rhythm, and spatial orientation.

# 2 Area of knowledge, background

The literature reviewed does not function as a framework for hypothesis testing or the questions, but as a contextual and conceptual background through which the practical exploration is articulated.

### Personal entrance

Before I start describing my chosen subject, I would like to describe my introduction to the subject. After stimulus-intensive days as a student at Konstfack University, I used to find peace in the school library, especially in the storage room downstairs in the basement. The room was quiet, calm, a little darker, with the sound of creaky roller archive shelves and a smell of history. The books down there were those that were not borrowed that often.

My interest began with reading Robert Sommer (1929-2021), an USA environmental psychologist known for his work on the interaction between physical environments and human behavior. One of his famous books is Personal Space: The Behavioral Basis of Design (1969). After Sommer, I studied the writings of the Swedish architect Sven Hesselgren (1907-1993), who emphasized perceptual approaches to architectural research. One of his important books is The Language of Architecture (1967). I also drew inspiration from the Danish architect Jan Gehl (1936-), who consistently advocates to priority the needs and experiences of the individual in urban space. One of his books is Cities for people (2010).

Through my studies at Konstfack, most projects have been based on my own feelings or desire for expression or concept- which created a frustration for me, there must be something else? I also felt from the beginning that Konstfack's study environment negatively affected my own function, especially the atelje' or "drawing room". The visits to the library gave me a key for my further studies, and my desire to work in the field between theory and artistic practice started.

## 2.1 Regulatory context: cognitive accessibility in spatial design

Contemporary environments are often designed with a primary focus on ”efficiency” and visual expression rather than recovery and sensory balance. Although the Swedish Discrimination Act addresses accessibility, its practical interpretation largely concerns physical barriers, while cognitive and sensory aspects of spatial environments remain insufficiently addressed.

This gap is also reflected in design guidance. In collaboration with the practicing architect Jonas Kjellander, feedback was submitted to Boverket regarding recommendations based on an oversimplified reading of research on learning environments (Barrett et al., 2015). Simplified advice such as “colorful background walls” risks producing environments with increased visual complexity and unintended negative sensory effects, rather than supporting inclusive spatial design. To ensure that this critique was grounded in the research, the guidelines were cross-checked against the original studies, which indicates that Boverket’s recommendations reflect an oversimplified interpretation.

These examples highlight the need for a more nuanced understanding of how spatial qualities such as light, color, and visual complexity affect cognitive and emotional responses in built environments.

## 2.2 Neurodiversity, neuropsychology and accessibility of architectural environments

Neurodiversity, or neuropsychiatric disabilities (NPD), is an umbrella term for conditions that affect how the brain functions and processes information, resulting in different cognitive abilities and challenges in everyday life (Attention, n.d.). Diagnoses include ADHD, autism, Tourette syndrome, language disorder, dyslexia, and dyscalculia. The degree of difficulty varies between individuals and is influenced by factors such as support, age, gender, and environment. Since different diagnoses interact differently with architectural stimuli, no single environment suits everyone; instead, spatial alternatives are needed (Tufvesson, 2007).

Already in the 1930s and 1940s, Henry Murray described how personality and environment mutually influence each other, introducing the concept of environmental press as a force affecting well-being (Murray, 1938). In architecture, cognitive arousal refers to states of alertness and engagement triggered by spatial characteristics such as color, light, and layout. Neurodivergent individuals that are non-screeners, are more sensitive to such stimuli and therefore at greater risk of overstimulation in environments designed for neurotypicals (Kwallek et al., 1996; Meherabian, 1977). While environmental complexity can stimulate exploration, a lack of structure may cause stress (Memari & Pazhouhaufar, 2017). Complexity and coherence are not interchangeable concepts (Kaplan, 1987).

In this master’s thesis, I explore how interior architecture can become more inclusive for neurodivergent individuals. Although accessibility is emphasized by the United Nations (Article 9, 2006), Swedish implementation often focuses on physical barriers, while sensory sensitivity and orientation difficulties are rarely addressed (Boverket, 2021). Research in neuroarchitecture shows that factors such as color chromaticness, light levels, and materiality influence cognition and stress (Mostafa, 2008).

Many public environments are still designed according to visual norms suited to the majority, which can result in spaces that feel chaotic or difficult to interpret. This contradicts the principles of universal design, which aim to make environments usable by as many people as possible (Boverket, 2021). Based on the literature, achieving true inclusion requires sensory-aware design as an integrated architectural strategy, accommodating both neurodiversity and the need for decompression spaces.

The Circumplex Model of Affect, proposed by Russell (1980), describes affective states along the dimensions of valence and arousal. Originally developed within psychology, the model enables a nuanced understanding of emotional intensity and quality. In my LTH report, I adapted the model for architectural interpretation, which helped me analyze the cognitive profiles of spatial environments (Gråmunke, 2024).

## 2.3 Architecture, sensory integration and restorative environments

“Stimuli” is a central concept in this work, derived from the Latin stimulus, meaning “spur” or “stick.” The project initially draws on James J. Gibson’s view of perception, where the observer is seen as active rather than passive. According to Gibson (1979), an alert individual seeks out and explores sensory information in the environment instead of waiting for stimuli to occur.

However, this perspective becomes problematic for individuals with increased sensory sensitivity, such as those with low sensory filtering (non-screeners). For them, stimuli cannot always be selected or avoided; sensory impressions may intrude regardless of intention.

Stimuli can also arise internally and interact with external input, reinforcing their impact.

We experience reality as a whole, even though sensory information reaches us through separate channels. Through multisensory integration, the brain combines vision, hearing, smell, and touch into a coherent experience (Stein & Stanford, 2008). This process is fundamental to perception and emotional development. As Juhani Pallasmaa argues, architecture mediates our relationship with the world through the senses (Pallasmaa, 2005). Designing restorative environments therefore requires an understanding of how the senses interact with architecture, as sensory-aware environments can reduce stress, support recovery, and enhance cognition (Ulrich, 1991; Kaplan & Kaplan, 1989).

Attention Restoration Theory (ART) emphasizes that mental recovery requires environments that are fascinating but undemanding. While nature is a primary example, architecture can also support mental flow (Kaplan & Kaplan, 1989). Kaplan and Kaplan (1995) identify four restorative components: being away, extent, fascination, and compatibility. Similarly, Stress Recovery Theory (SRT) describes how sensory-balanced environments reduce physiological stress (Ulrich, 1991). Restorative environments should therefore be an integrated part of architectural design, not an exception.

Architecture needs to allow a rhythm between spaces that demand focused attention and spaces that enable more open, effortless attention. Western design traditions often prioritize efficiency and rational consciousness (McGilchris, 2023, pp. 549-603), yet mental recovery requires alternation between focused and open modes of attention, such as observation without analysis or contact with nature (Kaplan & Kaplan, 1989).

## 2.4 Different names and aspects of calming rooms, sensory rooms - cognitive recovery rooms

Calming rooms or sensory rooms are increasingly being used as a supportive environment for people with cognitive challenges such as Autism Spectrum Disorder (ASD) and ADHD. These rooms offer a controlled multisensory environment that reduces sensory overload, strengthens emotion regulation, and promotes focus (Grandin, 2006). They are based on the principles of sensory integration, how the brain processes and coordinates sensory impressions to influence behavior and wellbeing.

Sensory rooms use for example, subdued lighting, soft colors, sound environments, and tactile elements. A similar idea is found in so-called peace rooms, which is used in some schools to provide a safe space where pupils can regulate strong emotions with support from an adult and return to teaching (CASEL, 2020). In contrast, escape rooms, which are designed for cognitive activation and playful problem-solving in sensory-stimulating environments. These rooms focus on challenge and entertainment rather than calm and recovery.

Cognitive recovery rooms should also support social interaction. In a study of the classroom situation by Kinnealey (et al., 2011) there was support that a comfortable sensory environment freed pupils to interact socially, as it seems as sensory hypersensitivity hinders social interaction. Therefore, from various aspects, it seems important that the sensory environment matches the individual's needs as it affects several different aspects.

## 2.5 Architectural stimuli through color-history, psychology, biology and physics also questioning of the aesthetics of the white plague

I have been reflecting on how we arrived at the current architectural situation. I believe it requires a historical perspective, as well as an understanding of the intentions behind positioning architecture as a contribution to the political ambition to cleanse society of disease and poverty.

The thesis also need to bring forward theory that can help clarify and make sense of different relevant factors.

### Brief history

The handling of color schemes in our rooms has varied over time.

Ruskin (1819-1900) believed that paint should not be used ”to color” architecture or serve as a background for form; and marbling and other imitations are forbidden (Olsson, 2007). During modernism, colors were often considered superfluous, and white became the norm despite its negative psychological effects (Valdez & Meharabian, 1994). White environments can be experienced as sterile, fragmented, and stressful (Augustin, 2014).

The development of white space in society can be understood as an isomorphic correspondence between two simultaneous tracks. One track is the hygiene and health oriented architecture that emerged in the fight against diseases at the beginning of the 20th century. The other track is the aesthetic modernism that emphasized abstraction and purity in harmony with industrial development, with rationality and efficiency at the center (Campbell, 2005 & Le Corbusier, 1931). Even within aesthetics, a parallel track developed, for example manifested in the gallery space.

The gallery that would now demonstrate a zero point and screen off other stimuli (O'Doherty, 1999). I also find it interesting to read about the distancing from perspective and constructed views of the artworks, to a horizontal and vertical extension where the artist works more with the surface (O'Doherty, 1999). For me it seems like a common cluster of ideas, but with built-in contradictions of liberation and control that don't take into account the experience of the individual.

## About color, texture and light in relation: psychology, biology and physics

My choice of area for my thesis took shape after I realized that I could not isolate "color" in my work. "Color" is a complicated interplay.

> When the light disappears, the colors disappear too, and when the light returns, the colors also return. When the shadow deepens, the colors disappear, and when the light increases, the colors become clearer. (Alberti, 1404–72, cited in Olsson, 2009, p. 17)

Surface color may be understood as an indirect way of experiencing light, where perceptual effects arise through complex interactions rather than isolated physical parameters. Perception does not arise from isolated stimuli but through a dynamic interdependence between light, color, texture and the perceiving person.

These elements do not operate within a hierarchy; rather, spatial experience emerges through their interaction. Without light, there is no perception of color, and light alone does not produce color experience. The perceived color is formed through the interaction between the spectral composition in the light and the physical and chemical properties of the surface it encounters, particularly its capacity for absorption and reflection (Foster, 2011). Also that in low-light conditions, blue and green tones are perceived more easily than red and yellow, which become muted (Hårleman, 2007).

Texture refers to perceptual properties that are experienced visually or tactilely, such as roughness, direction, and detail. The artist Moholy-Nagy distinguished between structure, texture, and facture regarding colors body: *structure* refers to the material's stable composition, *texture* to the visible surface, and *facture* to the sensory effect of processing and application methods such as brushing, polishing, or sponging (Olsson, 2009).

Lederman and Abbott (1981, cited in Klatzky & Lederman, 2010) found that surface roughness was judged equivalently whether people perceived the surfaces by vision alone, haptics, or both modalities.

Hesselgren (1985) included tactile sensation in the concept of grain, describing surfaces as hard or soft, smooth or rough. Even through vision alone, the brain responds to texture as if the surface were being physically touched (Klatzky & Lederman, 2010).

Texture could also be embodied as some individuals with for example autism lean against walls or feel on walls for physical support, or for memory function (Bogdashina, 2010; Gaines et al., 2018).

Texture also creates shifts in color perception through light and shadow, and changes in viewing angle and movement through space further alter how surfaces are experienced. Different application techniques allow light to penetrate, reflect, or diffuse, giving painted surfaces tactile and optical depth, an approach central to Bauhaus color theory, which emphasized surface, structure, and sheen (Olsson, 2009). Surface choices also influence how light is reflected: glossy surfaces can cause glare, while matte or more natural surfaces support visual clarity (Olsson, 2009).

Structure and surface composition influence not only visual experience but also orientation and spatial legibility through the interaction with light. Clear functional structure, where each zone has a distinct character, reduces cognitive stress by increasing predictability, an aspect particularly important for neurodivergent users. Color perception is closely linked to our understanding of three-dimensional space. This suggests that even subtle variations in texture can support spatial orientation by influencing how surfaces interact with light. Light, color, and texture can together help communicate function and create a legible and safe spatial logic (Baron-Cohen et al., 2009).

Beyond perception of light and color alone, research by Morichetto (2020) shows that surfaces with a certain complexity or depth can evoke nature-associated experiences that support well-being. For neurodivergent individuals, such qualities may reduce cognitive load and increase feelings of safety.

All together, surface composition communicates whether an environment feels welcoming, functional, or exclusive, shaping both spatial experience and self-perception (Acking, 1969; Boverket, 2021). Despite this, architecture often overlooks how color behaves depending on materiality and lighting conditions (Olsson, 2009).

