ARCHITECTURE AND AUTISM. SHARED SPACES AND SENSORY ESCAPES

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TRIESTE, 28 NOVEMBER 2025

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index

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International workshop
Trieste, 28 November 2025
in the frame of Interreg V-A Italia – Österreich 2021–2027
https://besenshome.units.it/

9:00 - 9:20 WELCOME AND INTRODUCTION
Giuseppina Scavuzzo (DIA - UniTS), Andrea Gasparella (UniBZ)

9:20 - 10:00 KEYNOTE
“Refuge as Prospect: an Anthology of the ASPECTSS of the Sensory Landscape”
Magda Mostafa (AUC)

SENSORY ROOM EXPERIENCE
Chair: Giuseppina Scavuzzo, Martina Di Prisco

10:00 - 10:20 “Wood Snoezelen: a prototype of an untreated wood multi-sensory room for the care and inclusion of students with disabilities at “G. Marconi” primary school in Lozzo Atestino, Padua, Italy”
Massimo Rossetti, Agata Tonetti (IUAV)

10:20 - 10:40 “Sensory environments: a strategy for inclusion”
Elena Bellini (DIA - UniFI), DU IT s.r.l.

10:40 - 11:00 “Designing well-being: the calm space of the MUSE”
Romana Scandolari, Paolo Degiovanni (MUSE)

11:00 - 11:20 Q/A + coffee break
room Sala Atti, building D

DESIGN THINKING AND USER ENGAGEMENT
Chair: Federica Bettarello, Martina Di Prisco

11:20 - 11:40 “Reflections and lessons learnt on inclusive design and meaningful collaboration with autistic individuals”
Katie Gaudion (RCA)

11:40 - 12:00 “Urban Heritage as a Driver for Mental Health”
Giulia Mezzalama (PoliTO), MinD MAD in Design

12:00 - 12:20 “Designing restorative spaces for people with neurodivergent conditions”
Toar Sadia (UCL)

12:20 - 12:40 “Aural Diversity Toolkit: engaging communities for inclusive acoustic design”
Jemma Jones, Chris Watkins (ARUP)

12:40 - 14:00 Q/A + lunch

BESENSHOME RESULTS
Chair: Giuseppina Scavuzzo, Federica Bettarello

14:00 - 14:20 “Architectural soundscapes and autism: rethinking auditory accessibility”
Marco Caniato (HFT)

14:20 - 14:40 “The senses and their role in special needs comfort”
Arianna Marzi, Suchi Priyadarshani (UniBZ)

14:40 - 15:00 “Requirements for BeSENSHome in school environments”
Lukas Wohofsky, Anna Resch, Laura Kroll, Daniela Krainer (CUAS)

15:00 - 15:20 “Mobile support for sensory regulation: a stress management app for neurodivergent individuals”
Laura Kroll, Anna Resch, Daniela Krainer, Lukas Wohofsky (CUAS)

15:20 - 15:40 “ Experience of co-designing sensor-friendly spaces: insights from ProgettoAutismoFVG”
Giulia D’Argenio (UniUD), ProgettoAutismoFVG

15:40 - 16:00 “BeSENSHome and the spatial dimension: architectural strategies for sensory inclusion”
Giuseppina Scavuzzo, Federica Bettarello, Martina Di Prisco (UniTS)

BESENSHOME TECHNICAL ASPECTS
Chair: Federica Bettarello, Martina Di Prisco

16:00 - 16:20 “BeSENSHome in action: AI and smart technologies for inclusive and sensitive environments”
Valentina Passarella, Marco Raffael (EUREKA System s.r.l.)

