

Interior Design for Adults with Autism

Student: Jovana Stevanovic

Tutor: Davide Crippa



POLITECNICO
MILANO 1863

Politecnico di Milano
School of Design
Master's Degree in Interior and Spatial Design
Academic Year: 2019/2020

Supervisor: Prof. Davide Crippa
Thesis of: Jovana Stevanovic
Matricola number: 895715

Interior design for Adults with Autism

In today society there are many more children and people with some type of autism, there is a greater need for interior design that will adapt to their needs.

In this paper, I will address new solutions for an environment where people with these needs can live more easily and thrive independently.

Abstract

People who have autism often encounter problems when it comes to processing information from their environment. With the rise of autism in the world in today's society, there is a growing need for designers to devote themselves to addressing these interior problems to help improve the lives of people with autism. Nowadays, most housing that is available, still feels very institution-like. That is why designing this type of housing should be done with great care given that individuals with autism can be very sensitive to surroundings.

The purpose of this research is to address the needs of people with autism when it comes to the need for some type of independent housing. The focus of this research is on the functioning of people with autism in space and the impact architectural elements can have on them in a normal environment. The theoretical section on Autism as a Neurological Disease helped to come up with basic facts to and to understand why these people need a different environment. Through questionnaires, questions were raised about changes that would have an impact on better and faster progress. Also, the focus was on existing design elements and their analysis. Further, the work was divided into problems and their solutions, which further led to the final design concept.

The cause of this research is a contribution to the conceptual design of the apartment as well as guidelines for other designers or families who would like to address this issue. The main reason that led to the elaboration of this topic is the problem that occurs when a person with autism, after completing his education, receives the need to become independent. Then People with autism and their families do not have much choice. Depending on the level of functioning of a person with autism, they either stay forever with their parents or go to specialized institutions, which according to research have proved inadequate because the atmosphere is too institution-like.

The results of this study indicate the wide variety of needs of people who have problems from this spectrum. This means that each individual has specific needs that make interior design very complex. However, these needs are grouped into categories sensory, social and spatial in order to more easily arrive at possible solutions to architectural elements. These 3 categories lead to leading problems and possible solutions. Later, these design principles served as the main guides for designing a 4 person apartment concept that is adapted for people with autism.

Key words_ autism, wellbeing, design, empathy, sensory environment

Astratto

Le persone che hanno l'autismo spesso incontrano problemi quando si tratta di elaborare informazioni dal loro ambiente. Con l'ascesa dell'autismo nel mondo nella società di oggi, c'è una crescente necessità per i progettisti di dedicarsi ad affrontare questi problemi interni per aiutare a migliorare la vita delle persone con autismo. Al giorno d'oggi, la maggior parte degli alloggi disponibili è ancora molto simile a un'istituzione. Questo è il motivo per cui progettare questo tipo di alloggio dovrebbe essere fatto con grande cura dato che le persone con autismo possono essere molto sensibili all'ambiente circostante.

Lo scopo di questa ricerca è di soddisfare le esigenze delle persone con autismo quando si tratta della necessità di un qualche tipo di alloggio indipendente. Il focus di questa ricerca è sul funzionamento delle persone con autismo nello spazio e l'impatto che gli elementi architettonici possono avere su di esse in un ambiente normale. La sezione teorica sull'autismo come malattia neurologica ha aiutato a presentare fatti di base per capire perché queste persone hanno bisogno di un ambiente diverso. Attraverso i questionari sono state poste domande sui cambiamenti che avrebbero avuto un impatto su progressi migliori e più rapidi. Inoltre, l'attenzione era rivolta agli elementi di design esistenti e alla loro analisi. Inoltre, il lavoro è stato diviso in problemi e soluzioni, il che ha portato al concetto di design finale.

La causa di questa ricerca è un contributo alla progettazione concettuale dell'appartamento e linee guida per altri designer o famiglie che vorrebbero affrontare questo problema. Il motivo principale che ha portato all'elaborazione di questo argomento è il problema che si verifica quando una persona con autismo, dopo aver completato la sua istruzione, riceve la necessità di diventare indipendente. Quindi le persone con autismo e le loro famiglie non hanno molta scelta. A seconda del livello di funzionamento di una persona con autismo, o restano per sempre con i genitori o vanno in istituzioni specializzate, che secondo la ricerca si sono rivelate inadeguate perché l'atmosfera è troppo simile all'istituzione.

I risultati di questo studio indicano l'ampia varietà di esigenze delle persone che hanno problemi da questo spettro. Ciò significa che ogni individuo ha esigenze specifiche che rendono l'interior design molto complesso. Tuttavia, queste esigenze sono raggruppate in categorie sensoriali, sociali e spaziali al fine di arrivare più facilmente a possibili soluzioni agli elementi architettonici. Queste 3 categorie portano a problemi principali e possibili soluzioni. Successivamente, questi principi di progettazione sono serviti come guide principali per la progettazione di un concetto di appartamento per 4 persone adatto alle persone con autismo.

Parole chiave_

Acknowledgments

First of all, I would like to thank Professor Dvide Crippa for providing support during this research and design process.

I would like to express my gratitude to architect Pedja Milutinovic, je centru za dnevni boravak dece I odraslih sa invaliditetom „SUNCE”. I am grateful for the time and goodwill to share his experiences with me, and the visit to this center had a great impact on the further development of my project.

This research would not have been possible without the help of the employees as well as the residents of this center who helped me to understand the needs and the problems that people with autism are facing.

Finally, thank my friend Jovana ivkovic, a specialist educator who, in addition to her professional contributions to this research, has had the patience to introduce me to the world of people with autism and to support me in solving their problems.

Content

Introduction

1. Theoretical frame	20
1.1. What is autism	21
1.2. Housing with support-problems and options	26
1.3. Incentive	28
1.4. Overview	30
2. Research	33
2.1. Methods	35
2.2. Case study	36
2.3. Interview	43
2.4. Autism and the Environment	49
2.5. Evaluation of results	55
3. Key findings	56
3.1. Problems	57
3.1.1. Sensory	57
3.1.2. Social	61
3.1.3. Spatial	61
3.2. Solutions	63
3.2.1. Sensory	63
3.2.2. Social	66
3.2.3. Spatial	67
4. Design analysis	69
5. Design concept	76
5.1. Zoning	78
5.2. Layout	79
5.3. Communal area	83
5.3.1. Relax area	84
5.3.2. Living room	86
5.3.3. Kitchen	88
5.3.4. Dining room	91
5.3.5. Laundry room	94
5.4. Private area	96
5.4.1. Single room	97
5.4.2. Master room	99
5.4.3. Bathroom	102
5.5. Garden	104
6. Furniture design ideas	107

7. Materials and finishes	114
7.1. Floor coverage	116
7.2. Wall coverage	117
7.3. Doors and windows	118
7.4. Furniture materials	119
7.5. Mechanical and electrical solutions	120
8. Conclusion	121
9. Bibliography	123

List of figures

Figure	Page
1: can get overwhelmed	22
2: hardly fit into society	22
3: hardly fit into society	22
4: visualization problems	23
6: thinking problems	23
7: empathy problem	23
8: affect more boys than girls	25
9: schematic visual of growing number of people diagnosed with autism.	25
10: difficulties in communication	29
11: love clear routine	29
12: difficulties in social interaction	29
13: schematic visual of the development of a Neurotypical person	31
14: schematic visual of the development of an autistic person.	31
15: example of an interior that has an atmosphere	32
16: example of an interior that has an atmosphere	32
17: graphical representation of research methodologies	35
18: Picture of the facade of the center „Sunce”	37
19: Picture of the entrance of the center „ Sunce “	38
20: Picture of the playground of the center „ Sunce “	38
21: Picture of the partition of the center „ Sunce “	39
22: Picture of interior activities in center „ Sunce “	39
23: Activite room for children with autism	41
24: library for people with autism	41

25: communal area for people with autism	42
26: Garden design for people with autism	42
27: Picture of Leo Kanner- first scientist who clearly define autism	49
28: Picture Hans Asperger	50
29. aspects to be improved/ independance, social interaction, evolution	51
30: aspects to be improved/ sensation, perception refuge	52
31: aspects to be improved/ safty, durability, tolerance	53
32: aspects to be improved/ monitoring, personalization, communication	54
33: evaluation of results graphic visualisation	55
34: barking dog	58
35: sound of vacum cleaner	58
36: trafic noise	58
37: glare and efections	59
38: Street lamps	59
39: temperature sensitive	59
40: Kitchen smells	60
41: insufficient private space	61
42: sharp edges	61
43: confusional layout	61
44: unlogical routine	62
45: space perception	62
46: scarce furnishings	62
47: good insulation	63
48: insulated canins	63
49: blinds	63

50: matte finishes	64
51: avoid big contrasts	64
52: separate kitchen	65
53: safety systems	66
54: deep window niches	66
55: preview before entering the room	67
56: curved walls	67
57: separate functions	67
58: no sharp edges	68
59: comfortable seating	68
60: wall with light	71
61: privacy enhancing work spot	72
62: privacy seating on the airports	72
63: privacy enhancing couches	73
64: natural light and calm atmosphere	73
65: acoustic panels on the ceiling	74
66: acoustic panels on the wall	74
67: Idea of a bed with total privacy	75
68: acoustic panels on the ceiling in the halls	75
69: zoning plan	78
70: plan with dimensions	80
fig 71: furniture disposition plan	81
72: section of the house	82
73 : plan with marked communal area	83
74: 3d visualisation of relax area, view 1	84
75: 3d visualisation of relax area, view 2	85

76: 3d visualisation of living room, view 1	86
77: 3d visualisation of living room, view 2	87
78: plan with marked kitchen	88
79: 3d visualisation of kitchen, view 1	89
80: 3d visualisation of kitchen, view 2	90
81: plan with marked dining room	91
82: 3d visualisation of dining room, view 1	92
83: 3d visualisation of dining room, view 2	93
84: plan with marked laundry room	94
85: 3d visualisation of laundry room	95
86: plan with marked single rooms	96
87: 3d visualisation of sigle rooms, view 1	97
88: 3d visualisation of sigle rooms, view 2	98
89: plan with marked master room	99
90: 3d visualisation of master room, view 1	100
91: 3d visualisation of master room, view 2	101
92: plan with marked master room	102
93: 3d visualisation of bathroom	103
94: plan with marked garden	104
95 : 3d visualisation of garden, view 1	105
96 : 3d visualisation of garden, view 2	106
97 :night table	108
98 : wordrobe	108
99 : desk	108
100 : bench	109
101: bed	109
102 : sofa	110

103 : armchair	110
104: coffe table	111
105 : commode	111
106: inflating seating	112
107 : dining table	112
108: partition with rotating panels	113
109: partition with rotating panels master room	113
110: wall with built on transparent panels	113

Introduction

This research focuses on designing an inclusive environment for people on the autism spectrum, and the main cause of this initiative is the growing number of people with this diagnosis and their need for appropriate accommodation. There is no accurate record or database, but there are statistics that indicate an increase in autism children.

It is also unknown whether the increase is felt because previously these symptoms have not been defined as autism or in the last 20 years there are actually many more children with this problem, but the current prevalence of ASD is estimated at 1 in 68 births. Growth of autism spectrum disorders, and the exact causes of this increase are not yet clear (biological and vaccines are mentioned)

Autism is defined by problems in social communication that have a serious impact on a person's ability to live independently. These people often need help with their daily routine at their home. Such assistance can be provided by institutions that are designated for people with different types of disabilities or parents and co-workers. The problem occurs when parents become old and no longer able to provide assistance to their autistic children, then there is a need for alternative housing options.

Prosperity is a subjective matter and has a different meaning for every person as well as for people with autism. However, their perception of the environment differs and the ability to verbally communicate is limited so that it is difficult to hear and understand person with autism. As a result, their experiences are often poorly understood.

In this thesis I will explore the factors that have the greatest impact on the development of people with autism. In order to enable the arrangement of the premises they become independent.

The main objectives of this research should be.

- Understand how the environment affects the health and wellbeing of people with autism.
- What are the pre-existing options for people with autism who end up with education and how are they evaluated by autistic persons and their families.
- Analyze existing design solutions and identify those that may be useful in further elaborating the concept.
- Through interviews, the necessary conclusions are drawn from the experience of architects and experts.

1. Theoretical frame

1.1 What is Autism

Origin of the term “Autism”

The first use of the word “autistic” was in the early 20th century, as a descriptor of symptoms. In 1912, Eugen Bleuler used the term to define symptoms associated with schizophrenia. It wasn't until 1943 that “autism” was used as a diagnostic term. In the first case of autism, Dr. Leo Kanner used the term to diagnose a social and emotional disorder. Previous observations of patients with symptoms of autism had led psychiatrists to a diagnosis of schizophrenia. The diagnosis of autism was used with eleven patients that Dr. Kanner was studying at the time. At about the same time, Austrian pediatrician Hans Asperger identified similar problems but among individuals with higher levels of language ability. Over the years, specialists recognized that these two accounts were describing variations of the same phenomenon. Since then there has been worldwide attention to autism.