Long-wavelength colors such as red are often associated with increased arousal, and short-wavelength colors such as blue with more calming or approach-related responses, but these effects are highly context-dependent (Andrew J. Elliot & Markus A. Maier, 2013). The perception of surface color cannot be directly translated into a specific wavelength. Instead, it emerges through the interaction between the spectral composition of the incident light and the spectral reflectance properties of the surface.

Consequently, surface color does not constitute a direct representation of light, but rather a mediated perceptual outcome. Research in color psychology has at times treated colored light and colored surfaces as comparable stimuli, despite their fundamentally different physical and perceptual bases.

Some researchers mean that differences in wavelength and energy distribution influence how colors are experienced. ”...due to a color’s wavelength, some colors at the same value level appear more saturated than other colors. For example, because red has a longer wavelength, it appears more saturated than its opposite color (blue-green) at the same degree of saturation.” (Kwallek et al., 2004, p.7). This relationship is though not inherent to color perception itself even if in perceptually calibrated systems such as the Munsell system, differences in perceived saturation are not directly determined by wavelength. While certain hues may appear more intense or reach higher chroma levels, this reflects perceptual organisation rather than a fixed physical relationship.

Color researcher Karin Anter argues: ”I remain highly sceptical of references to wavelengths and the supposed “energy content” of colours when discussing perception and psychological or physiological effects.” (email correspondence, 2026-03-21). ”Although color hue appears to influence levels of activation, directly linking such effects to isolated physical properties such as wavelength or energy remains problematic.” (Laike, 2014, p. 45). My interpretation is that you can not translate physics/optics into perception which is a interplay between light, context, and visual processing.

Early color research suggested that individuals differ in their reactivity to color stimuli, with more introverted personalities described as having higher levels of cortical excitability (Mahnke, 1996, p. 27) “The nervous system of the introvert is more excitable than that of the extrovert”. However, such interpretations were grounded in mid-20th-century personality theory and should not be conflated with contemporary understandings of neurodiversity. I don’t know how the sensory response was measured, but it would be interesting to gain deeper clarity on expression.

Evans (2003, p. 6) means that “Despite widespread belief, there is no clear evidence that color affects mood, emotions, or psychological well-being in any systematic manner. There is consistent evidence on color preferences, but emotional reactions to color are idiosyncratic and transitory.”.

I would say that while there is limited evidence supporting universal emotional effects of isolated colors, spatial color can not be reduced to discrete stimuli. In architectural contexts, color operates relationally through light, material, contrast, and spatial composition and interact with cognitive load and sensory processing rather than directly producing fixed emotional states.

Designing inclusive environments also requires distinguishing between sensory-sensitive (hypersensitive) and sensory-seeking (hyposensitive) individuals. Hypersensitive users often benefit from neutral and controlled stimuli, while hyposensitive users may require greater variation (Mahnke, 1996). Color is consequently not merely aesthetic as it influences emotions, cognition, and behavior. Avoiding over- or understimulation requires careful control of lightness, saturation, and the interaction between colors (Elliot & Maier, 2013).

Mehrabian and Valdez (1994) emphasize that it is the properties of color rather than hue alone that shape perception, highlighting lightness (dominance) and saturation as particularly influential.

This also raises thoughts about different color systems and their individual abilities: compared to NCS, the Munsell system (1915) more clearly defines lightness as a parameter. I think different advantages of different systems should be included in the ongoing professional discussion and not only be seen as regional different used models.

Contrast is fundamental to visual perception and can be shaped through differences and similarities. ”Differences in surface colors allow us to perceive visual boundaries; they help us to distinguish objects and surfaces. Conversely, similarities in surface colors allow objects and surfaces to be visually perceived as belonging to each other. Color differences and similarities can thus contribute to both spatial variation and wholeness. Differences and similarities between surface colors can be of various kinds and concern lightness, hue, and/or tone.” (email correspondence with Karin Anter, 2026-03-24). The ability to perceive differences in brightness and color enables vision itself (Liljefors, 1937, cited in Olsson, 2009).

Regarding color harmony, Hesselgren (1985) notes that unity of hue can result either in monotony or richness, depending on how variation and nuance are handled. Most individuals prefer a balance between uniformity and variation, while extremes tend toward either monotony or fragmentation (Hesselgren, 1985). Mahnke (1996) expresses that the designer’s major challenge is to balance unity and complexity.

As noted in professional architectural discourse, Le Corbusier used color as a communicative tool, applying variations in chromaticness and brightness to articulate spatial hierarchy, emphasize architectural elements, and create visual focal points (Souza, 2023). What I didn’t think, based on the often strongly contrasting color schemes in his architecture, Le Corbusier was aware of different personalities' affinity for color combinations. He meant that each individual is drawn towards some particular harmony which seems to accord with his inner feelings (Rüegg, 1997).

In designing for decompression, the perception of light itself cannot be isolated. In my models, it is crucial to distinguish between perceptual color temperature (Kelvin) and physical wavelength of the light, which are related but not equivalent (Moore-Ede, 2024).

Also the light distribution and light level is of importance, as we can both create more attractive environments and reduce energy consumption (Swedish Energy Authority [Energimyndigheten], 2023). The experience of light is shaped by the light's relationship to darkness. As Tanizaki notes, the true character of light emerges only through the presence of shadow (1933, cited in Fridh, 2004). Interactions between light and shadow, as well as phenomena such as glare, are therefore central to spatial experience. For neurodivergent individuals, particularly those with autism, sensory hypersensitivity can make changing or high-contrast lighting stressful or even painful (Bogdashina, 2016). It is therefore important to understand that both insufficient variation and excessive luminance contrast may function as environmental stressors, as research indicates that lighting conditions influence arousal, mood, and cognitive processing (Küller et al., 2006; Ulrich et al., 2008).

There is also research in hospital context that suggested that people feel more comfortable talking in rooms with dim lighting as compared to similar rooms with bright lighting (Ulrich. et al., 2008).

A functional approach is zone-based lighting, combining brighter, task-oriented light with dimmer, indirect light for rest and conversation. Indirect lighting, where light is reflected off walls or ceilings, contributes to a calmer and more legible spatial experience (Maslin, 2022). Natural daylight, particularly when combined with soft artificial lighting, can support recovery and sensory balance (Ulrich et al., 2008).

Perception, however, is not only about receiving sensory input, but also about adapting to it (Olsson, 2009). This raises the question of what happens when the sensory demands of contemporary architecture do not align with an individual's capacity to process them.

## 2.6 Introduction to The Circumplex Model of Affect and The Preference Matrix

This project draws on two environmental psychology models to frame the relationship between spatial qualities and human affective and cognitive responses: The Circumplex Model of Affect (James A. Russell, 1980) and the Preference Matrix (Stephen Kaplan and Rachel Kaplan, 1989), which together help frame the relationship between spatial qualities and human affective and cognitive responses.

### The Circumplex Model of Affect

The Circumplex model of affect (figure 4) conceptualizes emotional states along two continuous dimensions: valence (pleasant to unpleasant) and cognitive arousal (activated to deactivated). Rather than categorizing emotions as discrete entities, the model positions affective experiences within a circular structure defined by these two axes.

In spatial design contexts, this framework allows environments to be understood in terms of how they modulate activation levels (e.g. stimulating vs. calming) and emotional tone (e.g. comforting vs. distressing). It is particularly relevant when designing environments intended for decompression, as it helps articulate how light, color, and texture may influence both cognitive arousal regulation and perceived pleasantness.

### The Preference Matrix

The Preference Matrix (figure 5) proposes that people prefer environments that balance two fundamental informational needs of understanding and exploration. The model identifies four key predictors of environmental preference:

- Coherence (immediate organization and clarity)
- Legibility (promise ease of orientation and structure)
- Complexity (richness and amount of information)
- Mystery (promise of further information)

Coherence and legibility support comprehension, while complexity and mystery encourage engagement and exploration. In restorative or sensory-sensitive environments, calibrating these variables becomes crucial. Too much complexity may overwhelm, while too little may feel understimulating, and this is in relation to personal cognitive factors. The two concepts of coherence and complexity should not be used interchangeably, as an environment with high coherence can be very complex at the same time. In addition, the diversity of colors, textures, and shapes are some examples of complexity. (Kaplan & Kaplan, 1989, cited in Memari & Pazhouhaufar, 2017, p.16)

### Integrating the Models in Spatial Design

While The Circumplex Model of Affect addresses the affective regulation of space (how environments influence arousal and emotion), The Preference Matrix addresses the informational structure of space (how environments are cognitively processed and understood). Together, these models provide a structured way to understand how spatial environments influence emotional regulation, perceptual processing, and restorative potential. The integration is relevant in cognitively diverse contexts (and should include all collective environments), where both emotional regulation and manageable sensory information are crucial for restorative experiences.

## 2.7 Brief presentation of my preliminary study at Lund University of Technology (LTH)

This study at Konstfack builds on a course in environmental psychology at LTH. The initial hypothesis examined whether chromaticness differences within a hue of equal lightness could lead to different experiences of cognitive valence and arousal (Gråmunke, 2024). The pre-study suggests that surface color chromaticness may influence how environments are perceived, affecting cognitive arousal and valence in relation to individual screening ability. As the study was performed in environmentpsychology saturation was the used vocabulary for color strength.

The analysis focused on screening ability as a key variable based on Mehrebian (1977). However, during this thesis at Konstfack I understand that sensory sensitivity that is a similiar but different aspect may constitute an additional, distinct dimension influencing how chromatic environments are perceived.

Color schemes, often overlooked, appear to be an important factor in creating supportive environments and achieving architectural intent (Gråmunke, 2024). I used the theory models described above, Russell slightly calibrated (figure 3), for use in an architectural context.

### 2.7.1 Table and list of figures

What you can read out of the diagram is that out of 10 persons that participated in the study, carefully interpreted, there could be a connection between how different room colors is percepted related to screener ability.

Y-1060 was the generative color in the study choosed from a preschool in Stockholm, and the other colors Y-1030 and Y-1515 was choosen in communication with my supervisor Professor of Environmental Psychology at LTH, Maria Johansson. Y-1030 and Y-1515 has about the same lightness as Y-1060 and appeared as approximately equal steps in a visual comparison.

*Figure 8: Models, from the top Y-1060, Y-1030 and Y-1515.*

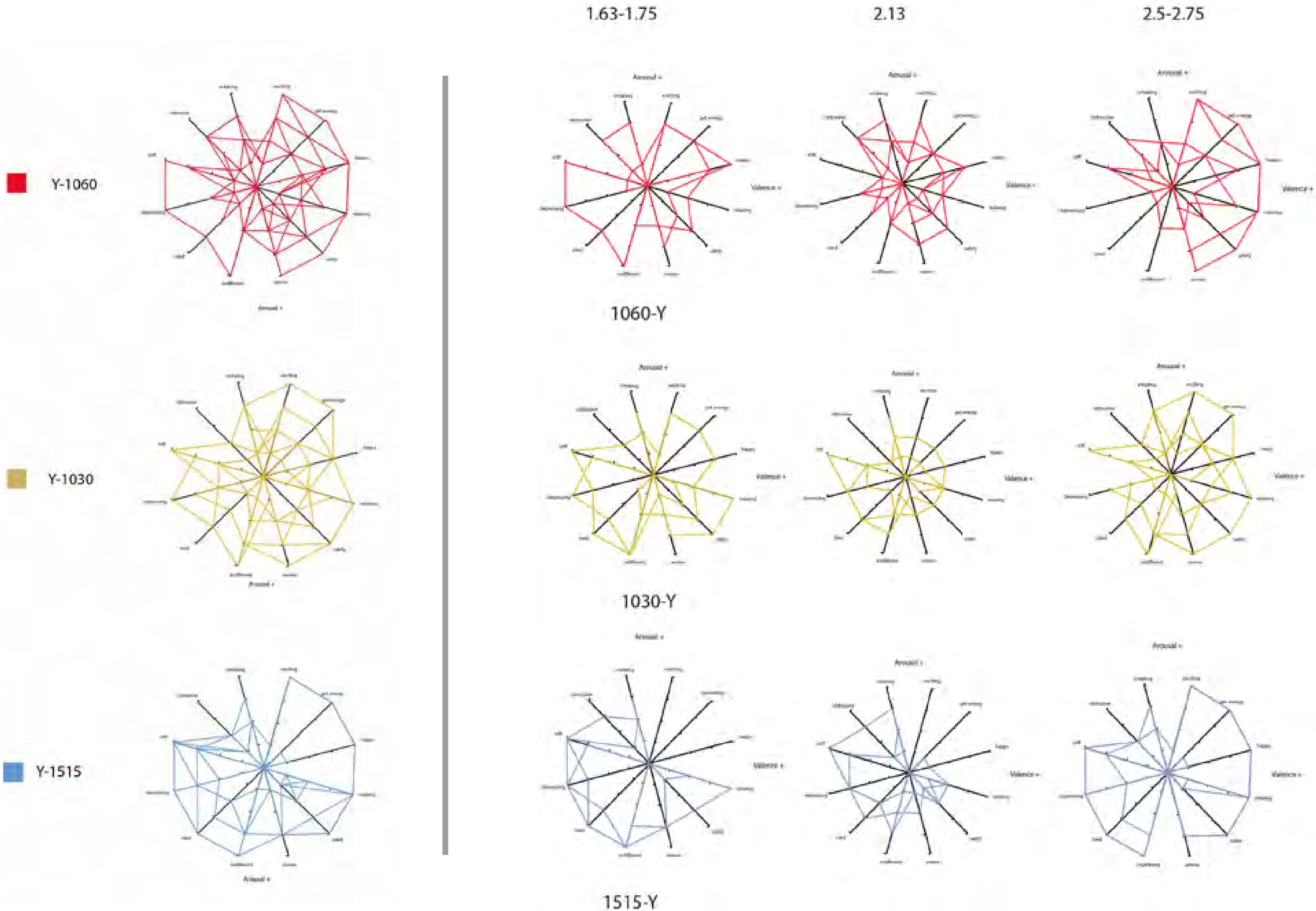



*Figure 9: LTH diagram out of Russell. Left diagram- perception put together of all participants. In the right diagram you can see that perception might differ due to cognitive function. Cognitive function was tested out of Mehrabian (1977) semiotic scale.*

## 2.8 Inspirational and degenerating environments- study visits and reflections

I have done study visits as a method. What connects the visiting environments? They are mainly public spaces, many aims at education and various types of healthcare. This has given me the opportunity to reflect and bring knowledge into the project.