16:20 - 16:30
Q/A + greetings

introduction

The international conference *Architecture and Autism. Shared Spaces and Sensory Escapes,* arise from the growing awareness that architecture and design play a fundamental role in shaping the sensory and emotional experience of neurodivergent individuals.
The event brings together researchers, designers, educators, and professionals to explore how built environments can become supportive, responsive, and inclusive – spaces that enable autonomy, well-being, and social connection.
At the heart of this discussion lies the BeSENSHome Interreg Italy-Austria project, a multidisciplinary initiative that aims to develop an intelligent sensory system capable of supporting neurodivergent people in their daily lives. The overall objective of BeSENSHome is to bring into homes, workplaces, public spaces, and community environments a network of smart sensors that can act as a personalized sensory extension, entirely shaped by individual needs, preferences, and neurodivergent profiles.
The integration of these sensors within the designated environments is achieved using appropriate smartboxes that are dedicated and co-designed with the potential users of the BeSENSHome system.
The project analyses the environmental factors that may trigger stress – such as noise, light fluctuations, or thermal discomfort – and seeks architectural solutions to mitigate them. It also investigates the adaptive and personalized redesign of spaces, ensuring that environments can flexibly respond to the sensory and emotional requirements of their users.

The conference's program reflects this vision through four thematic sessions.
The Keynote Lecture, *Refuge as Prospect: an Anthology of the ASPECTSS of the Sensory Landscape*, by Magda Mostafa, introduces a theoretical and methodological framework for designing sensory environments that foster inclusion and dignity.

Session 1 – Sensory Room Experience explores how multisensory spaces can support care, education, and well-being. Presentations include the Wood Snoezelen prototype, an untreated wood multi-sensory room designed to support the inclusion and care of students with disabilities at a Primary School in Padua, developed by Massimo Rossetti and Agata Tonetti of IUAV. Further contributions focus on sensory environments as a strategy for inclusion, presented by Elena Bellini of the University of Firenze and Alessandro Leonelli of DU IT S.r.l., and on the Calm Space of the MUSE Museum in Trento, presented by Paolo Degiovanni, Patrizia Famà, Ivan Muscolino, and Romana Scandolari, which illustrates design approaches for well-being and restorative experiences in museum contexts.

Session 2 – Design Thinking and User Engagement focuses on participatory design processes and user collaboration. Contributions include co-designing a sense of belonging in the Wellcome Collection Library by Katie Gaudion from the Royal College of Art and Evie Jeffreys, reactivating urban memory for collective well-being in Turin by Giulia Mezzalama in collaboration with the association MinD MAD in Design, designing restorative spaces for people with neurodivergent conditions by Toar Sadia from University College London, and developing the Aural Diversity Toolkit to engage communities in inclusive acoustic design by Jemma Jones and Chris Watkins from the design firm ARUP. These presentations share insights and lessons learned from co-designing restorative and acoustically inclusive environments across educational, cultural, and urban contexts.

Session 3 – BeSENSHome Results presents the project's research outcomes across multiple aspects of sensory-inclusive design. The session covers auditory accessibility and comfort studies, led by Marco Caniato from Stuttgart University of Applied Sciences, and explores insights from sensory research presented by Suchi Priyadarshani, Arianna Marzi, and Andrea Gasparella. Requirements for implementing BeSENSHome in school environments, as well as the design of a mobile system for stress assessment and management for neurodivergent individuals, are discussed by Anna Resch, Lukas Wohofsky, Laura Kroll, and Daniela Krainer from the Carinthia University of Applied Sciences in Austria.
The session also includes experiences of co-designing sensory-friendly spaces shared by Giulia D'Argenio in collaboration with ProgettoAutismoFVG, as well as a discussion of the spatial dimension and architectural strategies for sensory inclusion, presented by Giuseppina Scavuzzo, Federica Bettarello, and Martina Di Prisco from the University of Trieste.

Session 4 – BeSENSHome Technical Aspects finally showcases the technological dimension of the project, with project partner EUREKA System s.r.l. presenting the integration of AI and smart technologies for inclusive and sensitive environments (in collaboration with project partner MCI Management Center Innsbruck).

Together, these contributions form a collective reflection on how architecture can transcend its physical boundaries to become a living, learning, and caring system – one that recognizes sensory diversity as a fundamental aspect of human experience.