The notion that autism is a spectrum of disorders is a relatively new phenomenon. Before 2013, autism spectrum disorders, such as Asperger's syndrome and Kanner's syndrome, were thought of as distinct disorder classes with independent treatments. In the latest revision of the Diagnostic and Statistical Manual of Mental Disorders (DSM-V) in 2013, the American Psychiatric Association combined subcategories of autism and related conditions into one unified category with different characteristics and severity.

Autism is a developmental disorder of communication and social interaction that occurs in early childhood and lasts for the rest of your life. It is more common in men. People with autism have a learning problem, from early adopting basic habits to acquiring abstract knowledge and social skills. Interferences are most pronounced in the domain of communication, in understanding and accepting the rules and requirements that social situations place and in matching their own behavior to those situations.

The development of children with autism spectrum problems is often slow, and always uneven.

Autism spectrum is a term used today to indicate the existence of many different forms of manifestation of autism and to cover all these differences with one single term. It is a condition that can have a huge impact on a person's independent life. Therefore, adults with autism need help to be able to perform daily functions. The characteristic of this condition is that every person with this problem is very unique, the problem is the same but differently affect the behavior of the person. Some of them may live independently while others require support every day.

We can find common known aspect of autism as four different categories of the possible symptoms.

- 1) stereotypical and repetitive speech as well as simple motor stereotypes;
- 2) excessive commitment to routines and a strong resistance to change;
- 3) highly restricted and fixed interests i
- 4) hypo or hyperreactivity to sensory inputs.

Classification of pervasive disorders according to MKB-10 classification:

- F84.0 Autism spectrum
- F84.1 Atypical autism
- F84.2 Rett syndrome
- F84.3 Second disintegrative childhood disorder
- F84.4 Hyperkinetic disorder associated with intellectual disability and stereotyped movements
- F84.5 Asperger's syndrome
- F84.8 Other pervasive developmental disorders
- F84.9 Pervasive developmental disorder, unspecified



fig 1: can get overwhelmed

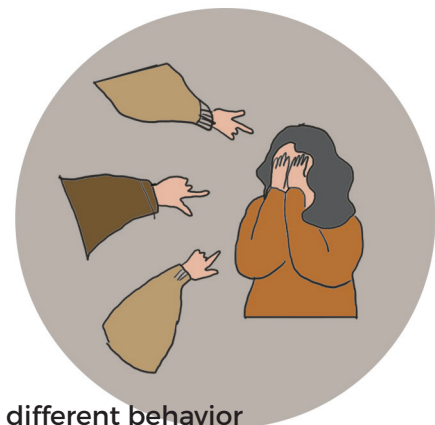


fig2. different behavior



fig 3: hardly fit into society

Asperger Sindrom

People with higher levels of ability within the autism spectrum, such as those with Asperger syndrome, generally have average or above average intelligence and developed speech. This group has a predisposition to become independent, so it is a group that is the focus for this type of project.



fig 4: visualization problems



fig 6: thinking problems



fig 5: learning problems

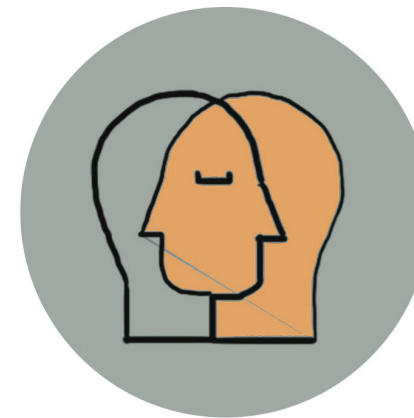


fig 7: empathy problem

Facts

According to Science Daily, the rate of children diagnosed with Autism was 1 in 150 in 2000. Current estimates put that number at 1 in 6; nearly double in less than 20 years (Science Daily, 2018)

The 2018 report covers the year 2014, which includes the cohort born in 2006. Its key findings include that:

Autism prevalence has increased to 16.8 per 1,000 (one in 59) children aged 8 years

Estimated prevalence of ASD was highest in New Jersey (29.3 per 1,000 or 1 in 34.1) compared to each of the other ten sites

ASD prevalence was 26.6 per 1,000 boys (one in 37.6) and 6.6 per 1,000 girls (one in 151), for a prevalence ratio of 4.0.

Male-to-female prevalence ratios ranged from 3.2 (Arizona) to 4.9 (Georgia)

Estimated prevalence among white children (17.2 per 1,000) was 7% greater than that among black children (16.0 per 1,000)

Estimated prevalence among white children was 22% greater than that among Hispanic children (14.0 per 1,000)

Estimates for Asian/Pacific Islander children ranged from 7.9 per 1,000 (Colorado) to 19.2 per 1,000 (New Jersey) with wide confidence intervals.

Studies conducted on those with autism show that it affects more boys than girls, and is most prevalent in developed countries. Autism diagnosis occurs across different age groups, though studies also indicate that autism is likely already present at the time of birth, although it is very difficult to form an early diagnosis.

Autism ranges from causing mild symptoms to more obvious abnormal behaviors associated with the condition. Unfortunately, no known cure has been found to alleviate this condition to date. Today, the cases of autism seen in adults and children are still rising

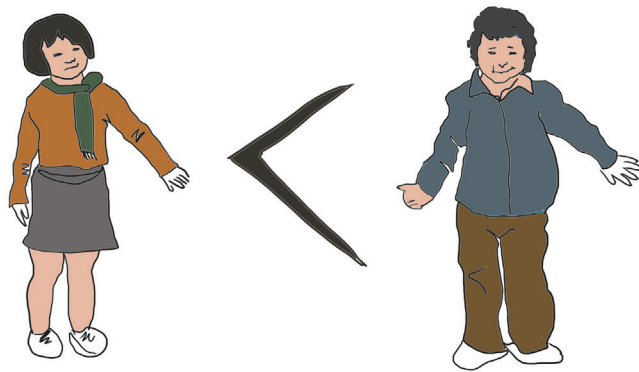


fig. 8: affect more boys than girls

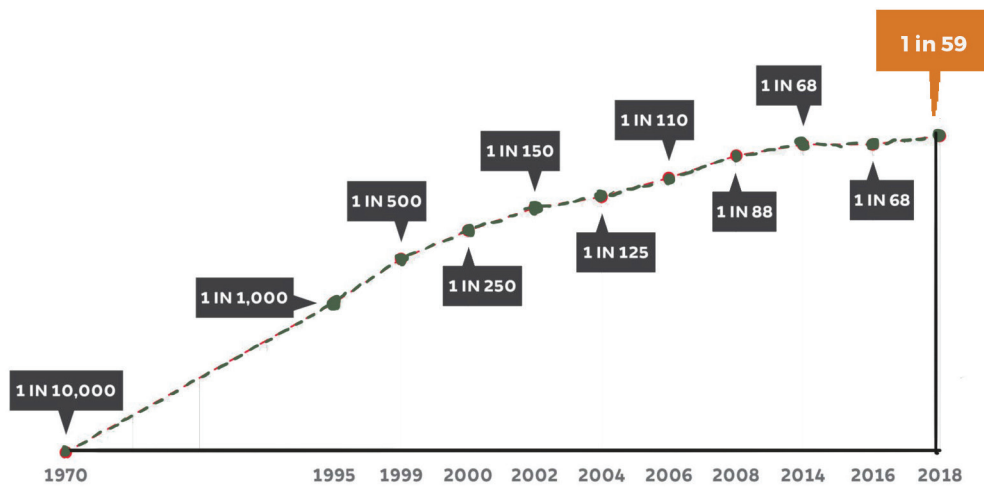


fig. 9: schematic visual of growing number of people diagnosed with autism.

1.2. Housing with support

Problems and options for autistic adults

Over the next decade, the CDC estimates that 500,000 teenagers with Autism Spectrum Disorder will age out of their school-based services and move into adulthood. As adults, the need and desire for person-centered housing opportunities is growing exponentially. An estimated 80,000 individuals sit on waiting lists that can be as long as 15 years. The number of individuals on waiting lists is expected to grow as the prevalence of Autism is predicted to increase by 15% over the next ten years. The discrepancy between availability and need is an ever-expanding chasm.

This suggests that there will be an even greater need for new housing opportunities in the future.

Housing for autistic adults are much more varied these days than they were in the past, but it is often too costly for most people to find a proper accommodation with support.

Current models of accommodation for adults with autism

Residential Care

Author: Clarissa Manuel-Jones

Organisation: The National Autistic Society

Date of publication: 27 November 2015

Some people with autism require specialist, 24-hour support in a Residential Service throughout their lives; others may find that they develop health problems in later life that require this high level of support. In these circumstances, it can be difficult to find residential care that is able to cater to both needs.

Supported Living-

This option is a very popular model and is usually a flat or house where a person has a room and shares other facilities with other people b with additional needs placed by social services.

Here a person has his own tendency to be independent by owning his own apartment, paying rent and having the necessary security that comes with his right to make a difference when it comes to residential care. This type of accommodation is what I will address in this thesis.

It can also be private flat if a person has challenging behavior or need for 1 on 1 support and can have a negative impact on other tenants.

Living with family with a support package in place

Some people stay with a family that provides adequate support with the help of a center or to hire a personal assistant who can help a person with autism progress and become independent.

An assistant can be found through some agencies but it can also be a friend or family member.

Other options

Large institutional residences are not appropriate for most people with autism. They can be over-stimulating environments, occupied by large numbers of people for whom daily routines are determined by staff rather than residents. In response to these older types of services, there has been a shift towards providing residential accommodation in domestic-sized buildings in the community, not apart from it.

Smaller living units such as group homes or self-contained flats in a single building have been shown to lessen the incidences of challenging behaviour, with individuals benefiting from more variety and stimulation from their living environment and inclusion in a community¹³. Whilst these new types of residential building form the focus of this study, it is recognised that they may not be suitable for all people with autism. Different models of accommodation and support exist in the form of clustered housing in one locality, sometimes referred to as villages or farmsteads.

1.3. Incentive

In this thesis I will explore how design could improve living environment for adults with autism providing the right architectural elements which can help to enhance motivation, confidence and self-esteem.

“The most interesting people you’ll find are ones that don’t fit into your average cardboard box. They’ll make what they need, they’ll make their own boxes,” Dr. Temple Grandin
“If you know one person with autism, you know one person with autism.”

This means that while people with autism, including Asperger’s Syndrome, share certain characteristics, they will be highly individual in their needs and preferences. Some people with autism are able to live relatively independent lives but others may face additional challenges, including learning disabilities, which affect them so profoundly that they need support in many areas.

The condition affects everybody differently, and people with autism, just like people everywhere, have all sorts of individual personalities, tastes, outlooks and beliefs. Autism can impact on a great deal of someone’s life and experiences, but it’s never the whole story about them.

Difficulties in social interaction

This includes difficulty in sharing interests with other people, trouble in understanding social rules and prioritizing their own needs. Find it difficult to understand other people. For example they may not be able to read common gestures, facial expressions or tone of voice and also have problems to recognize emotions and use them appropriate. In some cases, people might have limited or no ability to talk. They are slower in learning to interpret what others are thinking and feeling and not able to see things through another person perspective. This problems further make difficulties in making social relationships.

Difficulties in verbal and nonverbal communication

Communication with people with autism is very complicated, often they let other to know what they need or want. Some of people of the spectrum remain nonverbal throughout their life, while other can develop language but use it in a very unusual way. Conversation may be impossible because they may not be able to combine words into meaningful sentence. Also some of them use pictures or sign to communicate.



fig 10: difficulties in communication

Restricted and Repetitive Behaviors and Activities

People with autism love clear planning, order and routine. They are doing things the same way each time, and can get extremely upset if their routines are disturbed. It's common for a person with autism to have difficulty processing the

information that their eyes, ears, noses, muscles and skins are sending to the brain.

-Need for personal space

-Poor awareness of danger

-Poor coordination and balance

-Certain visual details, sounds, colors, smell, tastes or texture can cause both enjoyment and distress.

-Special interest and sometime high levels of ability in music, mathematics, art or technology.

- Problems with anxiety and depression.

People with autism may display some or all of this characteristic, but all of them have implications for the design of their home environments.

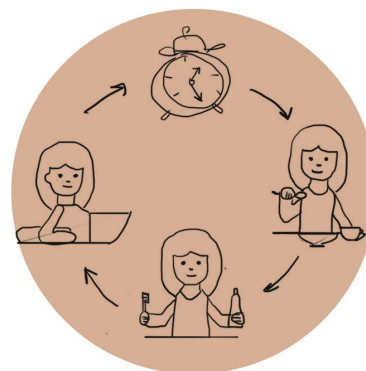


fig 11: love clear routine

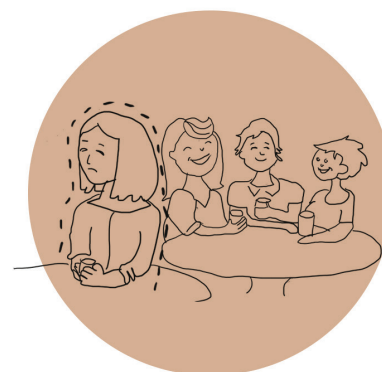


fig 12: difficulties in social interaction

1.4. Overview

In today's society, great focus lies on designing schools for special education. These schools are very well equipped and designed for, which leads to a perfect environment for the autistic children to learn and develop themselves.