**Ekonomikum, Uppsala University- contrasting rooms for different needs**

In February 2024, I visited the reading rooms "Outlook" and "Insight" (Sweco, 2018) at Ekonomikum. "Outlook" is daylight-filled and socially oriented, while "Insight" is darker, enclosed, and designed for individual focus. The visit clarified the importance of offering clearly differentiated environments and daring to create spaces such as "Insight," where darkness and individual adjustment are central qualities.

”Variation is natural and helps sharpen our senses. Darkness is also restful, making it easier to focus within the "bubble of light" that belongs to each individual place." (Kjellander, 2019).

**Lagoon Habilitation Center- a sensory model**

At Lagoon, spaces are designed to allow users to regulate stimuli such as light, sound, vibration, pressure, and movement. The sensory rooms can either activate or calm, highlighting that recovery is individual rather than general. However, I missed color as an active component and believe it could strengthen the experience. Testing a room myself for 20 minutes made clear how interior architecture directly affects bodily and emotional states, not just function.

**New Karolinska University Hospital- an environment without reflection?**

Repeated visits to the New Karolinska Hospital revealed an environment that feels functional but not caring, particularly for individuals with heightened sensory sensitivity. Attempts to contact the architects regarding inclusion and sensory awareness resulted in no clear answers, raising questions about what is considered "adequate" interior architecture in high-stress environments. In relation to the research by Ulrich et al. (2008), this also prompted a reflection on the potential economic loss for the region.


*Figure 10: From the left Ekonomikum ”Insight"; New Karolinska hospital corridor; New Karolinska childrens emergency waiting room*

**Mälardalen University, Eskilstuna- color in educational environment**
A field study at Mälardalen University focused on color, light, and perception. One key insight was the discrepancy between measured and perceived color values due to light conditions, texture, and gloss. For example, the red floor appeared to be higher in chromaticness and lighter, than the measured (with Colourpin reader) NCS value. 3060-Y80R compared with approximately 2570-Y80R in november. Glossy surfaces created glare, while matte surfaces diffused light more evenly. The combination of high chromatic flooring and white walls, both affected by bluish skylight, linear acoustic panels, and harsh lighting- likely increased both visual and auditory arousal. During the visit I started to understand how tonic environment factors may operate below conscious awareness. Tonic environmental factors refer to background features of an environment that influence individuals continuously and often subconsciously, rather than through sudden or noticeable stimuli. These factors such as ambient light, color, sound, spatial layout, and material qualities create a constant sensory "baseline" that shapes mood, attention, stress levels, and behavior over time without requiring conscious awareness.

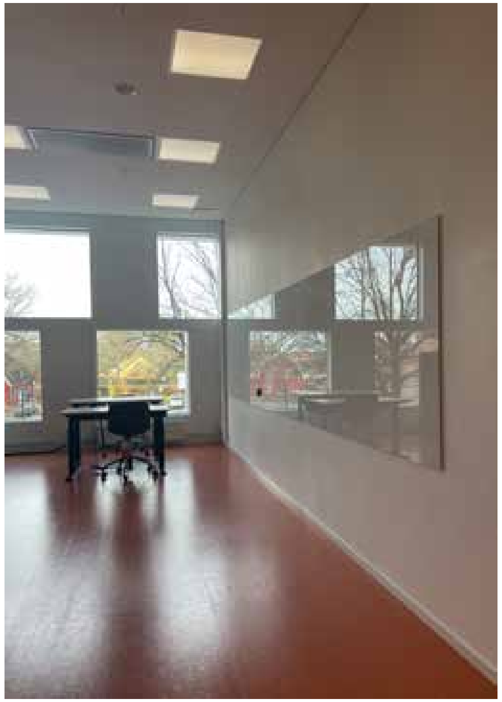


*Figure 11: Mälardalens University. How do you percieve complexity and coherence?*
*Photo: Åke E:son Lindman, Peder Lindbom*
*Figure 12: One lecture room at Mälardalens University*

**Churches as architectural inspiration**
Contemporary churches have repeatedly served as inspiration in my work due to their restorative qualities: soft light, calm acoustics, tactile materials, and clear yet non-hierarchical zoning. St. Mark's Church by Sigurd Lewerentz exemplifies how materiality and color can carry architectural expression through the senses, creating a space that embraces rather than demands attention.

**Public toilets as places of refuge**
In the absence of recovery rooms, toilets often become informal refuges in schools. However, they are rarely supportive environments. At Konstfack, harsh lighting, stressful high chromatic color choices, and signs of vandalism make toilets sensory inhospitable, illustrating how easily regulatory needs are overlooked in everyday interior architecture.

So far in my report I have placed my project in a knowledge position, compiled the theoretical background, presented central concepts and reported for study visits. With the above background description and theoretical framework, it is relevant to repeat the thesis questions before the process continues.

- How can users' subjective experiences and narratives, gathered through a participatory process, inform design parameters for three spatial models, each based on a coherent combination of color, texture, and lighting, and each incorporating both hypo- and hyper-decompression spaces?

- Can an initial participatory process, combined with theoretical studies and an artistic design methodology, help identify architectural tonic design components that are particularly relevant for neurodivergent users?

- How can my own perceptual analysis of spaces, using Circumplex Model of Affect and The Preference Matrix, be applied and translated into this project?

- How can physical models be used to explore and evaluate different combinations of color, texture, and light?

# 3. How- literature review, site visits, participant-based workshop, model studies and sketching, validation of color discrimination ability

My study is conducted through the following methods:

## 3.1 Methods and thoughts on methodological choices, effects as well as ethical considerations

### Literature review:

I base my work on research and theories around color, light, texture, neuroarchitecture, environmental psychology, and cognitive recovery. The literature from architecture, psychology, and neuroscience frames my questions and guides the design process.

I problematize that some research regarding arousal and attention rely in some cases on animal studies, which I find ethically difficult to support. This work therefore distances itself from uncritical use of such research.

### Site visits:

By visit different places that I perceive have different cognitive profiles, I collect knowledge that I bring into the design process.

### Participant-based workshop:

I conduct a workshop with pupils from a resource elementary school in southern Stockholm to gather their experiences and interpretations of color and space. The process includes open discussions and color scheme exercises, which I compare to theoretical frameworks.

### Model studies and sketching:

Based on earlier findings, I create models and sketches, testing combinations of color, light, and texture. I validate how different designs support pupils' regulation of energy through hyper- and hypo-decompression, using photos of models analyzed via Russell's theory. Only the physical model and calibrated screen provide accurate color and texture representation, prints and other screens risk distortion. All color and lighting assessments are therefore done on the original model.

Working with a 1:20 scale model could offer a concrete representation for participants, which I hope can later serve as communication material. The use of physical models and 1:1 examples, would also be important in terms of how to read the textures in a real situation, providing a bimodal perspective (Klatzky & Lederman, 2010). Pimkamol Mattson at LTH emphasizes that color work must be done physically, not digitally, as you lose qualities (webb meeting 2025-12-10).

### Researcher as instrument- validation of colour discrimination ability:

As color discrimination constitutes a central perceptual tool in this study, my color vision was assessed using the Farnsworth-Munsell 100 hue test at NCS Colour (Stockholm).
The result showed one minor transposition (hues 66 and 67), with all other sequences correctly arranged, indicating a high level of color discrimination accuracy. This assessment serves as a validation of the perceptual reliability underlying the chromatic investigations conducted in this project.

# 4 Interior architecture design work

## 4.1 Participatory design with pupils

I start the project with participatory design involving about 20 eighth-grade pupils at a resource school in southern Stockholm. As a deputy art teacher for the group, I already have an established platform of trust, which eases participation (Büscher et al., 2002 in Simonsen, 2013). The design tasks align with the Swedish National Agency for Education's art curriculum, and the project receives approval from the principal.

I initially use an open, reflective approach (Bødker et al., 2004 in Simonsen, 2013), following by a more guided task. The group is considered "vulnerable" due to age and the context of the resource school. Most pupils agree to participate with their guardians´ approval. Some choose not to participate, possibly due to the initially unclear scope of the project. Being aware of the pupils-teacher power dynamic, I emphasize voluntary participation and offer alternative activities. Most pupils appreciate the opportunity to reflect on their environment. I clarify that while the project may not bring immediate changes, their input is valued.

We start to discuss the school environment. What catch my attention is that most of the participants strongly dislike the grey-and-white color scheme, describing it as boring. They criticize the "ugly yellow flooring" and the colorful acoustic panels as distracting. One pupil notes that the harsh 6500K lighting in a toilet makes the walls appear sickly blue and worsens self-image. What is not really in the thesis but important for future aspects is that a sloping wall frustrates some participants. I chose not to change the floor plan so the slope of the wall is kept, but it is a problematic feature.

In the next task, pupils mix muted colors using simple acrylic paints to practice color perception. They then choose one of two rooms from my project and design a color scheme using a line drawing as a guidance. Some pupils create moodboards or work more freely, indicating potential for deeper exploration. I measure the pupils' mixed colors and compare them with Anter's (1994) measured nature colors and also with my own investigation at LTH (Gråmunke, 2024).

None of the chosen colors have a chromaticness above 40%, which aligns with theory and previous analyses.