SENSORY ROOM EXPERIENCE

WOOD SNOEZELEN: A PROTOTYPE OF AN UNTREATED WOOD MULTI-SENSORY ROOM FOR THE CARE AND INCLUSION OF STUDENTS WITH DISABILITIES AT "G. MARCONI" PRIMARY SCHOOL IN LOZZO ATESTINO, PADUA, ITALY

Massimo Rossetti, Agata Tonetti

abstract

This paper presents the results of a research project aimed at designing an environment made of untreated prefabricated wooden components, called *Wood Snoezelen*, thought to facilitate multisensory stimulation for people with intellectual disabilities.
Numerous scientific studies confirm the effectiveness of multisensory stimulation generated within a Snoezelen room, both for elderly people (dementia and Alzheimer's disease) and for children and adolescents with various types of disabilities (autism spectrum disorder, ADHD).
The rehabilitative and multisensory effects of the Snoezelen approach is enhanced by the use of untreated wood, which, thanks to its properties, can produce beneficial effects in terms of health, comfort, and cognitive and psychological well-being.
The project led to the definition of a fully modular wooden kit integrated with multisensory equipment and to the construction of the first Wood Snoezelen prototype at "G. Marconi" Primary School in Lozzo Atestino (Padua, Italy), inaugurated on February 28th 2025.

keywords

Timber Construction, Intellectual Disabilities, Multisensory Environments, Inclusive School, Biophilia

Introduction

The care and assistance of people with disabilities represents one of the most critical challenges for Italy's near future. The ageing population, the advancement of diagnostic techniques, and the decreasing of birth rates are all contributing to an increase in the number of people with disabilities. In Italy, in 2023, people with disabilities were approximately 2,904,000, accounting for 5% of the population (ISTAT, 2025). Globally, the World Health Organization estimates approximately 1.3 billion people with disabilities, about 16% of the world's population (WHO, 2023).

The school context is particularly important. In 2023/2024 school year, over 360,000 students with disabilities were enrolled in Italian schools – an increase of more than 60% over the past ten years. This represents 4.5% of total enrolments, compared to 2.6% of a decade earlier, with an average annual growth rate exceeding 7% (ISTAT, 2025).

Despite this constant growth, Italian school buildings are still not fully prepared to accommodate all students: only 40.5% are accessible for individuals with reduced mobility; just 16.7% of school facilities are equipped with visual signaling systems for students with deafness or hearing impairments; and only 1.1% feature tactile paths or raised maps for students with blindness or low vision (ISTAT, 2025).

According to this situation, it is clear that architectural solutions able of addressing the heterogeneity of disabilities are urgently needed. The integration of multisensory environments, such as Snoezelen rooms, offers a valuable tool for achieving the fourth goal of the 2030 Agenda for Education, known as Sustainable Development Goal 4 (SDG4). The World Health Organization (WHO) has identified schools as potential settings for long-term therapies (WHO, 2011). Similarly, the recent Italian guidelines FUTURA recommend a multisensory approach as an auxiliary teaching method in school design (Alvisi et al., 2022).

The Snoezelen approach and the potential of wood

The Snoezelen approach – derived from the contraction of the Dutch verbs *snuffelen* (to explore) and *doezelen* (to relax) – is a non-pharmacological therapy based on the multisensory treatment of individuals with severe disabilities.

These interventions take place in purpose-designed environments known as Snoezelen rooms, which are equipped with tools that stimulate different senses in a targeted manner – including bubble tubes, optical fibres, projectors, hammocks, enveloping armchairs, ball pits filled with coloured plastic balls, and waterbeds. A trained operator modulates the intensity, frequency, and type of sensory stimulus according to the individual's needs. The aim of Snoezelen environments is to find an optimal balance between the activity performed and the person's reactions to sensory stimuli, aligning sensory exploration with the individual's overall well-being.