There are a variety of facilities that are designed to help children with autism thrive. These schools are well equipped with materials and interior elements that make it easier for children with autism to learn and develop.

However, there is a problem when it comes to homes for adults with such needs. For now, the only choice for parents and people with autism are homes that evoke a sense of institution where sterile appearance dominates, so it's hard to find comfortable accommodation for people with autism who want to become independent.

These homes should be recognizable, but also to have comfort and warmth of a home. People with autism from birth have special conditions and undergo special education, but once education is completed, support ceases. The fact is that the developmental path of a person with autism is different from that of a neurotypical person.

When it comes to a person without a disability, the line is constantly evolving regardless of negative experiences because it can contribute to development if the person learns something good from it.

For people with autism, on the other hand, this line is steadily increasing and decreasing relative to the experiences they are going through. So the question might be

What architectural elements can influence the more stable development of people with autism in their environment?

So the first idea when designing this type of interior is to design for the sense. This is a very important element of this research. Because people with autism have a deficit of sensory filter, they respond differently.

Through this research in relation to the problems that people with autism encounter in their environment, I came to 3 leading categories - sensory, social and spatial.

Neurotypical person

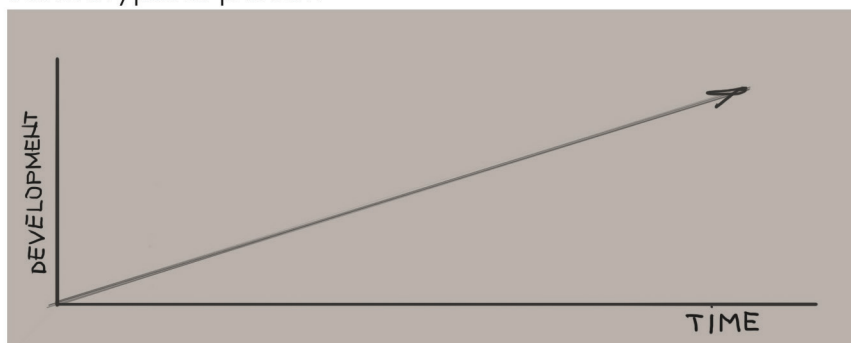


fig 13: schematic visual of the development of a Neurotypical person

Autistic person

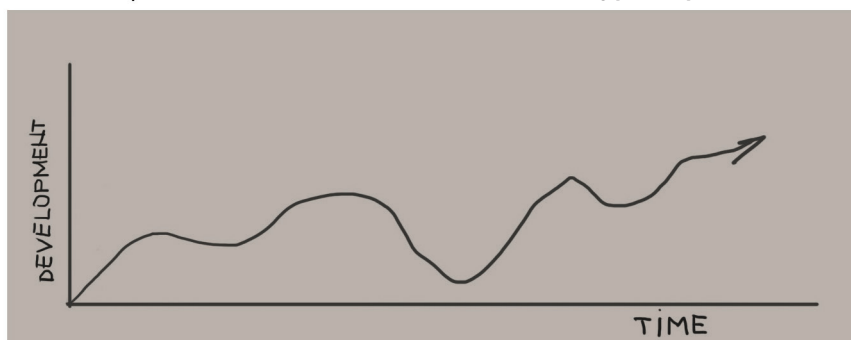


fig 14: schematic visual of the development of an autistic person.



fig 15: example of an interior that has an atmosphere



fig 16: example of an interior that has an atmosphere

2. Research

In recent years, there has been an increase in awareness among people and architects about the need for people with autism and a space that meets their needs.

The design strategy for people with different types of disabilities was primarily intended for architectural practice, especially intended for those with auditory visual and motor problems, while disturbances that are not physical and less visible and recognizable at first glance were ignored. These include people with autism who also have environmental responses and can respond strangely to loud sounds or neon lights that are normal elements for people with no disabilities. This type of problem requires a different design approach.

Certainly, studies on autism have a relatively short history, and studies on environmental factors are even shorter.

This condition is called I spectrum disorder, which indicates that the degree of functioning is extremely valuable, which adds complexity to this design endeavor because it is very difficult to define guidelines.

For example, some people are hypersensitive to one sensory factor while hyposensitive to another.

For example, some people do not like touch while others love it.

While all of these factors affect the complexity of designing a home for people with this problem, it should not mean that it should be ignored primarily because it is a phenomenon that has been on the rise in recent years.

Several studies prove that it is very important for people with autism to find the right home because their environment has a greater impact on them than on a normal person. However, many studies are limited to educational environment.

Certainly, there is a demand for a place in an independent housing facility with a little support that will give this circle of people the opportunity to live in a comfortable environment.

2.1 Research Methodology

In addition to the literature study, which was the basic database where I found the necessary information about the problem I was dealing with, I had the opportunity to visit a facility in Serbia that was intended for people with special needs.

This facility served as a great case study. It had a great influence on this research since I was able to analyze architectural solutions that proved to be effective in practice. It is a day care center for children and adults with disabilities "SUNCE" .500 m2



fig 17: graphical representation of research methodologies

2.2. Study case

Center for children with and adults with disabilities SUNCE

In addition to the literature study, which was the basic database where I found the necessary information about the problem I was dealing with, I had the opportunity to visit a facility in Serbia that was intended for people with special needs.

This facility served as a great case study. It had a great influence on this research since I was able to analyze architectural solutions that proved to be effective in practice. It is a day care center for children and adults with disabilities "SUNCE" .500 m²

In addition to day care activities, this center also has the option for nine person to overnight in the absence of parents or guardians.

The architectural structure of this center is designed to

meet the needs of clearly defined users of the center, which are:

- Children and persons with disabilities from 15 to 30 years of age,
- parents
- administrative staff and
- Personal care and customer service staff

The building provides a sense of security and safety, which is achieved by making it easy for users to navigate to designated zones. In this center, users have the following facilities: day care for the users, nutrition, health care, educational work, training for work and work activities, cultural-entertaining and recreational activities in accordance with the psycho-physical abilities and the expressed interests of the users.

Materialization is also one of the things I had the opportunity to analyze at this center. All the materials provided are natural and appropriate to contemporary architecture to meet the set standards required by such a facility. The walls of the building are made of different structures and thicknesses in accordance with the requirements for thermal and sound protection.

The interior walls are treated with water-based dispersions and without the use of wallpaper and similar materials to achieve an adequate hygiene regimen. The walls and floors in the toilets are lined with ceramic tiles. Flooring is solved depending on the purpose of the room but the requirement of maintenance and hygiene is met.

A visit to this center has helped me to analyze in practice the behavior of certain materials and design solutions already accepted by cartoon people with special needs. And even if this is not the type of object I am dealing with, by filtering out the interesting elements I have come to the conclusion that some of them are potentially applicable in housing design.

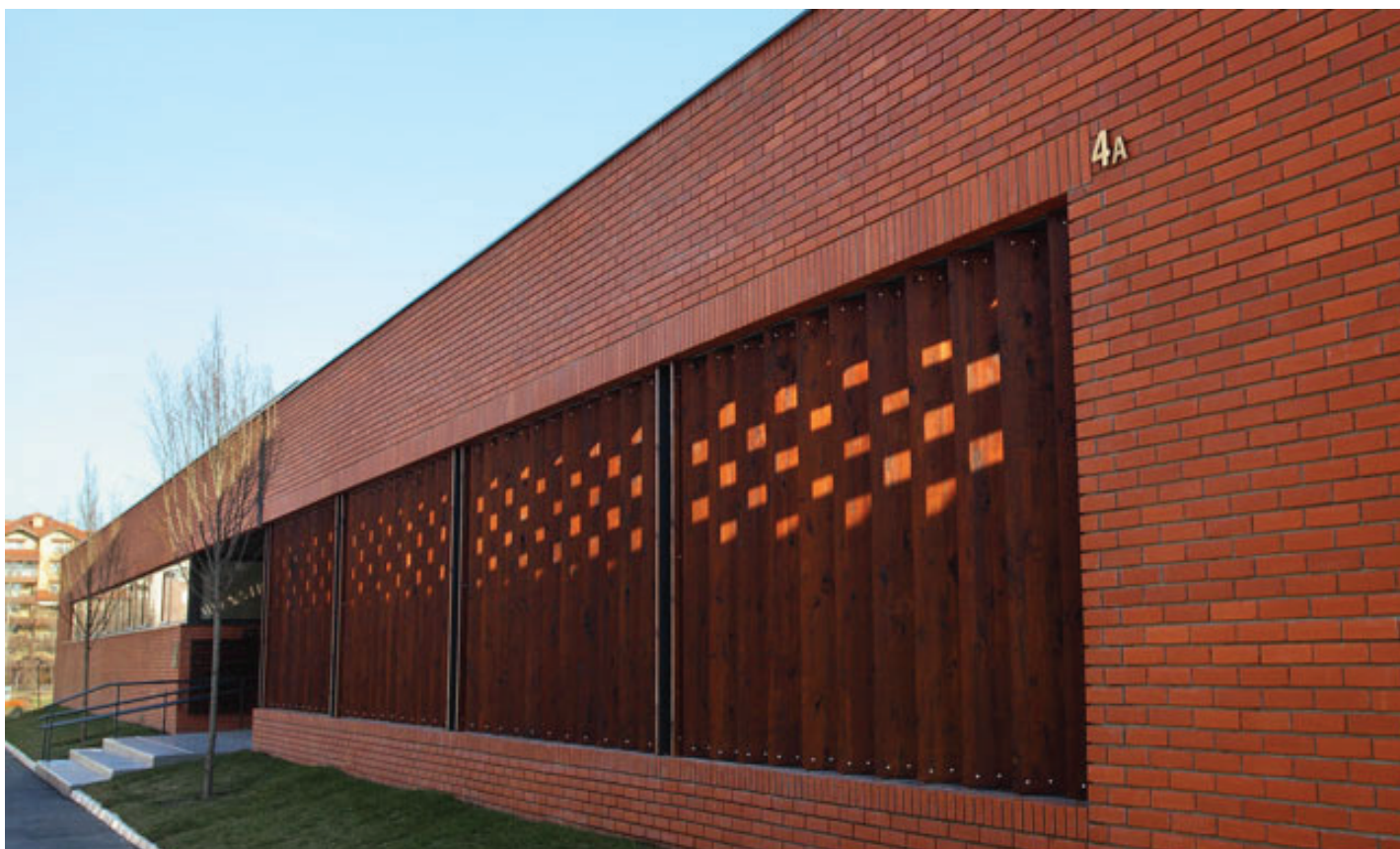


fig 18: Picture of the facade of the center „Sunde”



fig 19: Picture of the entrance of the center „ Sunce “



fig 20: Picture of the playground of the center „ Sunce “

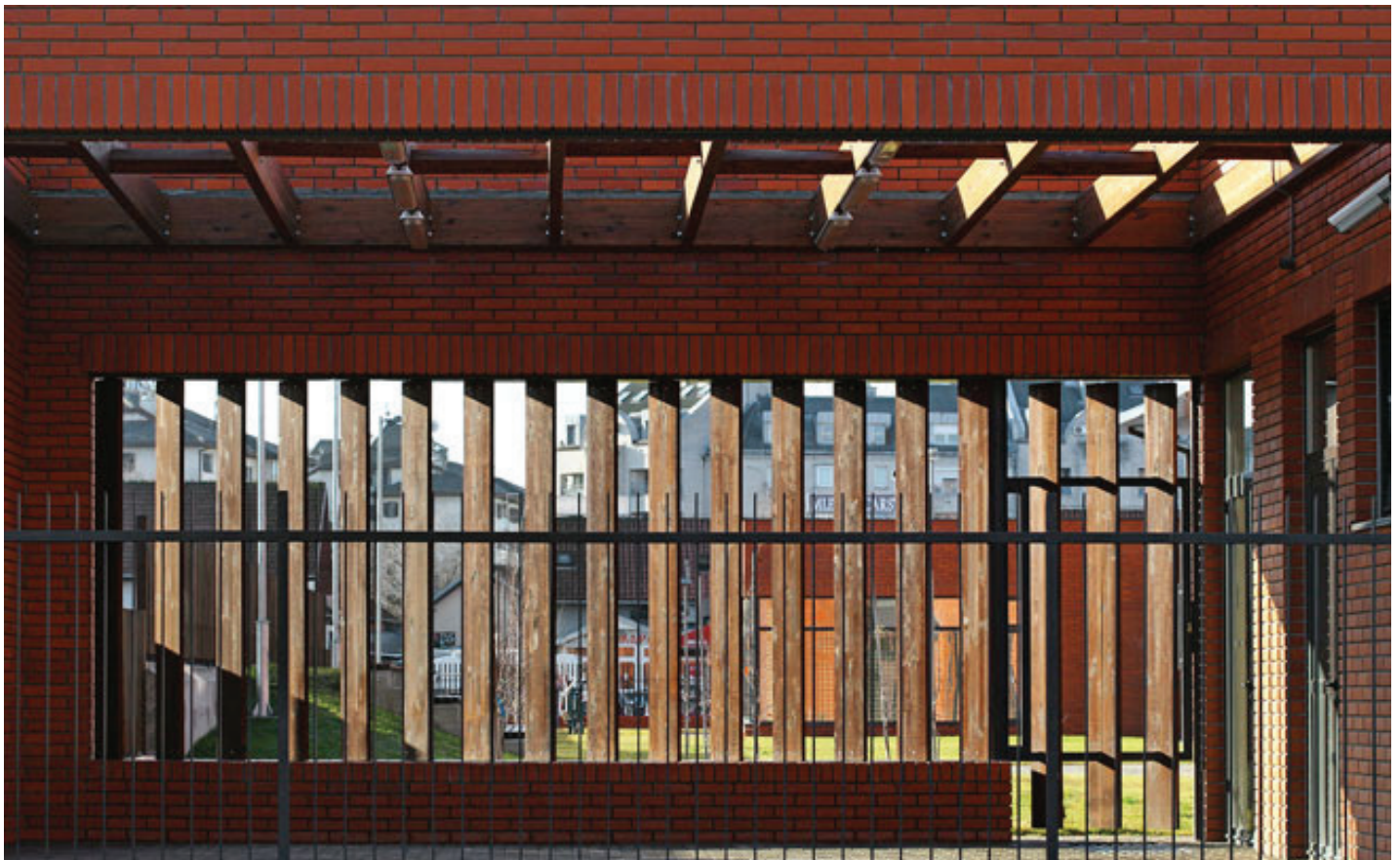


fig 21: Picture of the partition of the center „ Sunce “

Primeri iz prakse



Mogućnost formiranja malih vrtova svakako je stimulativan uticaj na razvoj dece i osoba sa hendikepom.