*Figure 13: An example from the task to mix muted colors. This is one example from a very skilled pupil. To the right the original picture.*

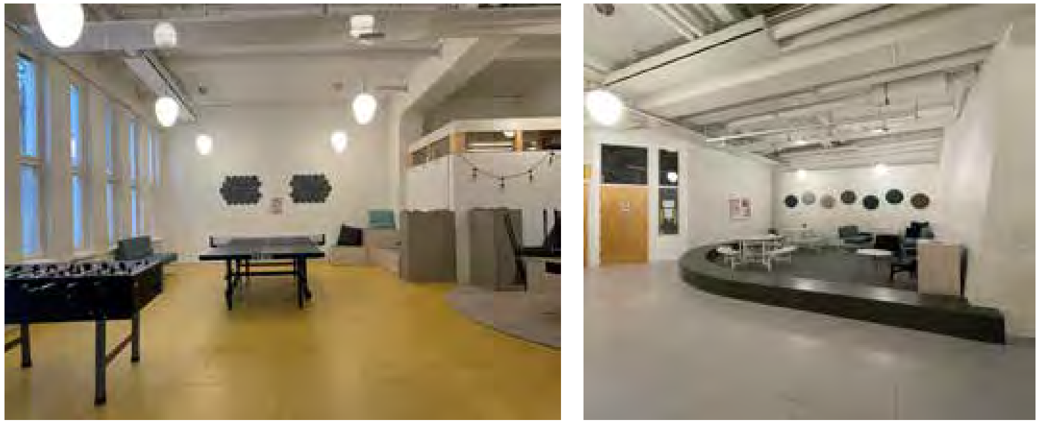
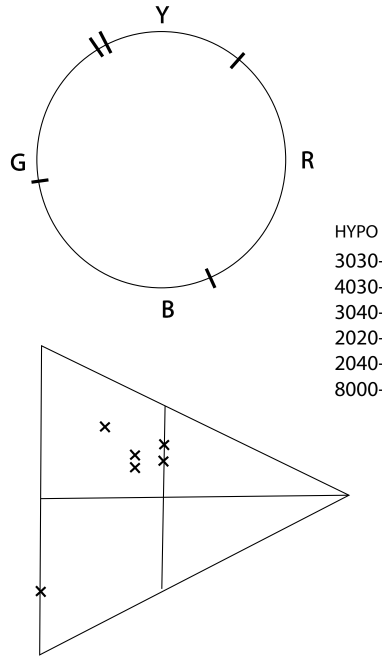
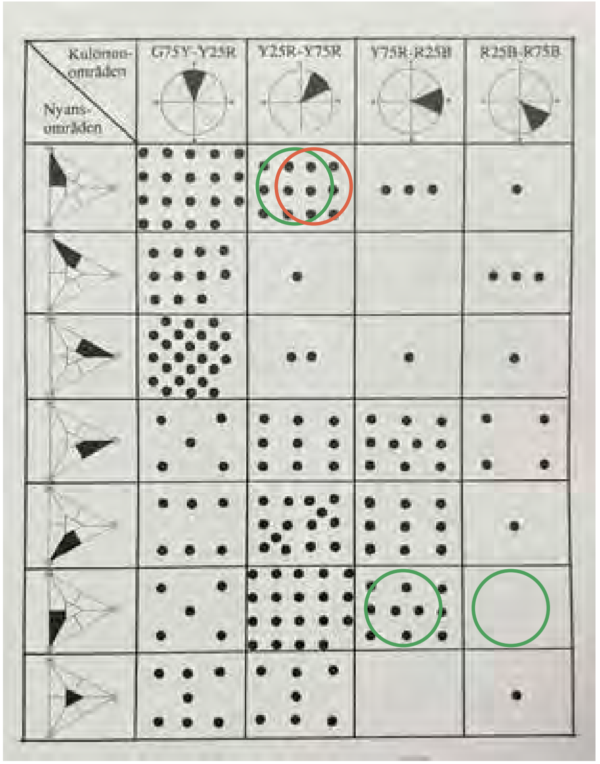


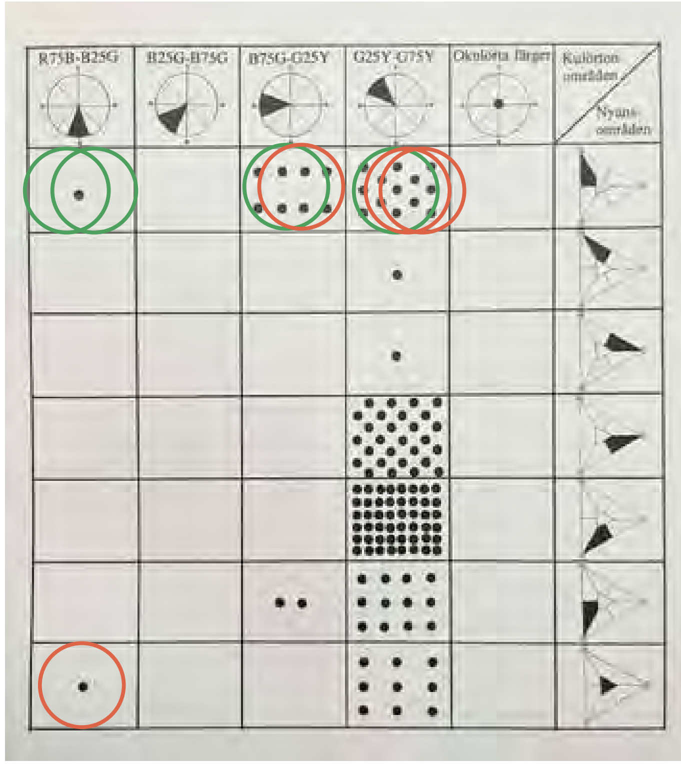
*Figure 14: The rooms in the school that is my study object.*

*Figure 15: Exampels of the pupils images*



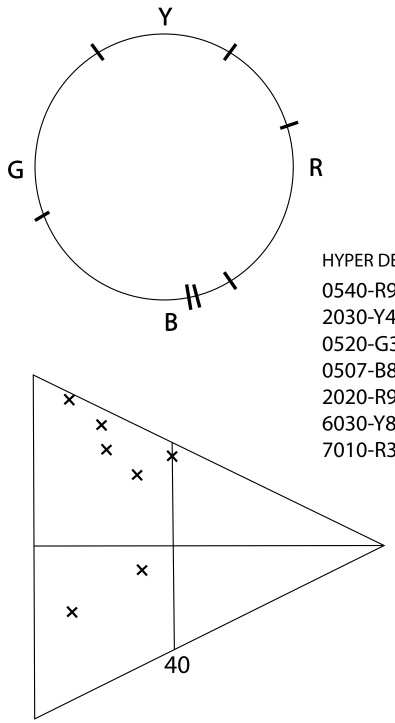

HYPO DECOMPRESSION
3030-G30Y
4030-B90G
3040-G30Y
2020-Y40R
2040-R80B
8000-N




Suggestions hyper decompression rooms

Suggestions hypo decompression rooms




HYPER DECOMPRESSION
0540-R90B
2030-Y40R
0520-G30Y
0507-B80G
2020-R90B
6030-Y80R
7010-R30B

*Figure 16: To the left, students own suggestions measured and placed in the NCS system. Top right I have compared the students' color scheme with Anter's (1994) color scheme of nature.*

## 4.1.2 Division of pupils color suggestions into three perceptual representations, and spatially hypo- and hyper-decompressing areas

I search three design tracks in the pupils' work to take forward. Common design terms such as ”program” or ”scene” are avoided in favor of ”perceptual representation”. This is due to emphasize that the project focuses on perceptual conditions rather than just aesthetic preferences.

The three color areas I identify, and interpretation:

**1) Warm colors, yellow to red: Embraced, shelter: “cave and cove”**
**2) Cool blue tones: Openness, overview: ”mountain peak/horizon”**
**3) Different green tones: Participation, wandering, being in: ”landscape / biophilia”**

This areas suggest through my interpretation basic existential states and spatial orientations. I reformulate the different areas as body-space relations within this project.

**1) Inward/ embraced- held / protected**
**2) Outward- expanded / overview**
**3) Within- connected / engaged/ part of**

I provide a preliminary design guideline based on the theoretical framework, outlining how different sensory parameters may be applied to the two room types. However, these conditions need to be tested with the user group in order to assess whether they are appropriately interpreted, and to better understand where different elements fall along a spectrum of perceptual complexity.

This relates to the Yerkes–Dodson law (1908), which describes the relationship between arousal and performance as an inverted U-shaped curve. Applied to this context, it suggests that sensory variables such as light, color, and texture support cognitive and emotional functioning only within a certain range. Both insufficient and excessive stimulation may be counterproductive, and the optimal level varies depending on the individual and their current state.

The conclusions for the two room-types perceptual representations are put into the headings of ”hyper” and ”hypo” referring to spatially hypo- and hyper-stimuli decompressing areas meaning the sensory qualities of the space itself, rather than individual sensitivity.

### HYPER-DECOMPRESSION ROOM

Aim: Release stimuli, calm breathing, regain balance.
Colors: Colors close in lightness and hue.
Light: Indirect wall lighting. Possibly more even lighting. Sitting areas are kept darker to reduce visual prominence and allow for a sense of retreat.
Texture: Walls may have texture but no disruptive patterns. Floor contrasts softly with walls, unison due to open plan.

### HYPO-DECOMPRESSION ROOM

Aim: Regulate energy with more energetic but still not harsh stimuli.
Colors: Saturated but grounded, energizing but not stressful. Wider range in lightness and complementary tones.
Light: More vivid light. Downlights between windows to reduce glare contrast.
Texture: More pronounced texture allowed but no directional/moving patterns. Floor contrasts softly with walls, unison due to open plan.

Hypo- and hyper-decompression spaces

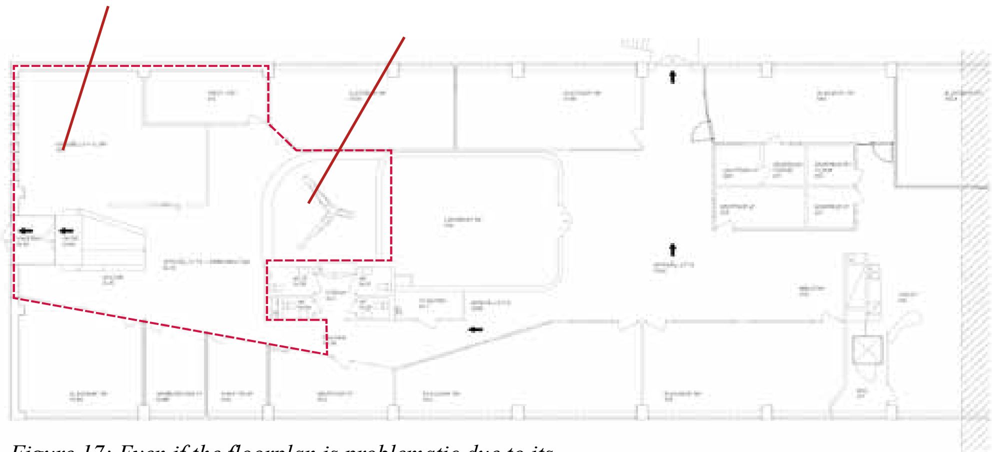
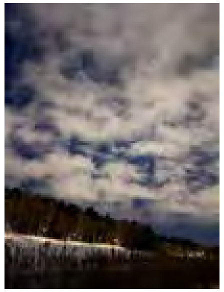
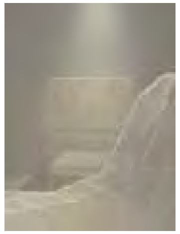


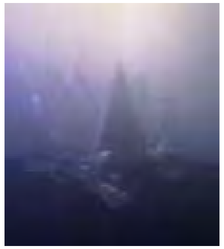
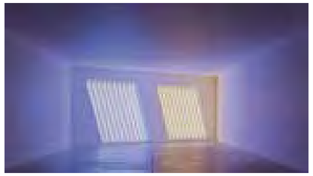
*Figure 17: Even if the floorplan is problematic due to its use, I kept it. It though would need some adjustments.*

## Perceptual representation I: Inward/ embraced- held / protected


*Figure 18: Pupils suggestions and inspiration pictures. Third picture from top left, photograph Mario Rüegger*

## Perceptual representation 2: Outward- expanded / overview

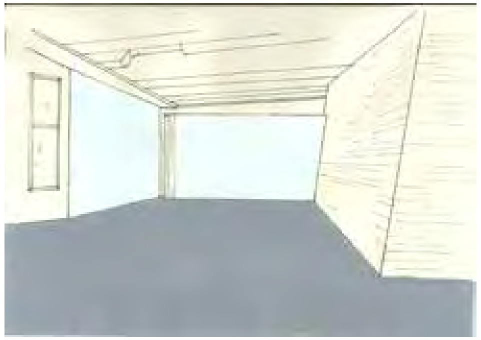
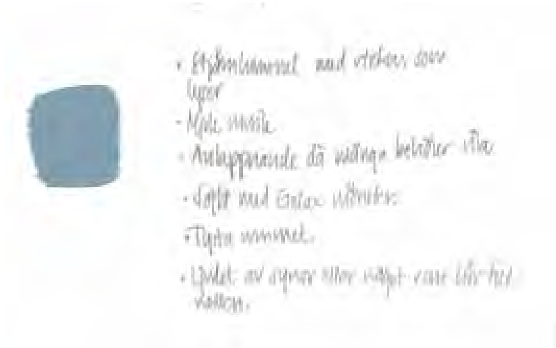
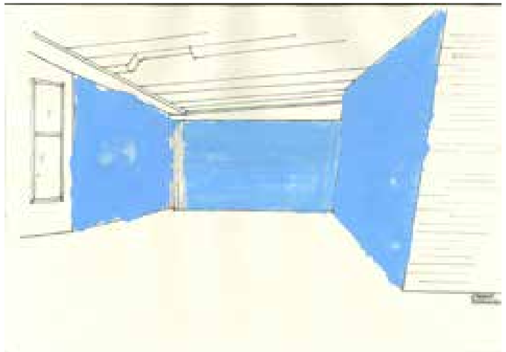
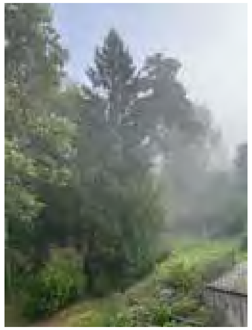
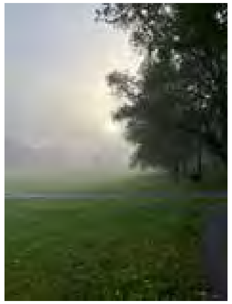
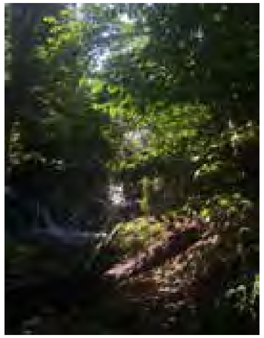
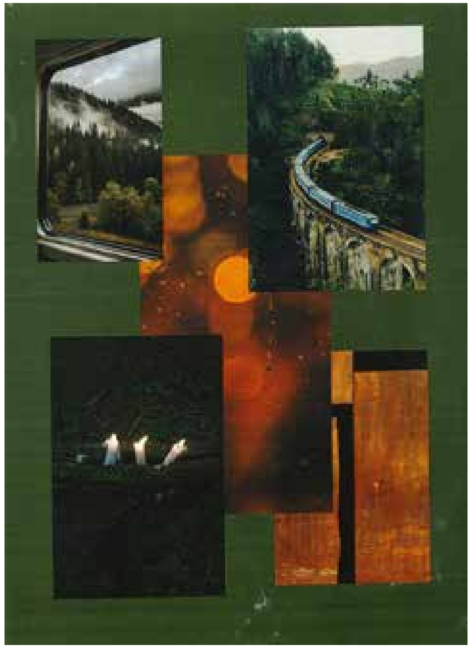