Several studies have demonstrated the effectiveness of the Snoezelen approach in relation to dementia (Strøm et al., 2016), severe and complex disabilities (Glenn et al., 1996), autism spectrum disorder (ASD) (Germeau, 1998), ADHD (Mahendran et al., 2018), and special educational needs (Carter & Stephenson, 2012). For instance, multisensory stimulation in a Snoezelen environment has been shown to reduce aggressive and self-injurious behaviour in individuals with severe intellectual disabilities.

In Italy, the Snoezelen approach is still relatively uncommon. A systematic analysis conducted by the authors within the Wood Snoezelen research project identified approximately 206 Snoezelen environments nationwide, located in facilities such as nursing homes (RSA), rehabilitation centres, day centres, and schools. There is a particularly notable absence in comprehensive educational institutes: at the time of the research, only 80 Snoezelen rooms were documented in schools – 14 in early childhood education centres, 7 in school districts, 50 in primary schools, 6 in lower secondary schools, 2 in upper secondary schools, and 1 in a university laboratory.

School Snoezelen rooms are generally small to medium in size and are almost exclusively used by students. In some cases, they are not employed in structured and continuous activities – i.e., like therapeutic treatment – but rather on an occasional basis, for example, when it is necessary to provide a controlled environment for a student with disabilities during emergencies. However, the presence of a Snoezelen room in a school, especially if used in a structured and consistent manner, could significantly support the delicate and often lengthy process of inclusion.

Innovation aspects: the use of untreated wood
The Wood Snoezelen project integrates the non-pharmacological Snoezelen therapeutic approach with the use of untreated wood – as a construction, furnishing, and sensory stimulation material – thereby eliminating the need for paintings or chemical treatments. Wood is particularly suitable for creating multisensory rooms, as it allows for the creation of neutral environments and, thanks to its performance characteristics, enables optimal levels of acoustic, visual, and thermal comfort that directly influence the sensory performance of users.

The properties of untreated wood include, among others, the reduction of heart rate, blood pressure, and stress levels (Bringslimark et al., 2009). Its characteristic yellowish to reddish hue emits wavelengths that can enhance cognitive abilities (Nakamura & Kondo, 2007). Several studies have demonstrated that wood can positively influence the psychophysical well-being of individuals (Demattè et al., 2018). Furthermore, research shows that spending time in natural environments, such as forests, reduces stress and anxiety due to the terpenes [1] released by trees (Meneguzzo & Zabini, 2020).

The use of wood in construction has already proven effective for individuals with autism spectrum disorder (Venturini, 2010) and in residential care facilities for dependent elderly people (Bozza et al., 2019). It is therefore no coincidence that the use of wood in environments with specific rehabilitation, care, and inclusion purposes for vulnerable people and people with disabilities is becoming increasingly widespread. Significant case studies, though limited in number, include *Noverca House* – a prefabricated multisensory pavilion designed by Atelier JQTS, installed in 2017 at Maria Veleda School in Loures, Portugal – and the *Classroom Makeover for Visually Impaired Students*, designed in 2018 by Creative Crews in Pattaya, Thailand, where the Braille system was transposed onto the wooden interior cladding elements.

Research methodology and the modular kit

The research project [2] was co-financed by Università Iuav di Venezia, Consorzio Legno Veneto, and Bozza S.r.l., with I.S.R.A.A. – Istituto per Servizi di Ricovero e Assistenza agli Anziani – and the association La Nostra Famiglia of Conegliano and Treviso as project partners.

The research was structured into three main phases:
1. a state-of-the-art analysis on disability and inclusion policies, Snoezelen environments, and prefabricated timber constructions;
2. the design of a modular kit for a multisensory room made entirely of untreated wood components, named Wood Snoezelen (WS);
3. the construction of the first prototype at a primary school in Lozzo Atestino.