Kuhinja - sa prohranskim elementima /radi adekvatnog nivoa higijene/ i organizovana tako da korisnici doma mogu da uzmu aktivno učešće u sluzenju obroka



Poželjno je da trpezarija ima kontakt sa dvorštem



Umivaonik sa podesivom visinom korišćenja



Zone unutar učionica /preslačenje, učenje, vežba/



Preslačenje na sklopivom stolu uz elemente za otpatke



Slobodan prostor-neopterećen nameštajem olakšava realizaciju raznovrsnih nastavnih programa



Ulazni hol sa čekaonicom



Adekvatna visina pultova kako bi osobe iza pulta delovale pristupačno



Simboli za označavanje namene prostorija

fig 22: Picture of nterior activities in center „ Sunce “

© ateljeal 2010

Design Home for Children with Autism Near Copenhagen

CREO ARKITEKTER A/S and JAJA architects have won a competition to design a new home for Children with Autism near Hareskoven, one of the large forests near Copenhagen. The project will be the future home for eighteen children, ranging in age up to 18 years old.

“The proposal creates an inviting and intimate atmosphere that makes it feel like home... It fulfills all our aspirations in creating a model of future homes for children with special needs,” commented the jury.

Here, the main activity room is located, designed with two skylights to provide indirect lighting and additional headroom for various sports and play. The larger room is bordered by smaller niches, housing a collection special functions such as sensory and creative workshops.

Along both sides of the courtyard are further connections to housing development. The movement along the courtyard gives residents a beautiful experience to the green surroundings, and also acts the main point of orientation in the building.

This case study is a good example of the concept. An atmosphere that is achieved through materialization, the use of natural materials and a large amount of natural light.



fig 23: Active room for children with autism



fig 24: library for people with autism

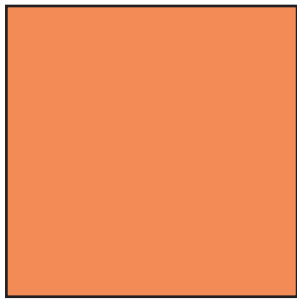


fig 25: communal area for people with autism



fig 26: Garden design for people with autism

2.3. Interviewees



Jovana Ivkovic

Special educator for people
with autism

How does the environment affects the health and wellbeing of people with autism?

In the experience of working with people with autism, I am able to notice their diversity and the variety of needs they have. However, the main goal and motive of working with this population is their independence. Therapeutic work can achieve a great deal in working with them in different fields. However, environment in which they reside can greatly contribute to this end. People with autism differ from the general population in the first place in how much attention they can pay to the details that surround them, which designers should keep in mind.

The people I work with mostly like bright rooms without much unnecessary detail and noise. They enjoy looking at themselves in the mirrors, listening to the gurgle of the water or the music they love, but their diversity must also be borne in mind. There should be a place where they can go if they become anxious, whether it is a swing or a corner of a room with pillows of different textures. If this is taken into account and their possible frustrations in the environment are minimized, they have every chance of living an independent life where they will be fulfilled and able to progress steadily.

How does the environment affects the health and wellbeing of people with autism?

In the experience of working with people with autism, I am able to notice their diversity and the variety of needs they have. However, the main goal and motive of working with this population is their independence.

Therapeutic work can achieve a great deal in working with them in different fields, however, and the environment in which they reside can greatly contribute to this end. People with autism differ from the general population in the first place in how much attention they can pay to the details that surround them, which designers should keep in mind. The people I work with mostly like bright rooms without much unnecessary detail and noise. They enjoy looking at themselves in the mirrors, listening to the gurgle of the water or the music they love, but their diversity must also be borne in mind. There should be a place where they can go if they become anxious or anxious, whether it is a swing or a corner of a room with pillows of different textures. If this is taken into account and their possible frustrations in the environment are minimized, they have every chance of living an independent life where they will be fulfilled and able to progress steadily.



Person 1

33 years old

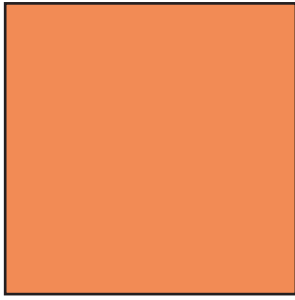
Currently living in center for people with disabilities

Person one is 33 years old man who lives with his parents. He feels safe in his home but his parents become worried about his future as they get older. In addition, they have been searching for alternative solutions for several years. Finally this year he moved into an individual flat in a new supported-living residence.

He brought his favorite furniture with him and took part in choosing the colors that would add to his room.

He loves church music, and favourite song he loves to play when he become upset.

He went through a difficult period, which was accompanied by challenging behavior, but with the help of special educators and his family, he was able to progress and eventually become independent. And even he doesn't like change, getting out of his routine has adapted to the new space he currently lives in. It has the help of expert persons every day and that is why he feels safe. He is employed by a factory that produces newspapers.



Person 2

26 years old

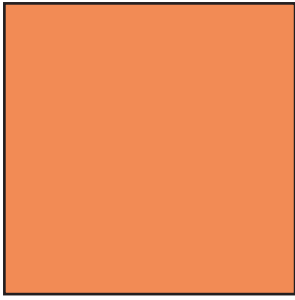
Currently living with parents

26 year old woman with Asperger's syndrome.

She lives in a center with for people with disabilities . She has her own room where she feels comfortable. She wanted to become independent so this was the only option they had at that moment.

She says that although she enjoys progressing as an independent person, she feels that her old room in the family home was more comfortable and warm. Other rooms in the center of residence are also sterile. She hopes that in the future she will be able to live in an apartment that she will decorate according to her personality. Loves full of colors and light.

She is very sensitive to sound and has perfect pitch. She may decide to wait outside a shop if it is noisy. Car engines left running and fans are a source of stress but she can manage her own vacuum cleaner and uses this daily to clean the house.



Architect Predrag Milutinovic

Studio Mapa

Planner of numerous architectural solutions, Predrag has the opportunity to do a project for people with disabilities. He received the Architectural Solutions Award for this project, but he says the smiles of the center's users and the gratitude of parents are the biggest awards.

1. What is the main focus when it comes to designing an environment for this specific circle of people?

Needs as such, but not entirely utilitarian. Design must follow and complete the design as required. The needs of this user group are not special, but different. They want socialization and belonging, and according to their solutions and approach, space should be adapted and the use and daily responsibilities facilitated. They have the same needs as everyone else, only with more restrictions that we should try to adjust and help them overcome ...

2. What are some tips you would like to give to colleagues who want to work on similar architectural designs?

The advice is to listen, not to have the morals or the need to be better than them and to understand them more than ourselves ... facing the problem and simply thinking that comes from basic principles and basic needs that adapt to the user's conditions. All people have the same need for joy, laughter, a life worthy of man. It is a skill to be aware of others, social empathy is a rarity in the present day....

2.4. Autism and the Environment

Dr Leo Kanner (1943) and Dr Hans Asperger (1944) formed the basis for our understanding of autism and the springboard from which research in autism has grown and evolved. In 1944, one year after Kanners paper, Hans Asperger described children that he also called 'autistic', but who seemed to have high non-verbal intelligence quotients and who used a large vocabulary appropriately. Confusion remains about the distinction between Asperger syndrome and high-functioning autism.

Kanner's observations of the children are filtered through their preoccupation and direct engagement with the unintended affordance of the physical environment and things within it, rather than the persons present, for example, spinning objects, ripping paper, and placing books into the toilet. While the things in Kanner's office were a source of interest and entertainment for the children, parents also reported on how some things within the environment can also cause distress, for example, tricycles, dogs barking, and planes.

Fit in

According to Gibson, the physical environment generates action opportunities and an affordance is the 'fit' between a person and the environment, which then creates opportunities for actions, whether good or bad. It is therefore the 'fit' that determines these opportunities for actions and if the affordance is not compatible with a person's capabilities, they may find it hard to 'fit in' with their environment. This is a key concept for designers, where exploring the 'fit' between the capabilities of a person with the environment that they inhabit is an important part of design activity.

It is the perception of a human environment with its layers of specifically human affordances that allows us to behave in human ways. It is also this complex set of transactions with the environment that looks to us like human behaviour.



fig 27: Picture of Leo Kanner- first scientist who clearly define autism

A person who fails to perceive the specifically human affordances of the environment will therefore exhibit behaviour that will seem strange, disturbing or even inhuman to us.

Whether autistic or not, individuals all share and live in the same multi-sensorial embodied world. The environment is furnished with designed objects whose sensory properties and affordances influence what we do and how we feel and behave. Design does not only result in form and function, it also results in feelings, affecting our state of wellbeing.

Feelings are connected to our senses, which enable us to experience and respond to our environment, which can be very different from one person to the next. To create a better fit and enhance our levels of wellbeing we continually control, modify, and adjust ourselves to the environment, by designing, adapting, repurposing, and signifying new affordances. For example, to feel happy and energised we may turn the music up and dance and to feel more comfortable we may choose to sit in a no-mobile-phone 'quiet' carriage on a train. But imagine if you had no or little control. Imagine if a sound became intolerably loud but you were unable to turn it down, or the light too bright but you were unable to switch it off. This situation can be the case for many people with autism, whose experiences and perceptions of the physical environment are individual and unique.

Affordances are the key mechanism that designers use to trigger understanding and action in others. As studies show that autistic people appear to have a different use/understanding for affordances, this means it is important to develop different design methods and empathic understandings.



fig 28: Picture Hans Asperger

Growth and Progress

In order to improve the quality of life of people with autism, their parents as well as professionals working on their advancement should give them as much opportunity to make their own choices.

For example, doing housework, washing dishes or preparing the food they want.

In this way, a person with autism becomes connected to their environment and feels the purpose of their lives.

However, a wide variety of options can create confusion and ambiguity for these individuals that they hardly handle. This leads to anxiety or increased anxiety.

So the goal is to create an environment that does not give too much opportunity, that the functions of the elements in the interior be clear but also that they can be variable according to the needs of the residents. Considering the individuality of each person, the environment should be such that they can express all their particular interests and thus gain motivation and confidence. So in order for a person with autism to thrive, they need to feel at home in the space, and this calmness allows them to discover how they want to live.

Improving the relationship between autistic people and the environment, these aspects can be improved:

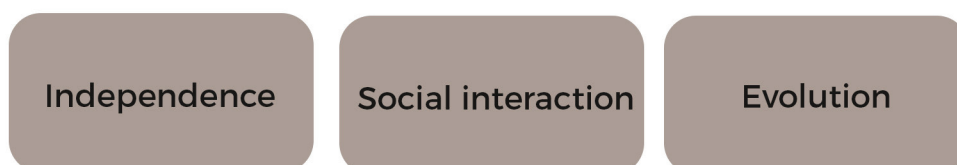


fig 29. aspects to be improved/ independence, social interaction, evolution

Causes

People with autism may be prone to unusual behaviors and reactions when they become upset.

Even ordinary daily activities can have a lasting effect on your condition. Such reactions cause communication problems and sensory anomalies that characterize people on this spectrum.

For characteristics to create a problem when stimulating the environment. These unpleasant reactions can be minimized by the design flair of interior elements.