*Figure 19: Pupils suggestions and inspiration pictures. Third picture from top left photograph Asaf Kliger, Fifth Donald Tuck*

## Perceptual representation 3: Within- connected / engaged/ part of



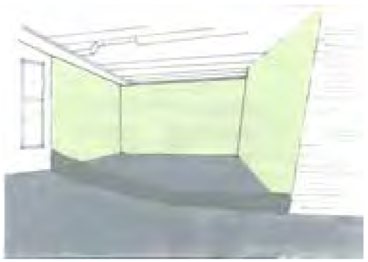



*Figure 20: Pupils suggestions and inspiration pictures.*

## 4.2 Interior architecture design process, model work

### Model work, diaries, sketches:

After the initial participatory phase, I move into practical model work. Based on the students' views on color intensity and the three perceptual representation tracks, I begin to experiment. This requires a different approach than traditional architectural model-making. Architectural models are often white to provide a neutral representation of form, scale, and spatial relationships, allowing light and shadow to define the architecture without ”the distraction of color”. This tradition stems from modernism's reductionist focus on form over sensory and emotional experience.

Such models may serve building architects well, but they limit the understanding of interior architecture, where color, texture, and light are central to human experience. This also points to a disciplinary gap, where spatial design is not always developed from a human-scale, perceptually grounded perspective. Research in neuroarchitecture and environmental psychology show that these sensory qualities are crucial for well-being and inclusion (Pallasmaa, 2005; Kaplan & Kaplan, 1989).

My references instead are model practices such as Flores & Prats, and researcher Johanna Enger's research-based light models.

*Figure 21: Photo of model: Studio Weyell Zipse*

*Figure 22: Photo of model: Courtesy of Prats & Flores Arquitectes*

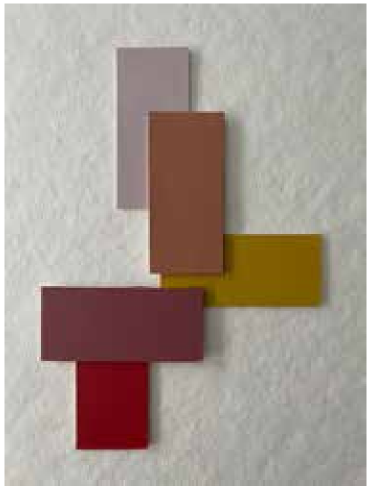
*Figure 23: Photo: Author, model: Johanna Enger*

Explorations and considerations:
Scale of texture in relation to the model; testing details separately at larger scale?

- Combining warm/cool and light/dark color schemes, including adjacent and complementary colors?
- Differentiating lighting between hyper- and hypo-decompression rooms?
- Investigating how light, color, and materials affect spatial readability and direction?
- Testing different paint types (latex, emulsion, egg tempera) and glazes to study texture, color perception, and light reflection?
- Using color, light, and texture to visually lower ceiling height and reduce the impact of exposed installations; relating proportions to bodily scale?
- Exploring whether spatial orientation or direction can be communicated through sensory articulation?
- Considering the role of Color Rendering Index (CRI) and Kelvin values in the lighting used?

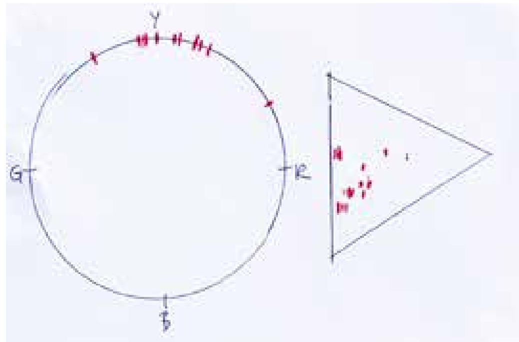
## 4.2.1 Process work with color, light, and texture as a dynamic process

The work begins with color, by revisiting earlier color samples that I previously mixed for the master thesis. While they felt joyful and intuitive at the time, some of them now appear scattered. Rather than discarding them, I treat this as a starting point for reflection and reorganization.



I sort the samples by hue and position on the NCS color wheel and explore different groupings. In parallel, I study color combinations in paintings of interiors and landscapes, an approach I also use in my teaching practice. These colors are measured and analyzed using the NCS system, allowing me to map their profiles and reflect on how I experience the compositions, for example in terms of color identity and kinship (Hesselgren, 1985).

I look for shared structures alongside individual variation, asking myself when colors lose their sense of belonging, jokingly referring to this as a "color family tree".




*Figures 24: Early color tests*
*Figures 25: Analyzing painting with NCS system*

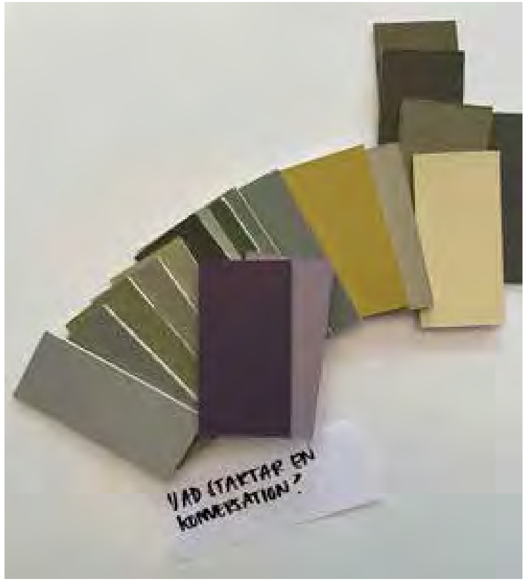
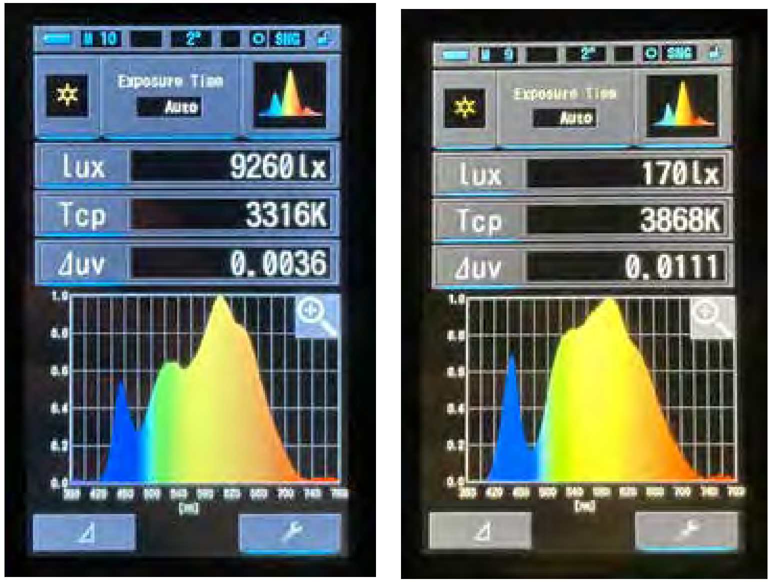



*Figure 26: Some of the colortest I made placed into NCS system based on hue and also thoughts on kinship and how to "start a conversation".*

*I also think of how different color systems could have different effects on kinship choices. I go from perception, and use the NCS Atlas more as a technical tool.*

From an early stage, color is never tested in isolation. Throughout the process, I continuously evaluate the colors in the intended lighting, which is a dimmed 3000K LED fixture.

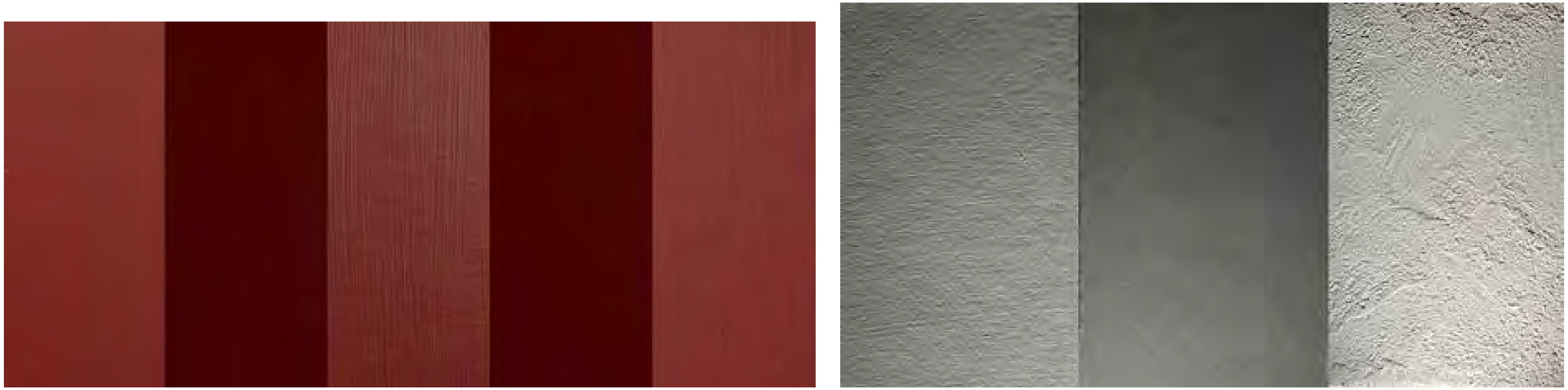



*Figures 27: I initially plan to use both a 3000 and a 4000K fixture. However, I find that one fixture produces noticeable variations in color rendering. These differences can be related to the spectral power distribution (SPD) of the light sources, which I test above, that determines how wavelengths are represented in the emitted light.*
*The problem helps me understand how important it is to have control over various parameters in a design project.*

The work moves iteratively between intuitive decisions and methodical adjustments, shifting back and forth between the NCS Atlas, hand-mixing paint, measuring with an NCS colour pin, diagramming relationships, and applying paint on paper, cardboard samples, and directly in the model. This back-and-forth process reveals practical challenges, such as the dominance of green hues within the NCS color circle, which requires repeated correction to maintain balance.

The back-and-forth process, here in some sentences condensed text, is the core of the project. I also need to take into account what work is done when in relation to the short daylight hours in the winter months- which are my working hours. The process gives me the next work task by being open to the setbacks that face me. I move forward by analyzing the setbacks and turning them into insights, I also use a daily diary with illustrations and texts- to try to see patterns.