The kit of components
The research developed a modular prefabricated kit of untreated wooden elements for the interior envelope (floor, wall panels, false ceiling, and storage components) in which the sensory equipment is integrated, producing an environment of high architectural quality. The modules were designed in accordance with anthropometric measurements and users' movements, conceived to ensure high flexibility and dry assembly. These can be configured to create Wood Snoezelen environments tailored to different user types and functional settings.

The kit is divided into four main categories (image 1):

Raised floor: designed primarily as a tactile device through the use of different textures and finishing materials. Additionally, the modules can assume various shapes and heights – triangular, curvilinear – functional for psychomotor development.
Wall panels: featuring a multisensory system with micro-perforated and backlit wood panels for visual stimulation, and panels made of different timber species (fir, cedar, larch, oak) for tactile perception. Other panels consist of interchangeable modules that generate a wide range of sensory combinations.
False ceiling: designed both as a sound-absorbing element for acoustic control and as a device for integrating multisensory equipment – hammocks, tactile curtains, cascades of optical fibres – and the lighting system.
Storage units: modular structures designed to integrate sensory equipment, such as the vibroacoustic waterbed mattress and the ball pool, and usable as storage elements.

The choice of which components to adopt depends on the project and the use of the room. During the research, it became evident that, based on the information collected, an effective Wood Snoezelen could be composed of an entrance area – which would serve as a welcoming and concluding space for therapy – and sensory stations organized in such a way as to prevent sensory overload. Accordingly, a basic Wood Snoezelen consists of the following macro-areas:
1. Welcoming space: an area where the welcoming and final greeting moments take place, equipped with seating and storage elements for clothing and footwear.
2. Calm space: an area dedicated to sensory stimulation aimed at relaxation, equipped with a vibroacoustic waterbed, mirrors, optical fibres, and projectors.
3. Space for tactile and visual stimulation: an area where tactile and visual stimulation is performed, equipped with tactile panels, bubble tubes, and projectors.
4. Active space: an area where senses related to mobility are stimulated, equipped with a ball pool, hammocks, and balance platforms.

The Wood Snoezelen of Lozzo Atestino

The validity of the designed components was verified through their application in the design of the first Wood Snoezelen prototype at "G. Marconi" Primary School in Lozzo Atestino, in the province of Padua – a school at the forefront of the national educational landscape.

The Wood Snoezelen was built inside a 50 m^2 underutilized classroom located on the first floor, also accessible by lift. In accordance with the requirements for Snoezelen environments, the room can be fully darkened thanks to wooden boards placed over the windows.

The project is divided into two macro-environments: the entrance space and the sensory space. For the definition of each zone, components from the abacus were used, constructed primarily with a load-bearing structure in fir wood and panels made of planed fir boards, except for the flooring, which consists of brushed oak boards.

The sensory space is divided into six thematic "islands" (image 2):
1. Calm zone: for the relaxation of the vestibular system. It consists of a waterbed equipped with a containment structure to create an enclosed environment that enhance relaxation, and a cascade of optical fibres flanked by a soft seat.

2. **Active zone:** primarily for kinesthetic stimulation and proprioception. It consists of a ball pool and balance platforms. Kinesthetic stimulation is achieved through the combination of static and dynamic activities, such as the relationship between the body and its weight, and the discovery of body parts and possible movements.
3. **Tactile zone:** for tactile stimulation through mobile floor and wall pathways filled with foam rubber of different textures and densities. The sense of touch can be developed through bodily exploration and the diversified use of materials and surfaces.
4. **Visual/acoustic zone:** for visual and auditory stimulation thanks to the integration of a bubble tube flanked by a mirror and a smart TV. The sense of sight can be trained through exercises in visual information memorization, focusing strategies, and localizing a reference point. The sense of hearing is trained through localization of sound sources, sound identification, recognition of familiar sounds, and the use of musical instruments.
5. **Olfactory zone:** dedicated to the sense of smell through containers with cedar lids filled with wood shavings and scented with essential oils (image 3). This sense can be stimulated through the recognition and discovery of odors, the use of certain essences capable of influencing mood, and their personalization.
6. **Fine motor zone:** dedicated to coordination between movement, cognitive aspects, and the seven senses, consisting of a micro-perforated fir wood panel into which shapes of different geometric or natural sections can be inserted, characterized by different wood species (fir, cedar, larch, and oak). This zone enables the exploration of non-verbal languages through the use of Braille and Augmentative and Alternative Communication (AAC).