Residents may have a negative or positive reaction to the presence of certain elements, textural colors, sounds or light. However, these triggers differ from approval to people, so it is very important to know well the needs of each resident.

Also, the size of the space has an impact on the condition of the people, if there are more people in the room that can cause anxiety in people who then wants to isolate themselves

Improving the relationship between autistic people and the environment, these aspects can be improved:

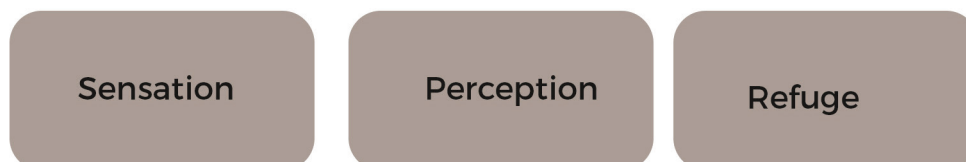


fig 30: aspects to be improved/ sensation, perception refuge

Strength

Unexpected movements are also one of the problems, because they do not have a sense of fear and danger in space as well as insensitivity to high or low temperature.

These characteristics are a significant risk for people with autism, so it is important to take precautions against potential harm. Solution options are sponge-lined walls, however, they create the appearance of an institution that causes a negative reaction in people with autism and this can be a trigger for annexation behavior.

So the goal when designing is to create a balance between a safe space and a comfortable home atmosphere. People with autism can easily lose their self-esteem, so it is important to design an environment that will have the features of easy maintenance and repair. This will also be beneficial for professionals who work with these individuals as their daily activities will be simplified.

Improving the relationship between autistic people and the environment, these aspects can be improved:

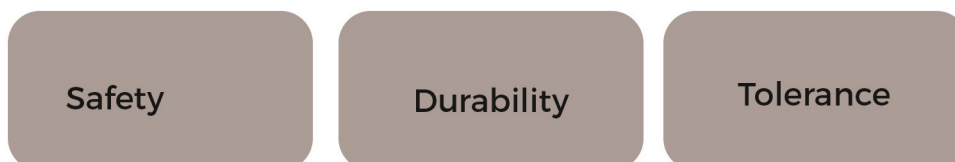


fig 31: aspects to be improved/ safety, durability, tolerance

Care Tools

People with autism have difficulty expressing their feelings and desires and understanding verbal and gestural communication. This has an impact on their relationship with their parents, friends and the people they interact with.

What can help overcome this problem and reduce the risk of discomfort may be the installation of non-verbal communication systems.

By incorporating these systems, communication between residents and staff can be simpler and more productive because people with autism can do the housework themselves instead of having employees do it for them. Thus, their need to be bused independently can be enhanced.

The most important advantage is that the residents do not feel as they are constantly being watched, and staff can monitor them from a distance.

Improving the relationship between autistic people and the environment, these aspects can be improved:

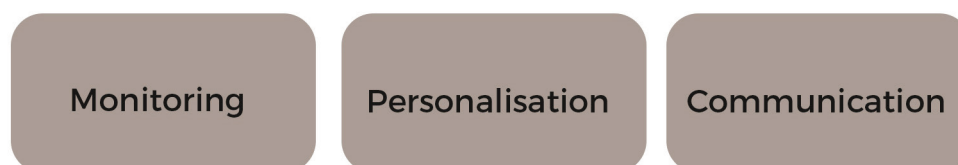


fig 32: aspects to be improved/ monitoring, personalization, communication

2.5. Evaluation of results

During my research, I came across problems that can be defined as the most prominent in people with autism. As noted above, sensory, social and spatial. These major groups are further divided

Sensory includes sound, visual, touch and smell

In spatial, layout and furnishing. And in social privacy.

By solving the given problems, a person with autism who acquires a routine will feel safer and more confident leading to the ultimate goal, which is independence.

So if you make a clear layout for person with autism, it will be easier for them to perform daily routine and therefore feel safer. This also applies to the other problems that are related to each other.



fig 33: evaluation of results graphic visualisation

3. Key findings

3.1. Problems

Through this research, I have come to the selection of the most frequent problems that people with autism encounter in their environment and are related to the interior phenomena that they experience differently.

3.1.1. Sensory

Hypersensitive children find themselves overloaded with even moderate levels of sensation, and work to block out sensory inputs such as light, sound and touch.

Hyposensitive children, on the other hand, are not stimulated enough by normal sensory inputs and typically seek out extra stimulation.

Sensory dysfunction is characterized by difficulties in the reception, processing, and integration of sensory stimuli, which result in unusual responses to sensory stimuli. The altered sensory response records that in a large number of people with autism spectrum disorder.

Sensory integration is an unconscious process that, through the perception, processing, interpretation and integration of stimuli, makes sense of information received from the body surface and enables a meaningful response to received information (Ayres & Robbins, 2005). Sensory integration disorders include disturbances of modulation, integration, organization, and discrimination of sensory stimuli. Interferences in one or more sensory processing domains interfere with daily functioning and condition atypical emotional and behavioral patterns (Gal, Dyck, & Passmore, 2010).

Altered sensory reactivity is reported in a large number of people with PSA, so Tomček and Dan (Tomček & Dunn, 2007) suggest that some 95% of children with PSA can be expected to experience some kind of sensory processing disorder between the ages of three and six.

A meta-analysis of 14 studies published between 1998 and 2007 shows that 80% of subjects with PSA have some form of sensory dysfunction (Ben-Sasson et al., 2009).

Sound

Certain sounds are particularly annoying to us all collectively. For many people, thinking of the sound of someone scraping their nails down a blackboard or the high-pitched squeal of microphone feedback can be excruciating to hear.

However, for people with autism, many of the everyday noises other people take for granted can be very painful and cause unwanted intrusions. For that reason noise could be one of the most important sensory challenge. According to Schrameijer (2013), out of six architectural characteristics, sound (acoustics) was marked by parents and teachers as the most influential, 64% - 79% of them (parents / teachers) ranked this characteristic the first spot.

The most important sources of interior noise are all sorts of installations (sounds like the ticking of heating elements and aircsystem) and electrical appliances(appliances like vacuum cleanser, dishwasher or laundry machine).

Noise from outside usually is traffic noise (airplanes, trams, trains) and environmental noise like barking dogs,

Visual

People with autism also have a problem processing information when it comes to perception. They can have stress reactions when it comes to the type of ambient light.



fig 34: barking dog

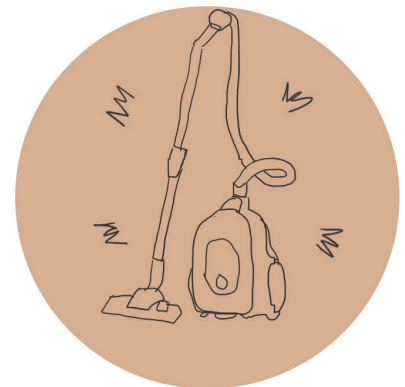


fig 35: sound of vacuum cleaner

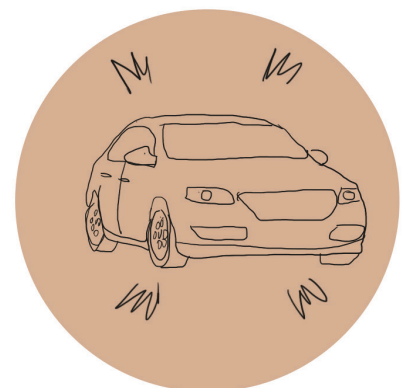


fig 36: traffic noise

So visual sensibility is also classified as a problem that needs to be addressed. It often happens that people with autism avoid eye contact with other people or can only see outlines of the object and other people.

In her book, *Nobody Nowhere*, Donna Williams says, "Colors and things and people would fly, doors would get kicked in and sometimes faces would, too. But it was never whole people, only their pieces."

Light

Research has shown that sunlight is very good when it comes to stress and depression, but with autism, it can be uncomfortable if you get a strong glare, seflexia or a warming surface. (van Dijk, 2013)

Problems when the sun is behind can also be caused by street lamps, car headlights or fluo light in the environment. (Visser (5), 2008).

When it comes to darkness and artificial lighting in people with this problem, insomnia occurs if the room is not completely dark, large windows that do not have adequate curtains can cause the light coming from outside or from other rooms.

Touch

Many people on the spectrum are over or under sensitive to pain.

Children who are hypersensitive to touch sensations may tantrum when they are touched, while hyposensitive children may crave and seek out strong hugs that provide deep pressure.

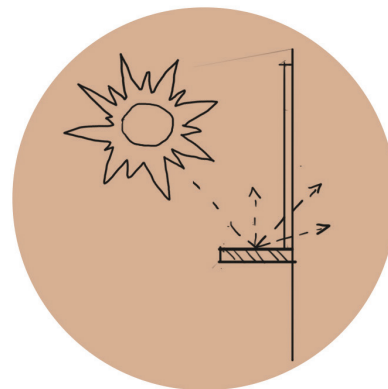


fig 37: glare and efections

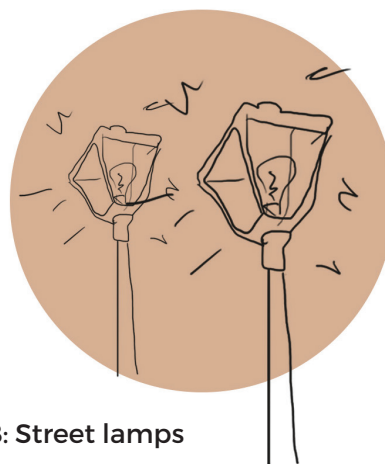


fig 38: Street lamps

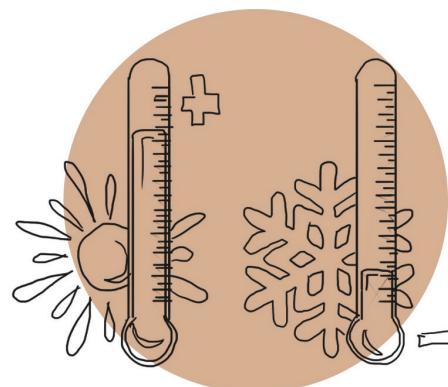


fig 39: temperature sensitive

Children with high pain tolerances may injure themselves quite significantly but carry on as though nothing has happened, while oversensitive children may find simple touches or textures to be intolerable. They can perceive temperature different than normal people, so they are temperature sensitive.

(For example objects made from metal could trigger electroshocks in winter) therefore, it is good to avoid cold and rough materials in the interior.

Smell

The sense of smell is important because it directs us to different memories, but it also helps to orient ourselves in the space, for example, in which direction the kitchen, dressing room and the like.

It also causes different sensations. The scent of nature can cause a state of peace, while the excessive smells and smells of food of high intensity can cause a negative reaction of people with autism.

It is therefore important that the premises and the activities performed therein are not interfered with.

Colour

Dr. Albert Styne's research showed that rooms painted in cool colours resulted in spaces that seemed larger, quieter, and cooler (figure 45).

A room with warm colours resulted in a more active space that seemed smaller, warmer, and louder (Gaines, 2016).

In a study of the Minnesota State University, exposure to red causes the heart to beat faster and increases feelings of stress (figure 46).

In contrast, blue causes the pulse rate to slow, and the body temperature to lower (Kutchma, 2003). Pink is known to cause the suppression of aggressive behaviour in prisoners (Gaines, 2016).



fig 40: Kitchen smells

It is further suggested that autism-friendly designs generally incorporate unsaturated, light earth tones with only small, contained areas of bright color (Mostafa, 2014; Beek (8), 2009). Bright or dark colours in furnishings were often considered too bright or too dark by the 150 people who filled out the questionnaire set up by Visser & Verheij (2008).

3.1.2. Social

Privacy

The problem with privacy is that people with autism often feel unsafe in the space, afraid that someone will maybe break into the house.

Temple Grandin (2010) explains: “all of us need a private space. Autistic people need their secret places too, in which they can hide and retreat to their own world. After all, autism is a ‘withinness disability’, and autistic people need the security of their own hideaways”.

3.1.3. Spatial

Conservative estimates suggest that as many as 33% of individuals with ASD have brains that do not correctly process the visual information they receive. A survey conducted in 1994 by the Geneva Centre for Autism in Toronto, Canada, suggests these difficulties may be more common, finding that 81% of those on the autism spectrum reported distorted perception. The most common problems were difficulties with depth perception; distorted perception of size, shape, and motion; seeing only small details and not the whole; and visual overstimulation.

Environmental Distortions where the individual sees the world in a distorted fashion. Objects are blurry, moving, changing, and can disappear. People may look frightening, stairs may look like a slide without steps, and walls and floors may swing and sway.