*Figures 28: I am continuously working on mixing color samples and sketching the relationship with NCS system. I partly use gray cards when photographing, but I don't find it helpful as I work with how the color is perceived in the specific used lighting.*



*Figures 29: The viewing angel top, and texture completely change the perception of a color.*

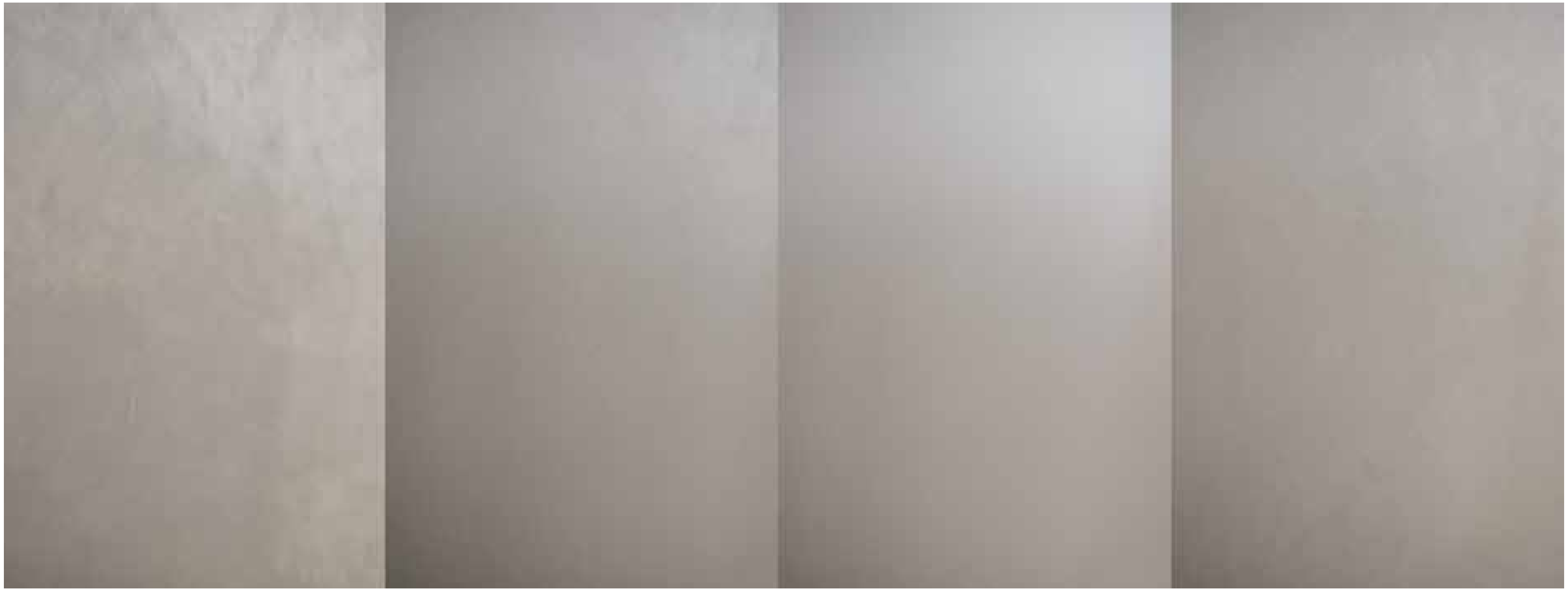


*Figure 30: Different types of color media painted on 70*100 cm boards. I have some problems with stirring the egg oil tempera during production, which is reflected in the result. However, it is interesting to see how light and perception are modeled differently based on medium, where I find that the ”alternative” colors are activated by light in a different way than the often used latex paint, or as the former painter Bernth Fredriksson poetically tells me: ”Uploading of the material”.*

Rather than aiming for standardized contrast values, I approach contrast as a relational and situational parameter. Accessibility guidelines often refer to a contrast value of 0.40 to support orientation for people with visual impairments (Boverket, 2011). However, these values are not universally applicable, as they do not account for individual differences in perception and sensory processing. For ND persons, cognitive load and emotional regulation are shaped by the interaction between contrast, visual complexity, light and properties such as gloss. I therefore consider 0.40 to be a relatively high contrast that risks visual fixation and disrupted spatial reading. In response, I work with a contrast of approximately 0.30 in two of the models, and even lower in the third, where spatial boundaries are instead articulated through lighting rather than color light contrast alone.

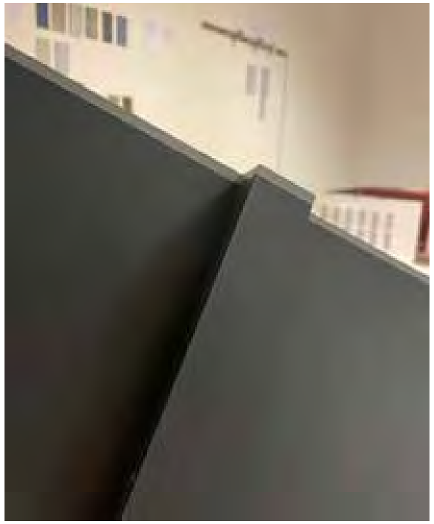


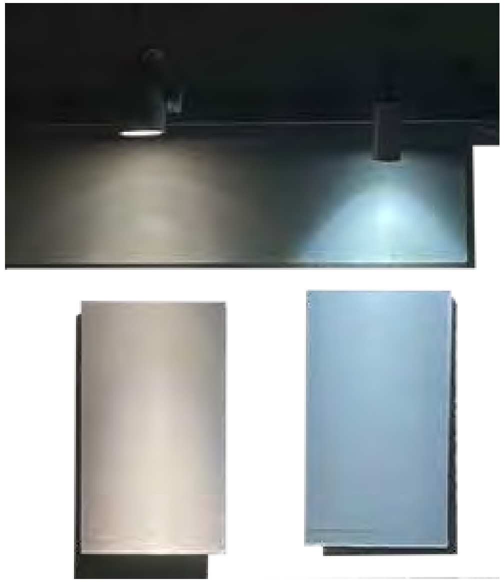
*Figure 31: Different ways of practising lighness difference, by measure or by perception? Right: How the same color can be perceived by different Kelvin, 2700 and 4000K.*

Throughout the color work, several aspects are considered simultaneously rather than sequentially: light-dark contrast; achromatic and chromatic contrast; complementary and intensity contrast; quantity and warm-cool contrast; as well as simultaneous, flicker, and successive contrast (Mahnke, 1996). These parameters are not applied as fixed rules, but are tested and adjusted in relation to each other and to the spatial context.

Light is treated as inseparable from color and as an active agent in shaping perception. As already noted by Alberti (1404–72), without light there is no color. In this work, the fixed lighting temperature of about 3000K becomes a key parameter in the color development. To reduce glare, I use potentiometers, and in some cases filters are required, which though change the perceived color temperature.

Drawing on my experience assisting in Johanna Enger's research workshops, I am aware that participants often describe darker rooms as more comfortable, less exposing, and easier to relax in. Several participants mention that conversations change and breathing slows in dimmer environments, which I interpret as a decompressive effect. I decide to go relatively dark compared to the environments that public facilities such as schools normally have. I understand that this can be a comment on my work, but it is a deliberate and thought through decision.

To better understand how light alters color perception, I also test with a separate wall lighting setup with 2700K and 4000K. The perceptual differences are clear, reinforcing the importance of testing color schemes on site, in the intended lighting and room orientation (Hårleman, 2009).



In the models, walls primarily function as light receivers and reflectors, helping to define spatial boundaries while revealing surface texture. Overall, I treat light as a guiding principle rather than a finalized solution. Its primary role is to support color and texture, direct attention, aid orientation, and contribute to calm, coherence, and stress reduction. I notice that when I lose myself in the colors or textures without testing them against lighting or overall appearance, I loose ground.

Depending on how many fixtures I place on the ceiling against a wall, the size and lumen together change the reading; the distance to the wall also affects the intensity, I constantly need to make new decisions.

Due to technical limitations, all light sources in the model share the same brightness and height. In real environments, lighting should vary in height, direction, and intensity depending on function. To approximate this, I experiment with simple directing methods. Because the school used as a case study has a visually cluttered ceiling with exposed installations, I avoid upward lighting and instead make the ceiling darker and more subdued.

The models are continuously documented through photography, as lighting differences are not always immediately perceptible. Lighting proves to be the most challenging part of the process. Additional LED fixtures reveal discrepancies between stated and perceived color temperature, producing a colder light than intended despite a nominal 4000K (figure 27, right). This highlights how aging or technical inconsistencies in luminaires can alter perception over time, an issue of particular importance for sensory-sensitive users. Although the project does not focus on technical lighting specifications, the process underscores the importance of lighting stability for inclusive environments.

Texture is developed in parallel with color and light, not as a decorative layer but as a means of creating background variation. As emphasized earlier, color and texture need to reinforce each other rather than send conflicting signals.

This work has not been tested with users and should therefore be seen as a foundation for future research. While theory suggests that texture can have positive effects (Klatzky, 2010), it remains unclear where, along the Yerkes–Dodson U-curve, increased complexity becomes overstimulating.

I assume that the “hypo” room can tolerate a more articulated texture and color composition, but I cannot say where this change occurs for hypo or hyper. In this work, I choose to take action to see the effects; if it were a real project, I would be more subdued and cautious.

*Figure 32: Textures by different applying techniques together with color. Depending on how the different parameters are, complexity and coherence differ. The light also are a factor that turns the texture on and off as well as reducing or articulating .*

*Figure 33: I amplify the praramters and try to regulate by holding back. By investigating differents kinds of  applications I see what happenes due to different inputs.*

I work with three different fillers with varying grain sizes to produce textures, as well as a wallpaper with woodchip texture. These surfaces make the walls more articulated and, in my view, introduce a form of low-level fascination that may be calming in neurodivergent environments (Bogdashina, 2003). Some textures do not translate well at model scale, becoming too rough, sharp, or directionally disturbing. I experiment with tools such as toothbrushes, putty knives, and nail brushes, and sometimes sand the surfaces to soften them.

When color is applied, texture generates variation through peaks and valleys, allowing multiple expressions to emerge within the same surface. Some color effects require texture in order to fully register. By adjusting paint consistency as well as the tools used for application, I can control whether pigments settle into recesses or remain on surface peaks, aiming for coherence between texture and color rather than ambiguity.

Overall, the process is not about optimizing individual parameters, but about continuously adjusting their relationships. My aim is for the rooms not only to function, but to offer a cohesive experience that supports users' needs, where aesthetics becomes a tool for function rather than an added layer.

So how is the project's use of the theoretical models? The models developed by James A. Russell and Rachel Kaplan and Stephen Kaplan serve primarily as conceptual guidelines throughout the design process. Rather than applying them as strict analytical instruments, they are kept in mind during the development of the spatial models and their visual compositions.

The following diagrams therefore represent an interpretative placement of the project's model images within the respective theoretical framework.

The positioning is based on my own perception and artistic interpretation of the different rooms and is not an empirically validated estimate. A more systematic evaluation would require further empirical investigation.

It should also be noted that the perception of the environment changes significantly depending on the lighting conditions. Variations in light intensity, direction, and colour temperature alter how spatial depth, colour relationships, and material qualities are perceived. Consequently, the same spatial model may be interpreted differently depending on how the light models the space.

I make some furniture for the models to better understand scale within the images. I also construct a room divider, partly because the geometrical rooms need an element that softens, but also something that can catch and show the light. This room divider object, with both centrifugal and centripetal qualities, becomes important.

In relation to the preference matrix, the information variables described by Kaplan & Kaplan - coherence, complexity, legibility and mystery - are addressed in this study through my artistic interpretation and not applied in detail. A more detailed operationalization of the spatial, visual and material attributes underlying these variables may remain a task possible for future research.

On next page follows a illustration how me myself percept examples out of the models placed into Russells " The Circumplex Model of Affect".

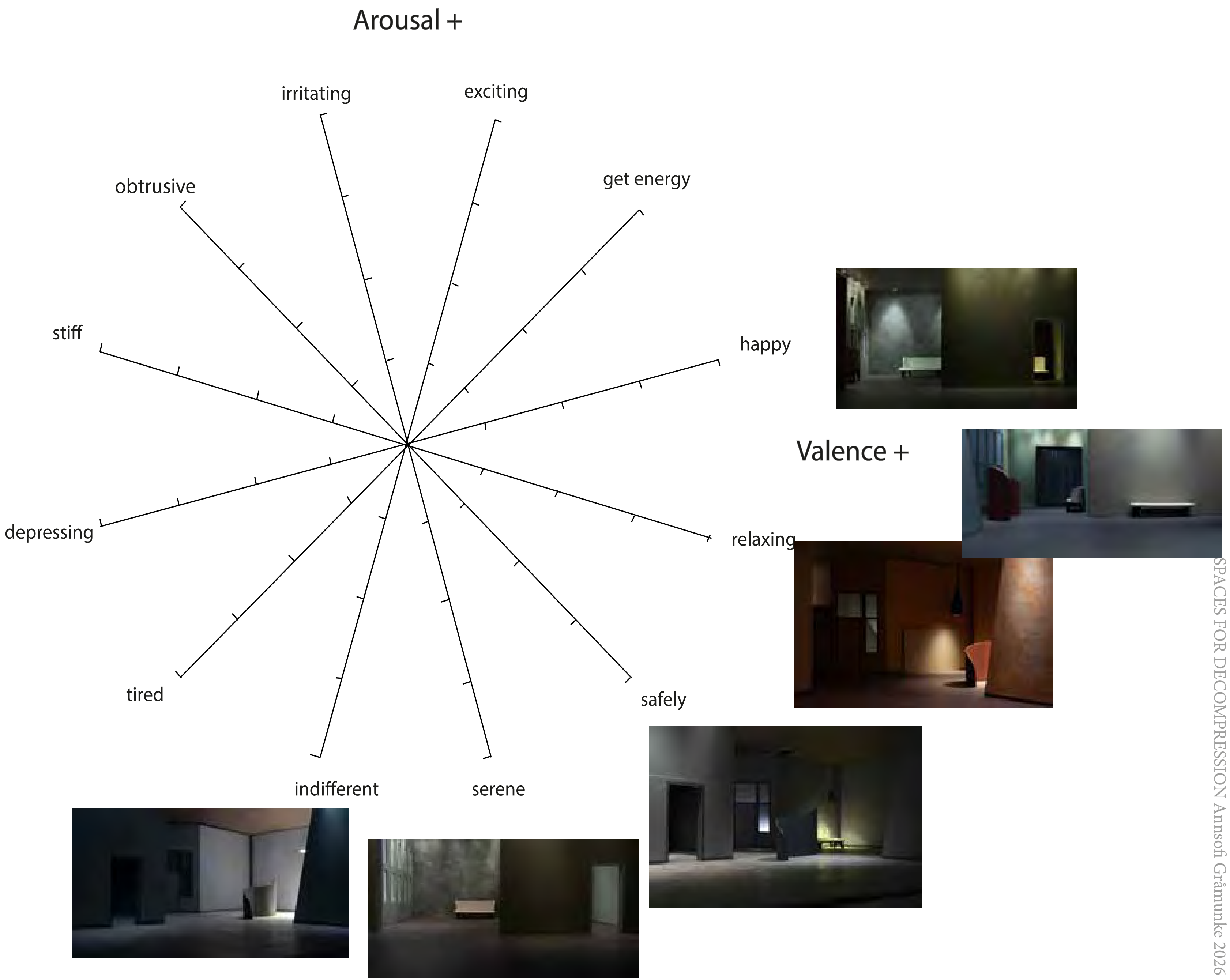
*Figure 34: Model 1, with room divider and chairs with high backs for protection.*