The room's colour can vary according to the colours of the sensory equipment. The Wood Snoezelen was inaugurated on February 28th 2025, same day of Rare Disease Day, and is currently used (image 4).

Conclusions and future perspectives

According to the statistics and issues previously outlined, it is clear that the number of vulnerable individuals is constantly increasing and that, in particular, the number of school-age individuals with disabilities is destined to grow over time. This scenario necessitates defining support systems for people with disabilities – not only episodically but in a sustained and continuous manner in everyday life. In this regard, school buildings can become ideal opportunities for developing situations and opportunities for assistance that many people with disabilities would otherwise not have access to. This aspect must be combined with wood's capacity to create comfortable environments and promote well-being.

The choice of wood, therefore, appeared as the logical consequence in view of creating an environment with the defined characteristics. Consequently, the design of a multisensory room made of wood – Wood Snoezelen – constitutes a real example of an inclusive space aimed at care and rehabilitation. Having in mind an increasingly comprehensive policy of integration and inclusion of people with disabilities within everyday social contexts, the construction of the Wood Snoezelen at the primary school in Lozzo Atestino represents a first step in this direction.

The building of a high-performance architectural and therapeutic environment required structured and transdisciplinary collaboration among the project partners. The synergy between technological-architectural expertise (Università Iuav di Venezia, Consorzio Legno Veneto, Bozza S.r.l.) and clinical-medical expertise (Associazione La Nostra Famiglia, I.S.R.A.A.) was crucial in designing the modular wooden abacus and defining the sensory islands, aiming to transform the school into a place suitable for long-term therapeutic practices.

First feedback
The first uses of the room at the Lozzo Atestino school have yielded positive feedback regarding the effectiveness of the Wood Snoezelen environment for students with disabilities [3].

Regular use of the WS has also been documented within palliative care sessions for a student affected by a degenerative condition, non-ambulatory and blind. Despite the primary visual impairment, the student experienced tangible benefits from remaining in the environment – particularly related to its visual component [3]. This suggests that the ambient lighting quality and the integration of sensory equipment with the wooden envelope can generate photonic and chromatic stimulation producing a positive sensory response or neurophysiological comfort.

Another relevant case concerns G., an adolescent with autism spectrum disorder (ASD) not enrolled at the school. During his first visit, G. exhibited considerable motor hyperactivity and agitation in traditional school spaces. Upon reaching the Wood Snoezelen, he displayed a latency phase before entering, taking time to familiarize himself with the environment [3].

Once inside, the Wood Snoezelen facilitated the de-escalation of his agitated behaviour. G. began autonomously exploring the thematic islands and subsequently engaged in reciprocal social interaction with the therapist [3]. The deepest state of relaxation was achieved in the Calm Zone (Vestibular), where the enclosing configuration of the wooden structure surrounding the waterbed produced a sense of spatial safety (cocooning effect). At the end of the session, he showed reluctance to leave the room [3].

G.'s experience in the WS demonstrated success in behavioural regulation consistent with the outcomes reported in Snoezelen literature, particularly in reducing aggressive and self-injurious behaviours in individuals with severe disabilities (Lancioni et al., 2004). The persistence of environmental well-being and the generating of positive spatial memory were confirmed during a subsequent visit, when G. calmly entered the building and independently headed toward the Wood Snoezelen [3]. This initial observation validates the role of untreated-wood environments as sought-after therapeutic spaces, demonstrating that architectural quality and materiality are decisive factors in promoting autonomy and reducing anticipatory anxiety in individuals with ASD.