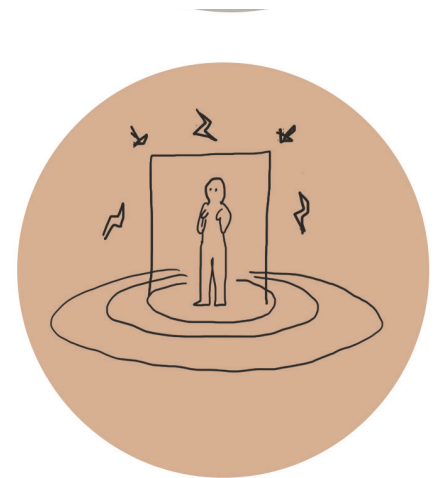


fig 41: insufficient private space

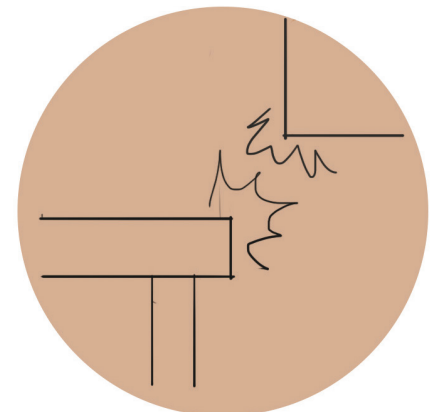


fig 42: sharp edges



fig 43: confusional layout

So it could be a problem for a person to perceive the right size of the space.

Another point about space is layout which creates unclarity routine.

As people have a problem with orientation in the space long corridors with too many doors of a different rooms could cause a annoyance. Also unlogical positions of the dress room, bedroom and bathroom for example can make a confusion in routine for people with autism and also a problem with finding a right way to get room they need and get lost in the space. (Ultee, 2009).

Furniture is a very important factor in the interior, however, most existing establishments are equipped with furniture that is uncomfortable and inadequate for the needs of people with autism. Sharp edges, uncomfortable materials and finishes, linoleum floors are what determine such interiors that give the impression of an institution. The rooms look empty and cold.

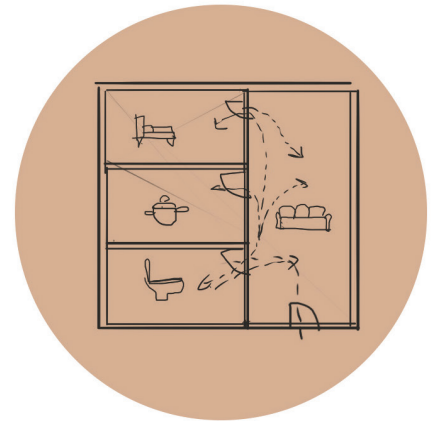


fig 44: unlogical routine

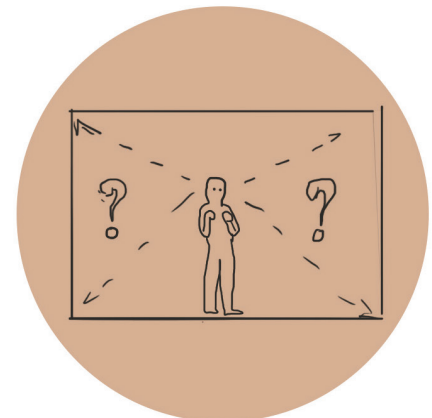


fig 45: space perception

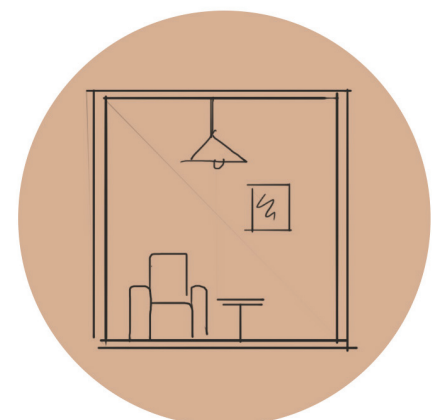


fig 46: scarce furnishings

3.2. Solutions

3.2.1. Sensory

Sound

The point is to reduce noise generally in the space. This problem can be solved by using traditional brick construction for the internal walls and insulated blocks for the exterior walls.

Using suspended ceilings, absorption materials, sound resistant plasterboard much more than we use it while designing normal house. For the floor we can use sound dampening carpeting or acoustic tiles.

There are many small simple solution which can have effect on the absorption of the noise in the house, like adding sliding doors instead of normal ones, or by adding felt pads under the furniture legs (chairs, tables.) we can minimize the scratching sound. Important is also connection of door and frame, double glazing on the window, ventilation grilles with sound attenuation.

The nuisance caused by electrical appliances could be decreased by placing these systems in insulated cabins.

Light

When it is about solving problems about light the most important is to make a balance between sufficient incoming daylight and the tendency of people with autism to avoid it.

There are many ways of achieving this for example adding shutters on the windows which allow to control the amount of sunlight entering the room, by lifting or lowering, the same could be done with artificial light in the room by adding dimmers in light switches, but make sure that they do not emit noise which can cause distraction and discomfort. So the person is allowed to make an atmosphere according to the emotional state.

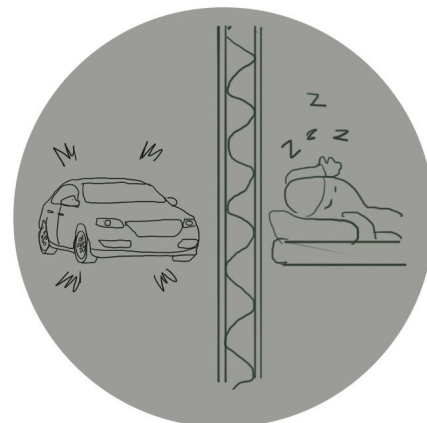


fig 47: good insulation

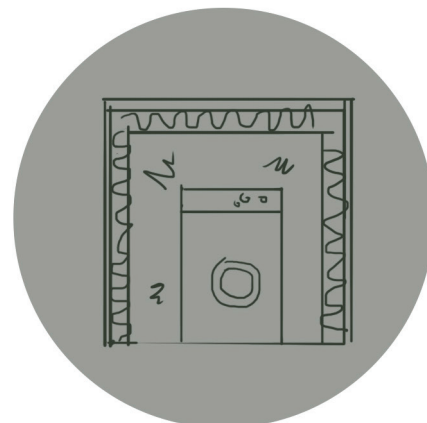


fig 48: insulated cabins

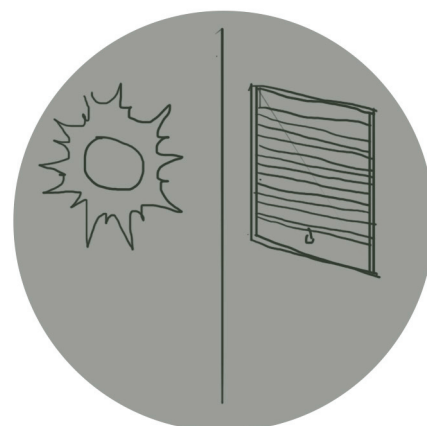


fig 49: blinds

Use matte finishes and light absorbing materials to prevent disturbing sunlight reflection. (van Dijk, 2013).

It is better to use indirect or recessed lighting and a variety of different light sources. Natural light should be available in all rooms.

Safety and security

- Avoid using high-heat tungsten and halogen lightbulbs.
- Use wet-area fittings on all portable lighting and wall outlets.
- Halls, stairs, and landings should be well-lit.
- Install day/night activated exterior lighting at doors and in yard; motion activated lighting may be startling to some individuals .
- Bathrooms should have bright, uniform, shadow-free light and include mirror and shaving lights.
- Rooms should have overhead, recessed lighting as well as task lighting.
- Include light fixtures in closets for accessibility and to minimize resident frustration.
- In kitchens, provide lighting under cabinets and overhead recessed lighting.

Colour

Concerning colours, peaceful colours are advised, but the Kannerhuis suggests that perception of colour is too individual. But it is recommended to use muted, matt and harmonious colour schemes in communal areas and consult residents on their colour preferences for private spaces. Avoid strongly reflecting colours. Green, blue and white are advisable and pastel palette.

It is also recommended to use a colour contrast to highlight functional features. That helps to give a space visual identity and placing feature objects as a landmark to help residents to orientate themselves.

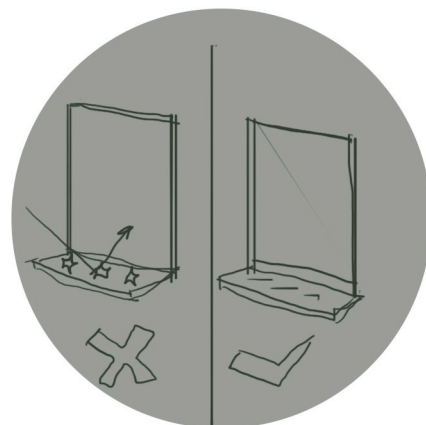


fig 50: matte finishes

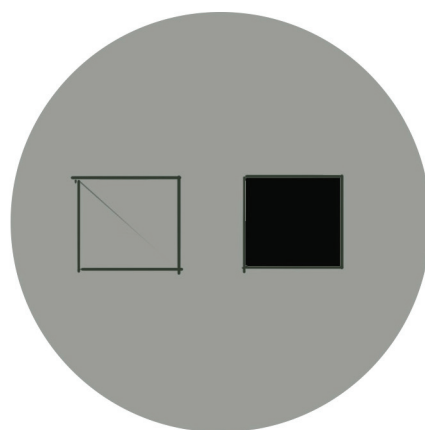


fig 51: avoid big contrasts

Colour expert Monique van Eeckhoud doesn't look at colours individually, but to the context in which colours are applied: the proportion to other colours, light, measurements, function of the room, windows and doors, walls, carpets and furnishing. Stark contrasts are discouraged (Schrameijer, 2013).

Materials and finishes

When is about materials it is important to select durable, nontoxic building materials and finishes.

To reduce distraction use non-reflective, matte materials with minimal details. For example geometric repetitive patterns can provoke excessive focused interest so organic non-repetitive patterns like natural wood could be better option.

Install finishes that are easily cleaned

Surfaces should be user-friendly and attractive, but nonabsorbent. When a person has open cuts, scrapes, blisters or burns there is a greater need to clean and disinfect surfaces and other materials on a daily basis.

Use of textured ceramic tile in the bathroom, kitchens, and laundry rooms. Prevent povredu owith this nonslip flooring.

Overall use materials thaht create a warm home environment rather than an institutonal atmosphere.

Smell

To prevent kitchen smells from spreading through other living areas, the kitchen should be separated (Gaines, 2016), see figure 82.

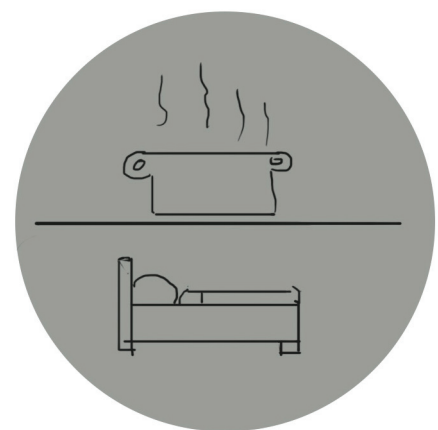


fig 52: separete kitchen

Additionally, purifying plants can be added to the living areas to filter the air. This might also add to the resident's development and self-esteem, since he or she also has to take care for these plants (Raanaas, 2011). Plants also have the quality to improve sleep and add to a sense of relaxation (Bringslimark, 2009),

3.2.2. Social

Privacy

It is very important to increase privacy and reduce anxiety .

Given the difficulties of responding to social presence, homes should have a variety of spaces where different types of social interaction can occur, allowing for resident choice, need, and ability.

As this project should be designed for more than one person there should be a variety of spaces where different types of social interaction can occur. This should allow resident to have a choice and by designing a small rooms which can give illusion of additional space where resident can be isolated if needed. Residents should have opportunity to manage social discomfort by having a common space to mix with other people and separate private places. This concept and idea that no one has access to a private space also help resident to control desired and undesired social interaction.

Another way to increase privacy is a design option of a deep niche for window, so when resident look outside still has a feeling of a protection.

Adding security system in the space is one of the most important factors for people with autism to feel safe as they can see on the monitor who is coming.

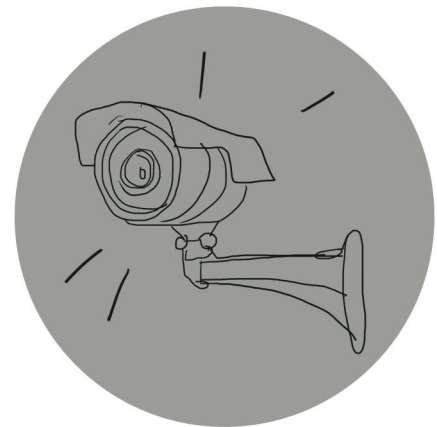


fig 53: safety systems

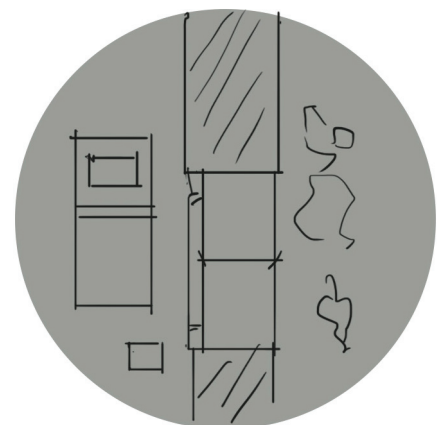


fig 54: deep window niches

Interaction

People with autism often have a problem about what is going on behind them or behind the walls in the house, it is a desire to have ability to be able to see into room before entering and have a maximum control of possible contact. This problem can be solved by adding transparent wholes(windows) next to the doors or in doors and by this providing transparency through space. This could be solved also by designing an open space concept but only in areas for the social interaction.