*Figure 35: When I place the models within Russell's framework, the rooms appear in different locations. These placements are not objective mappings, but situated interpretations shaped by, in this case, my cognitive state; sensory sensitivity, and needs at a given time. The model function less as a static tool for classification and more as a way of articulating and understanding perception.*

*This also raises questions about the framework itself. While my use of Russell's model may suggest stable relationships between arousal and valence, the experience of color, light, and texture is dynamic and relational. Effects cannot be completely isolated or fixed within a diagram, making each placement provisional.*

*Rather than identifying a single "correct" position, the variation between rooms highlights the importance of accommodating individual differences and shifting perceptual states. The project therefore points to the need for spatial diversity, with different environments supporting different cognitive profiles, tasks, and needs over time.*

*Also its interesting to understand that the same room can be at different places in diagram due to the light scheme.*



### 4.2.2 Model work documentation

During my work, many questions arise regarding how the camera, computer or print alter perception. White balancing with a grey card, although often considered neutral or objective, compensates for the chromatic qualities of the light source and thus alters the perceptual relationship between light and color. The intention of the documentation is to reflect how colors actually appear under specific lighting conditions, rather than how they would appear under a neutral reference light. I strive for a close match between the perception and the photograph.

When looking at the picture on a screen gives light from behind, and is therefore different from a printed picture that untouched lacks information in the dark areas.

The choice of aperture is made in relation to how spatial experience and visual legibility emerge at model scale. Depth of field is used as a design tool to approximate everyday visual perception. An aperture of approximately f/6.3 is found early in the process to provide a balanced representation, with a clearly defined focal plane without the entire image appearing uniformly sharp. This results in an image that avoids both strong selective blur and exaggerated sharpness.

An excessively large depth of field risks producing an analytical or artificial character, while a very shallow depth of field may create a hazy or fragmented spatial experience. Aperture f/6.3 is therefore chosen as a deliberate method, supporting a perceptually and sensorially balanced documentation rather than a technically maximal or visually spectacular representation. Later, I also use f/2.8, as this can reduce the visibility of small errors in the models, and emphasize focal points.

### 4.2.3 What could have been done differently?

The lighting proves to be a challenge, as it is not designed for this type of work. The initial intention is to demonstrate different lighting conditions, including both brighter and darker settings, as well as different color temperatures (3000 and 4000 K). As I also encounter technical difficulties, I gain access to a fully functioning lighting at a late stage. If this setting had been available from the outset, I would have structured the process differently. This limitation instead highlights the importance of the dynamic interplay between factors and the necessity of iterative testing.

I am advised to place the model in daylight to observe how the colors behave. However, this is not feasible due to the model's size and because the studio does not face the appropriate direction, which would result in an incorrect light color. I therefore made an early decision to establish a clear design boundary in terms of light and time, choosing to work exclusively with artificial lighting.

*Figure 36: View out from my atelje´at 3 PM in november.*

While this inevitably introduces a laboratory-like quality, it also reflects a realistic condition at a latitude such as Stockholm: an afternoon in November at approximately 3:00 PM.

This is also an interesting approach due to my project, as this particular time of day can be very difficult to manage in school environments for my former pupils.

While zoning is often described as a solution for sensory inclusion, color does not behave as a discrete element that can easily be assigned to a zone. This is especially hard in open floor plans. Color affects the space as a whole and operates peripherally, often before we consciously register it. This makes it difficult to "separate" sensory relationships within the same spatiality.

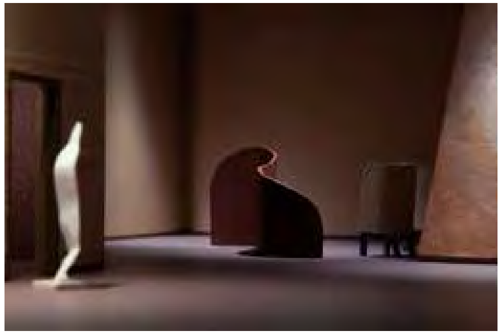
In this project, I choose to work with two different rooms and in order to investigate contrasting sensory approaches. This separation allows me to examine variations in chromatic intensity and complexity, light direction, and textural complexity more clearly. At the same time, I am aware that this methodological division introduces other problems. Spatial separation can both support regulation and inadvertently reinforce categorization.

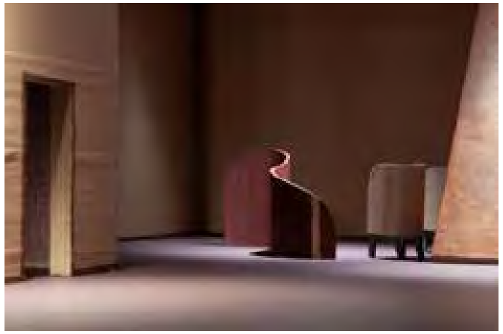
The division is therefore both a tool and a constraint. It creates clarity for investigation, but it also highlights the tension between atmospheric continuity and differentiated sensory support. What may be necessary for regulation in one moment can become isolating or limiting in another. This ambivalence is not resolved in the project but is acknowledged as part of the complexity of working with color as an embodied and environmental phenomenon.

## 5. The thesis central content

This thesis investigates how colour, light, and texture operate as active architectural agents in shaping spatial perception and cognitive experience. Grounded in neuroarchitecture and environmental psychology, it examines how calibrated variations in visual complexity influence emotional regulation, attention, and states of recovery. Particular emphasis is placed on neurodivergent users, exploring how sensory-sensitive design can foster cognitive inclusion rather than functioning solely as aesthetic expression.

Through spatial painting and the development of tactile and visual models, the project tests how carefully composed chromatic and material environments affect perceptual processing. Ultimately, the thesis positions interior architecture as a neurocognitive interface, capable of helping to modulate stress, supporting decompression, and enhancing clarity within public educational settings.





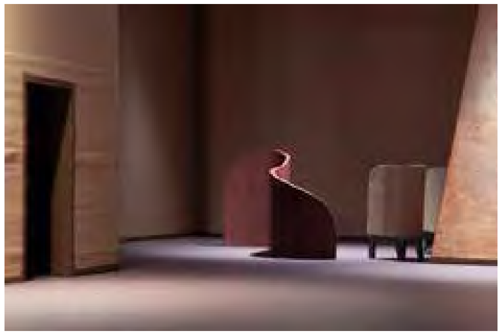


*Figure 37: Model 1: Dependig on different light, perception of decompression change. Also perception of prospect and refugee alters.*

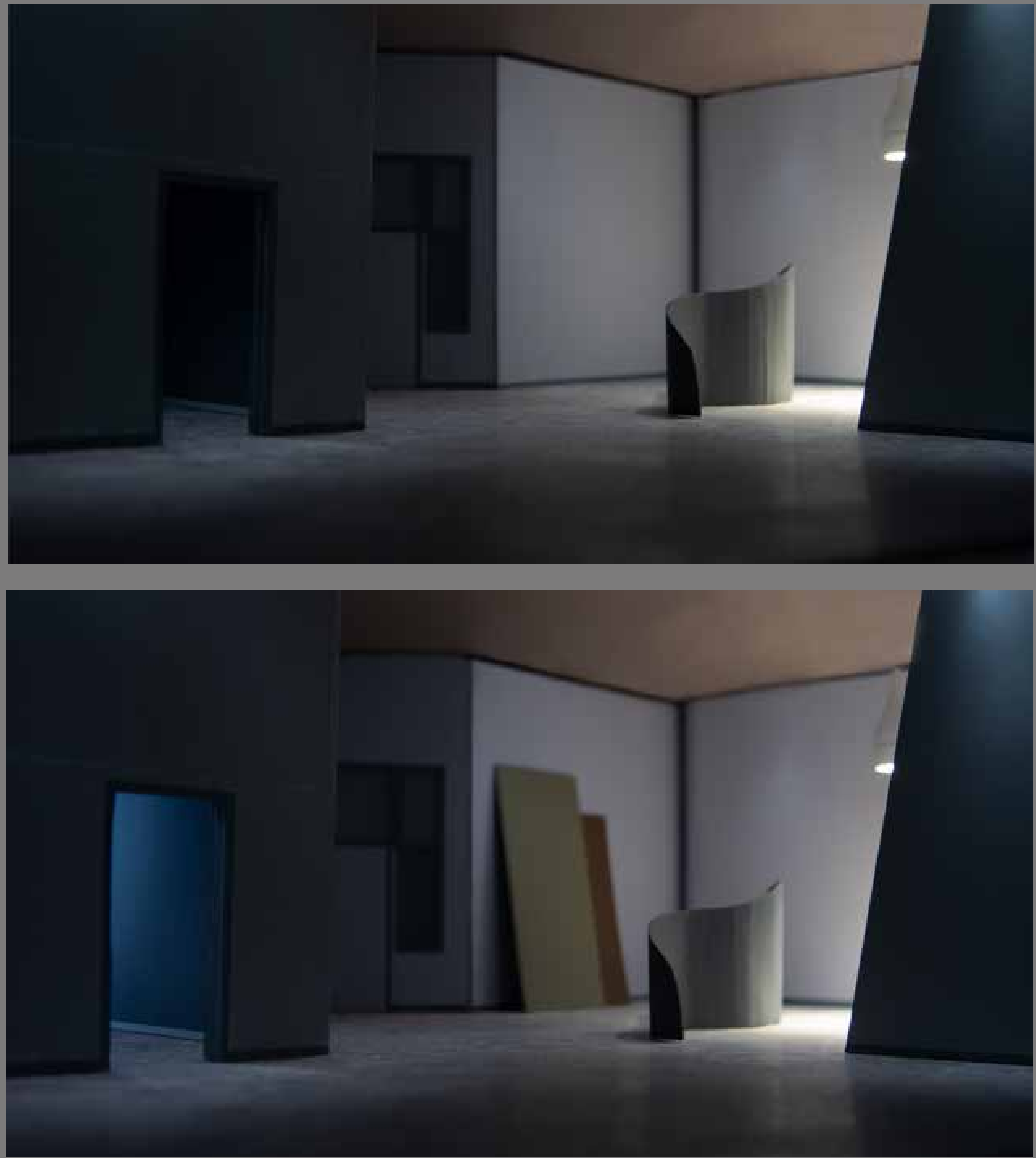


*Figure 38: By changing light little and adding some colors, perception change. Color in an interior can be described as operating across distinct layers. The foundational layer comprising walls, floors, and ceilings sets the overall perceptual tone. A secondary layer is formed by artefacts, including furniture, textiles, and movable objects, which can introduce chromatic variation, hierarchy, and focal points. The interaction between these layers plays a crucial role in shaping both visual perception and sensory experience of the space. The slanted color objects can represent these artifacts in a rather abstract way.*

*Figure 39: Further tests of layers of color in model 2.*

*Figure 40: Model 3, test of texture and color, and warm and cold light.*

*Figure 41: Test of texture and color, model 2.*


*Figure 42: Model 1*


*Figure 43: Invitation to my exhibition.*

# 6. Possible tonic design guidelines for decompression rooms

Human perception needs sensory clarity that is not overloaded. White walls can also in itself be overloading (Valdez & Mehrabian,1994). Lighting should be stable, non-flickering, and adaptable to different needs rather than governed by static rules such as fixed wattage per surface.