Future perspectives
The next phase of the research project, essential for its validation, will focus on structured clinical monitoring and evaluation of therapeutic effectiveness.

This evaluation framework was developed in collaboration with clinical specialists from the association La Nostra Famiglia, specifically dr. Gianni De Polo (child neuropsychiatrist) and dr. Sonia Bortolot (pedagogue). The methodology aims to define observation forms structured according to the ICF (International Classification of Functioning, Disability and Health), to be used over a time frame of several months during therapy sessions conducted by trained school staff.

This system will enable the systematic collection of verified data and the construction of a longitudinal record of results, transforming qualitative feedback into quantitative clinical evidence and supporting the potential replicability of the Wood Snoezelen model in other educational and care contexts.

notes

[1] Terpenes: Bioactive substances, specifically classified as Biogenic Volatile Organic Compounds (BVOCs), released into the atmosphere by trees and forest soil. They are the main constituents of essential oils and responsible for the characteristic scents of forests. These volatile compounds have been shown to have stress-reducing and immune-boosting properties in humans, forming the scientific basis for forest therapy practices.

[2] The research project entitled “Wood Snoezelen: Multisensory Environments for Assisting and Rehabilitating Individuals with Severe and Very Severe Cognitive Disabilities” (October 2021–September 2022) was co-financed by Università Iuav di Venezia, Consorzio Legno Veneto, and Bozza S.r.l. It was developed by Arch. Agata Tonetti, research fellow at Iuav, under the scientific supervision of Prof. Massimo Rossetti (Iuav). Project partners included Consorzio Progetto Legno Veneto, Enzo Bozza (Bozza S.r.l.), Dr Gianni De Polo, Dr Sonia Bortolot, therapists Chiara Novello and Marianna D’Incà (Associazione La Nostra Famiglia, Conegliano and Treviso), and Geom. Silvano Pangerc (I.S.R.A.A., Treviso). The school principal Alfonso D’Ambrosio of the Istituto Comprensivo di Lozzo Atestino also contributed to the project.

[3] Preliminary operational feedback provided by the teacher responsible for the Wood Snoezelen at “G. Marconi” Primary School in Lozzo Atestino.

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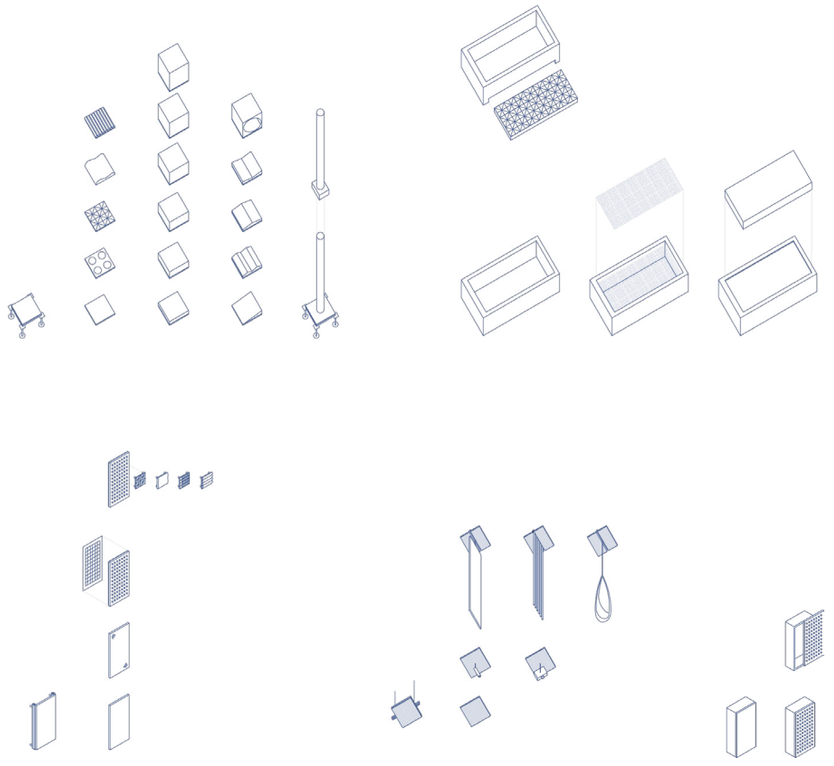