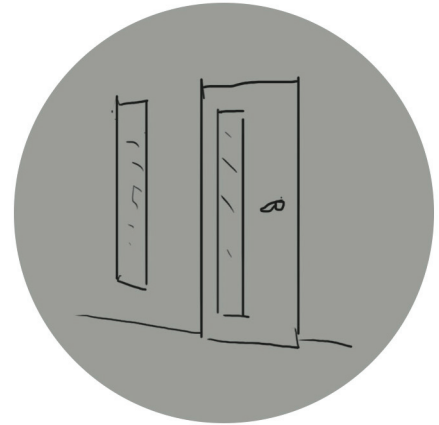


fig 55: preview before enterin the rom

3.2.3. Spatial

Layout and wayfinding

It is very important for the layout to be clear, simple with functional circulation routes which can lead to effective use of all household spaces.

Specify spaces according their primary function. For instance, this reinforces that a kitchen is for preparing food, dining room is for eating, bedroom is for sleeping, so the simple layout can minimize confusion.

For the communication areas it is recommend-ed to have more than one exits to give residents a choice and comfort to leave the space when they need.

Minimise blind corners in the space.

To reduce travel and make a logic layout connect rooms like kitchen and dinning area by making direct access between them, or connection between closet, sleeping area and bathroom. Laundry facilitates should be located as clothes doesn't have to be carried through food preparation or storage areas. This kind of layout allows people with autism to do similar activities easier and without stress.

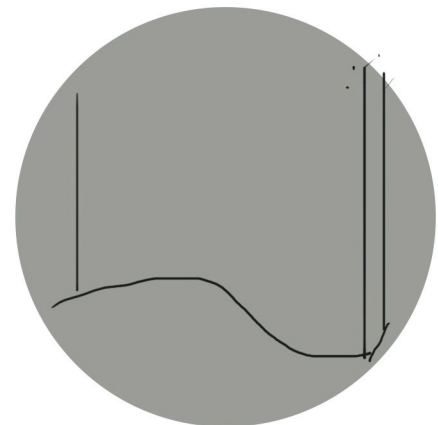


fig 56: curved walls

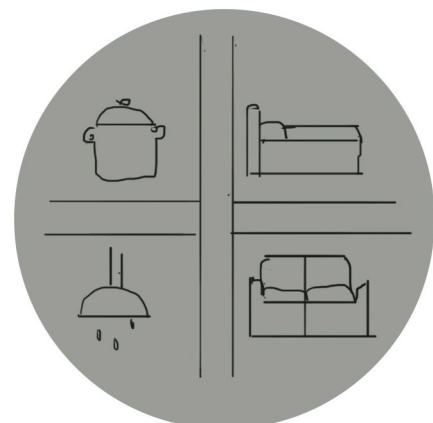


fig 57: separate finctions

To help this idea of understanding space and orientation it is good to change a material/color/texture of the room (wall color, flooring material) to indicate change of use. Also idea of a differences between living area and quiet private area can be achieved by changing atmosphere with for example cold or warm colors and separate this areas to minimize transmission of the noise.

Curvilinear design applied on the walls also helps with orientation problems. Residents can easily follow the route and hallway. This kind of space causes a person with autism to more easily follow the route given in the space and sharp corners can be avoided, which increases security of the residents.

Furnishing

Furniture is one of the main factors that dictates the atmosphere and circulation in space. Therefore, attention should be paid to it.

To avoid institution like kind of space it is important to use domestic, comfortable furnishing that is free of toxins and of gassing chemicals rather than furniture for special needs.

Overfurnishing should be avoided. Arrange furniture so that movement is not obstructed and use of furniture that is easy to move, self standing furniture rather than built-in furniture, so residents can adjust environment.

As individuals with Autism like to spin and swing it is good to provide some swing or other moving equipment which can make person to relax and get calm.

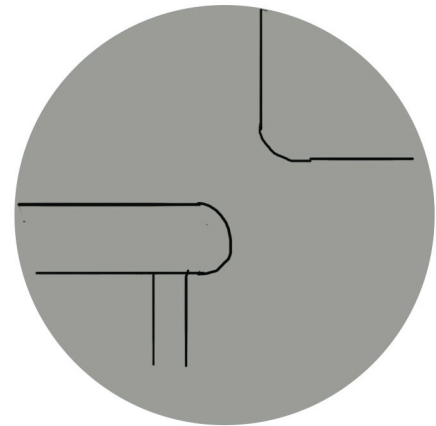


fig 58: no sharp edges

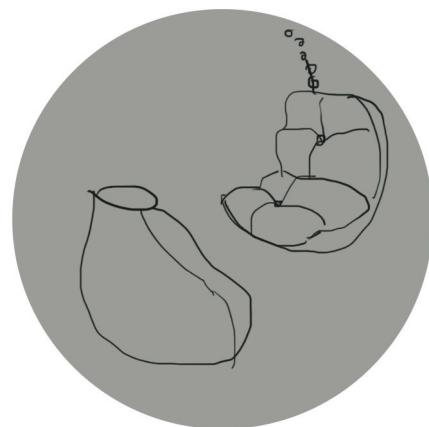


fig 59: comfortable seating

4. Design analysis

in this chapter, I will analyze already existing design solutions that might be suitable for people with autism.

Concerning sound, light and touch those are several examples which shows how sensory intervention can be done.

1. light that the user can regulate by touch. Made of comfortable material that gives a relaxing atmosphere to the interior. It may be a good solution for people with autism who may be interested in this, but there is also a possibility of preoccupation with this design, which can then cause a new problem.



fig 60: wall with light

2. For individuals, Heya creates a place for people to escape, think, and breathe. For groups, Heya creates a place for people to closely collaborate and connect. Heya's comfort and visual softness allow these small rooms to blend seamlessly into the office, while still providing the closeness and privacy people need to really focus.



fig. 61: privacy enhancing work spot

3. . Delayed flight? Not a problem in these amazing airports from around the world that are so good you might not even want to leave the terminal! An example of a private seating that can be also be adapted to the interior for the autistic person.



fig.62: privacy seating on the airports

4. 137kilo Architects + Beza Projekt have designed a excellent office space for pharmaceutical firm Bausch & Lomb in Warsaw, Poland.



fig 63: privacy enhancing couches

5. Jaja arhitects give an example of a good atmosphere with natural materials and natural light that emits throughout the big windows. But on the other had it would be better to have some blinds so that residents can cotnrole the amout of the light in the room according to thair needs.



fig 64: natural ligth and calmig atmosphere

6. Designed to control the acoustics of any grid ceiling environment, the peaks and valleys of EchoRidge ACT are shown here adding dimensional flair to this minimalistic office space.



fig 65: acoustic panels on the ceiling



fig 66: acoustic panels on the wall

7. An example of a interesting bed that loos like a cave, so that person with autism can have privacy and feels eaven more safe in his home.

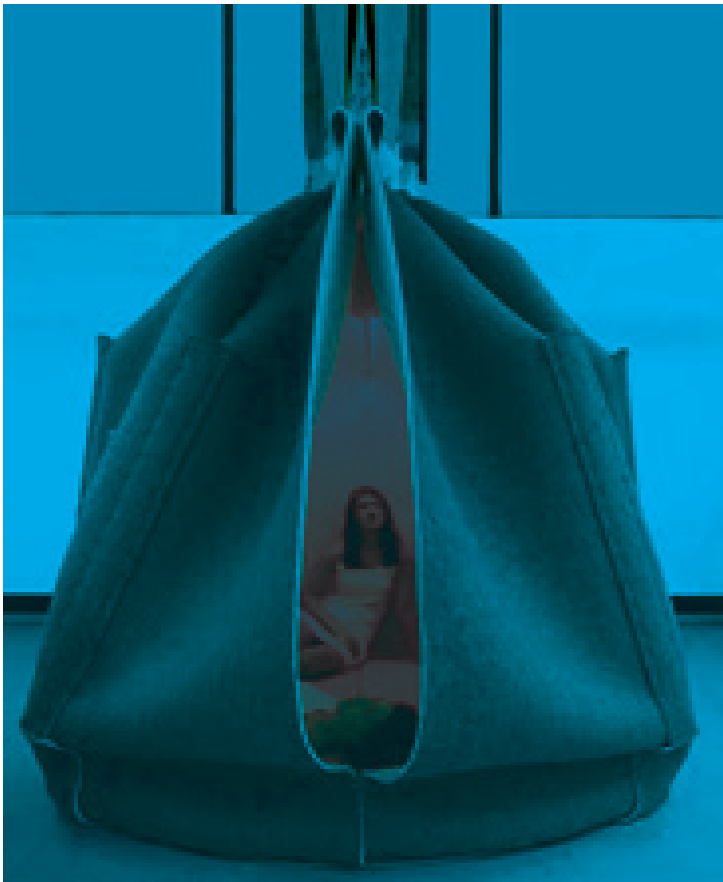


fig 67: Idea of a bed with total privacy

2.Troldtekt acoustic panels ensure a pleasant sound environment and contribute to a good indoor climate in a new, modern healthcare centre. See the building where acoustics, indoor climate and architecture go hand in hand.



fig 68: acoustic panels on teh ceiling in the halls

5. Design concept

In this section, I tend to introduce the concept of a 4-axis apartment with a diagnosis of high-functioning autism.

One of the main goals I wanted to achieve was a comfortable home atmosphere, since my research has come to the conclusion that the problem of existing architectural solutions is to look like institutions with a cold atmosphere.

Through this concept I tried to focus and give possible solutions to all the elements in the interior that have a negative impact on the development of people with autism.

5.1.Zoning

The space is divided into two parts - communication and private.

The communication part includes the rooms that all tenants share - the entrance part and the corridor, which further leads to the circulation space, the living room and the relaxation area as well as the kitchen, dining room, garden, laundry and toilet. The private part contains bedrooms with toilets - two single and one master room.

This division is determined both by the rooms used more by day and by those used at night so that persons with autism have better orientation in this area. This arrangement of the rooms is done in such a way as to make a clear routine, in terms of the order of use of the rooms.

There is also a separate guest toilet in the communication area so that the privacy of the household is fully respected.

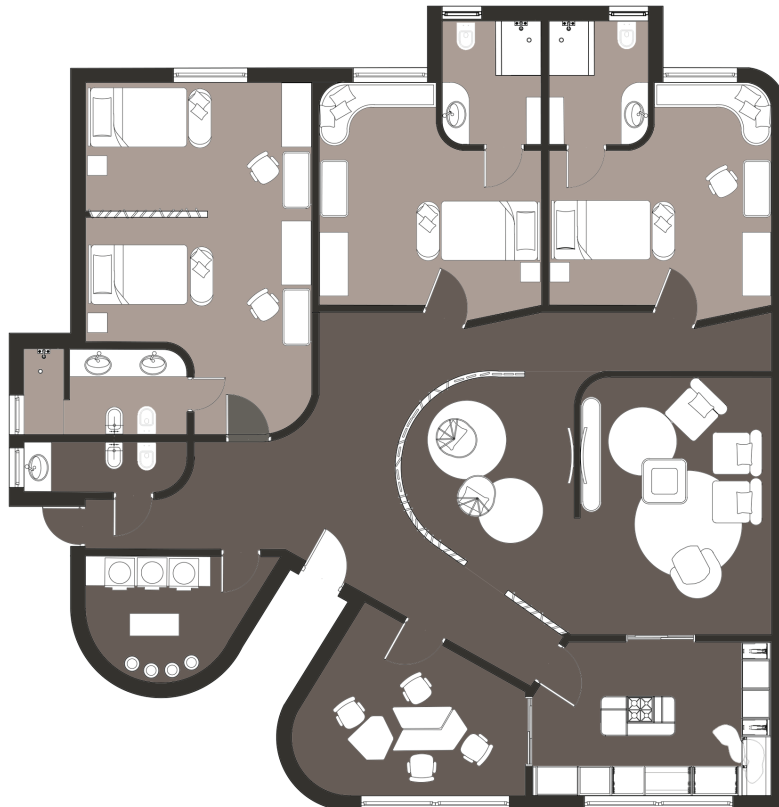


fig 69: zoning plan

5.2. Layout

The apartment layout is organized in such a way that clear routes are established. The main objective was to arrange the size and appearance of the rooms in the standard for its purpose. (kitchen for food preparation, dining room for eating and bedroom for sleeping).

The entrance to the apartment itself is made to look like a hallway, so the idea to make an impression of safety zone, which should provoke a positive reaction in people with autism.