Color schemes should support energy regulation needs. Differences and relationships between surface colors may occur along several dimensions. For hyper-sensitivity, regulation may involve small variations in lightness, limited shifts in hue, and low chromaticness, creating a narrow and cohesive color range with reduced contrast.

For hypo-sensitivity, calm base colors can be combined with more distinct variations in lightness, clearer shifts in hue, and slightly higher chromaticness. This allows for a broader range of color, texture, and contrast, supporting structure, orientation, and engagement without causing overload. The relative size and spatial distribution of coloured surfaces, together with the way transitions between them are composed, are also important for perception.

In the biophilic scenario, I deliberately avoided chlorophyll green associated with early summer, instead favouring autumnal green tones. This aligns with Anter's (2009) findings that colors closer to yellow tend to have a more relaxed character, suggesting that "concepts" like biophilia cannot be treated as a single, uniform strategy.

Although warm light is often associated with calming atmospheres, cooler light may be beneficial in decompression environments when the aim is to increase alertness, support orientation, or counter hypoarousal states. Therefore, lighting design should be responsive to different regulatory needs rather than based on one universal solution.

Importantly, biological activation is influenced less by correlated color temperature (CCT) and more by the spectral composition of light, particularly the presence of short-wavelength blue light. In other words, two light sources with the same CCT may appear similar, yet differ significantly in how they affect alertness and physiological activation. A continuous spectrum contributes to predictable color rendering and can increase perceived safety and rest, especially for ND users. CCT alone is therefore insufficient.

Cultural and geographical factors may also shape light perception. In northern latitudes such as Sweden, the sun's low angle produces a warmer spectrum, which may influence both perception and preference. This was noted by participants in one of Johanna Enger's research studies, where I had the privilege of serving as the test leader.

Textured, non-directional surfaces often appear calmer than smooth surfaces, particularly when compared with white or highly chromatic glossy latex finishes. When color and texture are coherent, texture can reduce monotony and abstraction, which may otherwise contribute to underlying stress

Many individuals with neurodevelopmental conditions exhibit heightened sensory sensitivity, including increased reactivity to friction-based sounds and tactile textures. Material qualities such as surface resistance, acoustic feedback, and visual- tactile congruence may therefore significantly influence comfort and cognitive regulation in interior environments.

Rather than a single "ND design", variation appears essential. I developed two relaxation profiles for my decompression rooms that share consistent principles, controlled chromaticness, logical lighting, low glare, non-reflective materials, spatial readability, and absence of noise without eliminating information, while differing in expression.

## Possible environmental tendencies for different sensory profiles regarding color, texture and light

| Variable | Hyper-sensitive environments may benefit from | Hypo-sensitive environments may benefit from |
|---|---|---|
| Hue range | Narrow hue range within the room | Broader hue range within the room |
| Chromaticness/saturation | Low chromaticness across surfaces | Moderate chromaticness in selected planes |
| Hue contrast | Low hue contrast; avoid complementary tension | Controlled hue contrast to create focal points |
| Luminance contrast | Reduced luminance contrast between adjacent planes | Moderate luminance contrast between floor, wall, and ceiling |
| Visual hierarchy | Calm, uniform hierarchy | Clear hierarchy with differentiated zones |
| Light distribution | Even, stable light minimizing harsh shadow contrast | Directional light enhancing depth and spatial differentiation |
| Shadows | Soft, diffuse shadows | Soft shadows without movement |
| Texture | Soft, subtle, non-directional textural variation | Greater textural differentiation supporting embodied awareness |

# 7 Conclusion, including summary and reflection

## 7.1 “Answering” the questions

• How can users’ subjective experiences and narratives, gathered through a participatory process, inform design parameters for three spatial models, each based on a coherent combination of color, texture, and lighting, and each incorporating both hypo- and hyper-decompression spaces?

Through the pupils’ stories and color exercises, I developed design parameters by both technically organising the material and visually grouping and connecting it. The free stories revealed preferences that I would not otherwise have had access to, such as the personal significance of color, and a shared perception of conventional, unsaturated color schemes as boring. Also lightning was many times in classroom situation wanted to be turned off, with instead free fixtures available for pupils with needs.

• How can my own perceptual analysis of spaces, using The Circumplex Model of Affect (Russell, 1980) and The Preference Matrix (Kaplan & Kaplan, 1989), be applied and translated into this project?

Spatial representations often produce an overall impression, while individual aspects remain difficult to separate. By applying a remodelled version of The Circumplex Model (Gråmunke, 2024), I found a tool that supported both analytical and holistic thinking. My supervisor also highlighted how different spatial elements may occupy different positions within the model. Light, color, texture for example can have different individual character. The part of The Preference Matrix that I worked with in this thesis was mainly “complexity”.

These frameworks became central to my design process, allowing me to explore cognitive preferences and potential overlaps between them. In future research different parts could be further investigated such as perceived perception in color complexity related to hightened sensivity to stimuli and screener ability. These concept is often interconnected, but not always.

• How can physical models be used to explore and evaluate different combinations of color, texture, and light?

The model consists of detachable elements, making it easy to test alternatives. Its unfinished character invites discussion, particularly in early project phases.

Photographing variations helped create distance and clarify design tracks. The physical act of testing alternatives proved to be important; and the method could be extended to co-design processes, for example by combining model discussions with images and emotional signals, which partly was tested in my work at LTH.

Regarding the color work in this thesis, the physical model was a necessity to understand the behaviour of the colors and also its absolute relation to light.

• Can an initial participatory process, combined with theoretical studies and an artistic design methodology, help identify architectural tonic design components that are particularly relevant to neurodivergent users?

The combination of participatory input, theoretical frameworks and artistic exploration suggests that such components can be identified, but not as fixed or universally applicable solutions. Existing theory points to a range of environmental factors that influence arousal. During site visits and surveys, it became clear which spatial parameters students and teachers were aware of, and which seemed to operate more in the background.

By iteratively moving between theory, practical testing and artistic exploration, a set of recurring sensory variables emerged, particularly related to color relationships, light character, contrast and textural complexity. These can be understood as tonic design components, operating continuously and often below conscious awareness, yet influencing cognitive load and emotional regulation over time.

Rather than defining precise thresholds, the process helped to frame these components as relational and context-dependent. The artistic methodology played a key role in this, leading to questions that are not always captured in conventional research. In this sense, the approach does not produce definitive answers, but helps to identify and articulate a field of relevant design parameters that can form the basis for future, more empirically based studies.

## 7.2 What did I learn?

This project is positioned within artistic research and research through interior architecture, where knowledge is generated through material exploration and reflective practice rather than empirical validation. The work draws on existing theories of sensory processing, neurodivergence, and environmental perception as a conceptual starting point for design explorations using physical and visual models. These models function as thinking tools, not as evaluated solutions, enabling examination of relationships between sensory parameters, perception, and potential function.

Rather than producing generalizable results, the project articulates a design space by identifying variables, tensions, and questions that arise when theories of neurodivergent sensory needs are translated into design. It should be understood as an exploratory and preparatory study that lays the groundwork for future research involving participatory or empirical methods. In this sense, the models function as boundary objects between theory, design practice, and future interdisciplinary research.

A central focus of the work is tonic environmental factors such as color chromaticness, light character, texture, and visual density, which operate continuously and often outside conscious awareness. Unlike phasic stimuli, these tonic conditions can generate prolonged sensory load, contributing to diffuse stress and cognitive fatigue. Highlighting this often-overlooked layer of environmental perception has been a key aim of the project.

Findings from color and perception research, including Küller et al. (2008) are sometimes analyzed more or less as a hypotes about hues. I think the issue is more complex, different factors do affect. ”The colorist who yields to generalities, such as red excites and blue calms, without an understanding of psychological/neuropsychological interconnections will soon find out that the desired effect cannot be achieved” (Mahnke, 1996, p.43). Variations in results are particularly relevant for neurodivergent profiles, where standard design assumptions may not apply.

Environmental features such as color, light, and texture interact with perception and arousal in complex, sometimes unpredictable ways. This underscores the critical importance of incorporating diverse functional profiles into architectural design, ensuring that spaces actively support a wide range of users rather than inadvertently creating obstacles.

Theoretical sources (e.g. Hesselgren, 1985; Valdez & Mehrabian, 1994) suggest that smooth, abstract surfaces combined with high, uniform illumination can flatten spatial depth, amplify contrasts, and increase arousal. In contexts such as schools, healthcare, and offices, this may function as a low-intensity but constant stressor. The studied school environment where I placed my study is characterised by white walls, static lighting, and limited tactile variation. It may contribute to increased cognitive strain for pupils with heightened sensory sensitivity.

Like all color systems, NCS has both strengths and limitations. The Natural Color System is a perceptually color system structured around how humans experience color as proportions of elementary hues (yellow, red, blue, green) in combination with blackness and chromaticness. As such, it provides a precise and communicable framework for defining individual colors. However, while NCS is grounded in perception, its structure is based on the balance of color components rather than on the psychovisual or experiential character of colors in relation to one another. Consequently, equal numerical differences within the system do not necessarily correspond to equal perceived differences, particularly in compositional contexts.

Perceived similarity or contrast is influenced not only by position in the NCS space, but also by context, light conditions, surface properties, and surrounding colors.

This underscores the importance of higher education in architecture and design not only transmitting systematic knowledge of color, but also fostering practical, embodied learning through applied color work. Such training enables the development of a refined perceptual sensitivity that cannot be derived from color systems alone.

Overall, the project has generated more questions than answers for me, particularly regarding how interior architecture can support recovery, energy regulation, and open attention through decompressive spaces. It reinforces the relevance of cognitively inclusive interior architecture while also pointing to a lack of integrated knowledge within architectural practice and professional institutions. This work positions decompression not as a singular design solution, but as a spatial condition that enables rest, and reduced cognitive load leading to recovery. There are some uncertainties in the various parameters in the experiments, but the result is still interesting.

This project has fundamentally shifted how I perceive interior architecture: from primarily formal and aesthetic expression toward an understanding of interior architecture as a support for everyday cognitive and emotional functioning. It has led me to question aspects of modernist ideals and to recognise the importance of perceptual conditions- how spaces affect, not just how they look.

Theory, method and material exploration are integrated in shaping the spatial experience. My contribution moving forward lies in combining practice with education around cognitive inclusion in interior architecture.

In this thesis, I argue that the work is less about producing a finished object than about formulating relevant questions such as: “How is spatial perception constructed, and how is it experienced?”

Throughout this project, primarily conducted in a rented studio, an independent way of working and structuring the process has been developed. I have had regular dialogue with the supervisor, combined with input from external expertise beyond Konstfack that provided guidance throughout. When questions emerged, research and literature offered input.

The process has been both engaging and genuinely enjoyable, and this way of working proved highly suitable. Many new questions arose, particularly concerning the complex relationship between human perception and functioning in interior architecture such as the effects of color, texture, and light. These questions align directly with the study’s initial purpose: exploring how environments can either support or hinder people, and examining how design choices influence diverse perceptual experiences.

Personal experiences of mismatches between individuals and certain environments highlighted the impact on well-being and productivity. Often, environments unintentionally create obstacles rather than supporting human needs, which reinforces my own motivation to continue to investigate these issues. The relation between interior architectures and different cognitive profiles needs to be further explored.

I have received feedback from supervisors that my project is research focused and somewhat forward looking. At the same time, the project has required me to work with several disciplines and read a lot to understand different perspectives. The interior architecture work in my master thesis may seem simple at first glance, but even seemingly simple spaces contain many design considerations and embedded theories. Although some aspects can be adjusted, I stick to the basic tone of my work. Often, it is perhaps the rooms that are perceived as simple (though positive valence) that can seem trivial or unnoticed- at the same time, perhaps those rooms can embody a great, often unperceived complexity.

I started this master thesis with a quote from Henri Lefebvre, he conceptualizes space as a socially produced phenomenon operating across the perceived, conceived, and lived. Architecture can be read through multiple layers, where material organization, design intention, and embodied experience intersect. In contemporary architectural practice, however, the balance of these layers is often skewed: the conceived dominates, while the lived, embodied, sensory, and diverse perceptual experiences are often marginalized. This imbalance highlights how modern design can overlook the variability of human perception, making Lefebvre’s framework particularly useful for examining how elements such as light, color, and texture shape and are shaped by diverse sensory experiences, including neurodivergent individuals.

*Figur 44: Support can be spatially designated, yet experientially absent.*

*"Social space is complex: it is at once perceived, conceived, and lived."*
*(Lefebvre, 1974)*

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