image 1

Abacus for a Wood Snoezelen, Agata Tonetti, 12 July 2022.
Abacus of untreated wood components: raised floor, wall panels, false ceiling, and containment structures. The modules allow for different spatial configurations supporting the Snoezelen therapeutic approach.

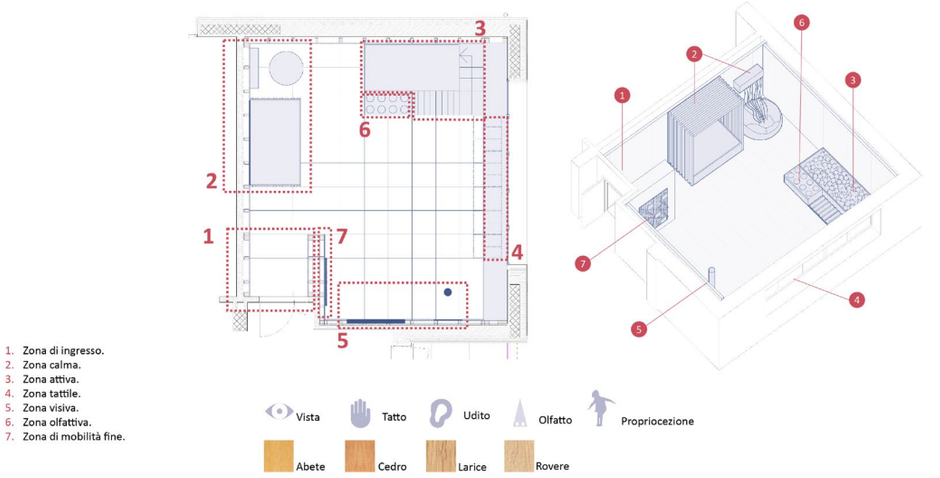

image 2

Design of the Wood Snoezelen of Lozzo Atestino, Agata Tonetti, 6 March 2023.
Layout of the interior space of the Wood Snoezelen (50 m^2) showing the identification of the six thematic sensory zones. The wood species used in the prototype are fir (for the supporting structure and panels) and brushed oak (for the flooring).

image 3

Olfactory zone, Agata Tonetti, 3 October 2025.
Therapists from La Nostra Famiglia of Treviso guide the pupils of Lozzo Atestino school in experiencing the sense of smell by sniffing the cedarwood lids of the sensory containers. The olfactory zone is stimulated through the use of wood shavings and essential oils, supporting the recognition and personalisation of scents.

image 4

Wood Snoezelen of Lozzo Atestino, Agata Tonetti, 6 December 2024.
View of the visual/acoustic zone wall and the fine motor zone. The latter is dedicated to coordination and cognitive aspects, integrating shapes made of different wood species and enabling the exploration of non-verbal languages such as Braille and Augmentative and Alternative Communication (AAC).

The international conference *Architecture and Autism: Shared Spaces and Sensory Escapes* brings together researchers, designers, educators, and professionals to explore how architecture can support the sensory and emotional needs of neurodivergent individuals. The conference highlights the BeSENSHome Interreg Italy-Austria project, a multidisciplinary initiative developing intelligent sensory systems and adaptive environments that respond to individual preferences, needs, and neurodivergent profiles.

Through keynote lectures and four thematic sessions, the event examines multisensory spaces for care and education, participatory design and co-creation, research on auditory accessibility and comfort, and the integration of AI and smart technologies in inclusive environments. Case studies and innovative projects – from school classrooms to museums – illustrate how design can foster autonomy, well-being, and social connection.

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