After entering the house there is a corridor, it further leads into communal activity spaces and private zones. The measurement of the corridor is enough to pass people conveniently.

The communal zone is designed in such a way that it has two exits so that the residents have a choice in case of an unpleasant situation. It consists of a living room from which it directly leads to the garden, a relax area separated from the hallway by a partition with rotating elements and into a kitchen which is further connected to the dining room.

Other rooms that belong to this area, which all residents share, are the laundry room and guest toilet.

The other part of the corridor leads to a private zone. There are private rooms, two single and one master room that contain toilets to fully preserve privacy.

Plan

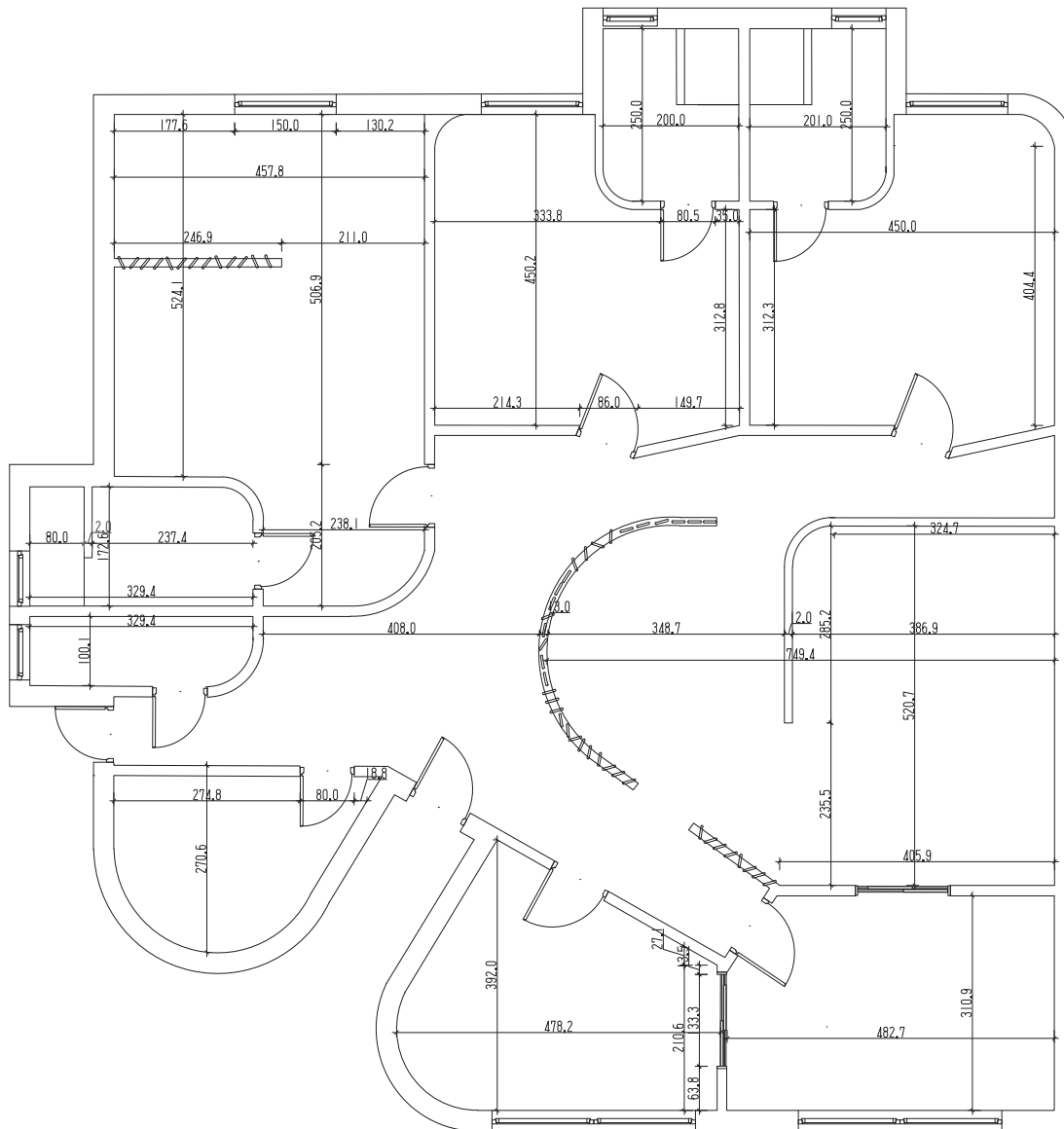


fig 70: plan with dimensions

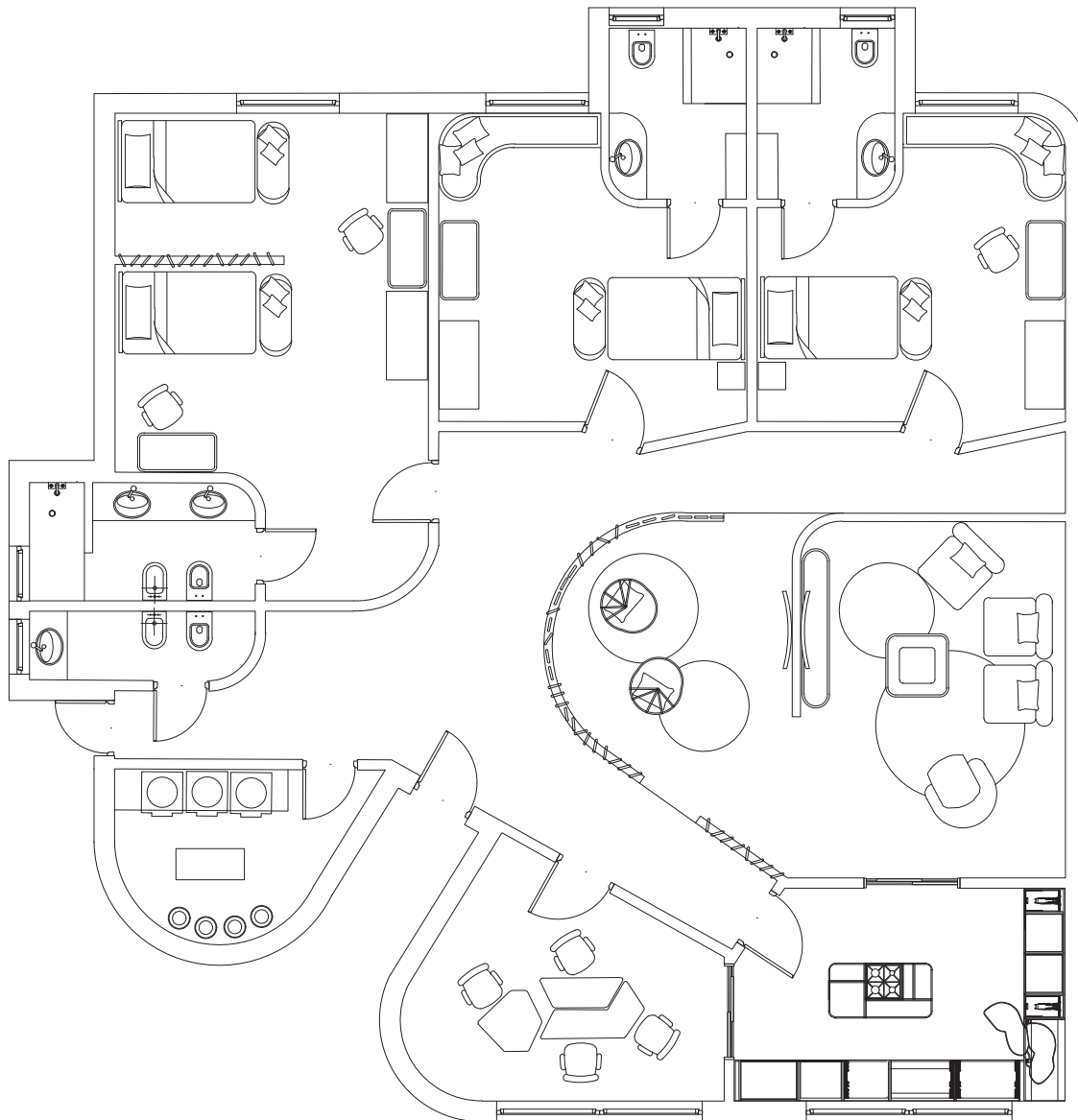


fig 71: furniture disposition plan

- 1 Front entrance space and hallway
- 2 Communal space (living room and relax area)
- 3 Dining room
- 4 Kitchen
- 5 Single rooms with bathroom
- 6 Single rooms with bathroom
- 7 Toalet
- 8 Loundry
- 9 Garden

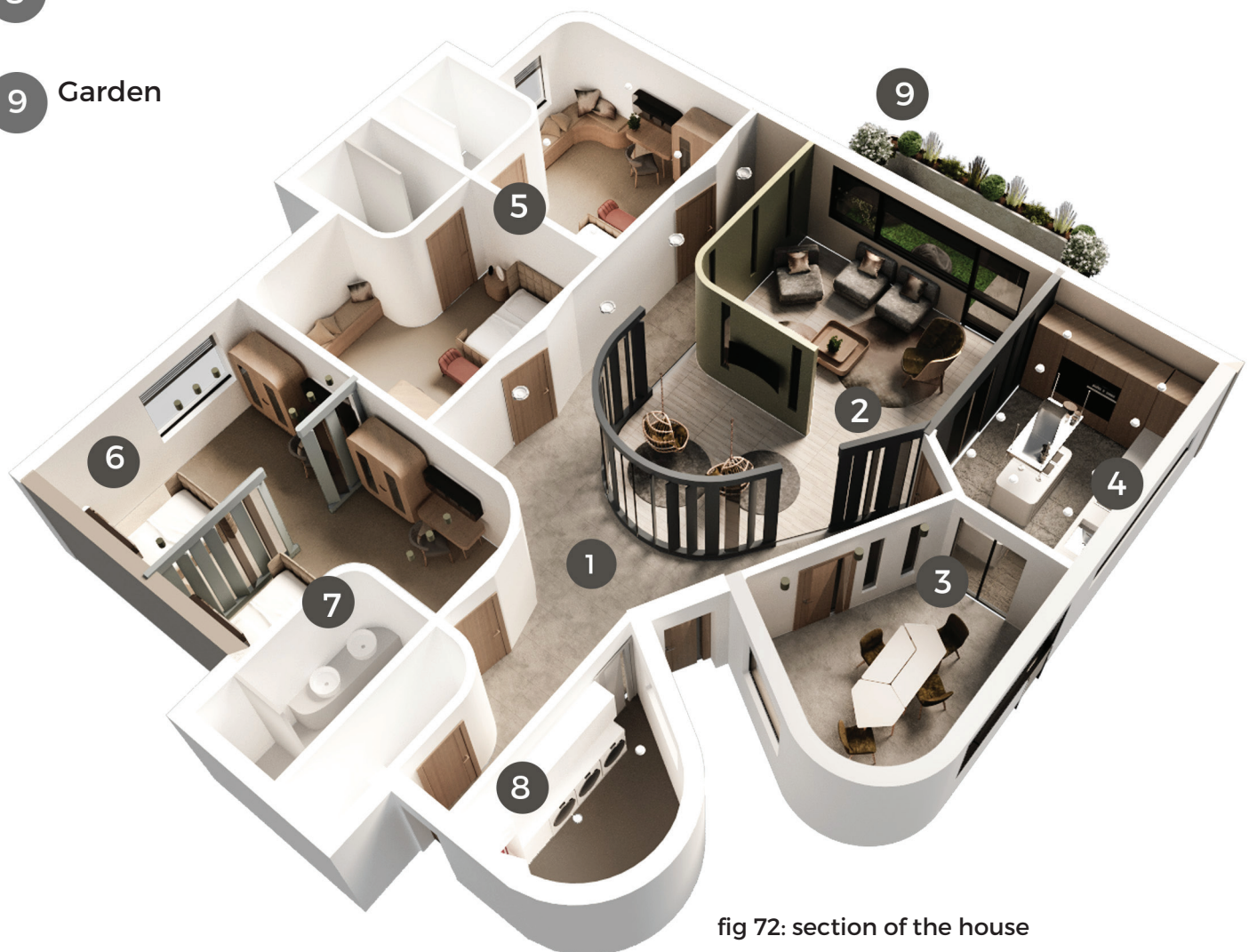


fig 72: section of the house

5.3. Communal area

The entrance door leads into the hall which leads to all other rooms.

The walls are curved and the ceiling contains ice light in strips that further determinate the line of movement in the space.

In central part there is a partition panel that allows atonovnicima to change the atmpsphere in the space. This is achieved by turning the plates which are rotating around their axis and thus releasin different amount of light into the relaxastion that contains two rocking chairs. This section contains several outpputs that help people with autism have freedom of movment. Behind the relax area there is a living room where the setis designed so that each member can separate and feel confortable. Alarge window emits enough natural light that can be controlled by rolling shutters that are lifted and lowered by the remote control. On the walls there are slots with built in semipermeable pleksilas.

Wc for guests is located closely to the communicational space.

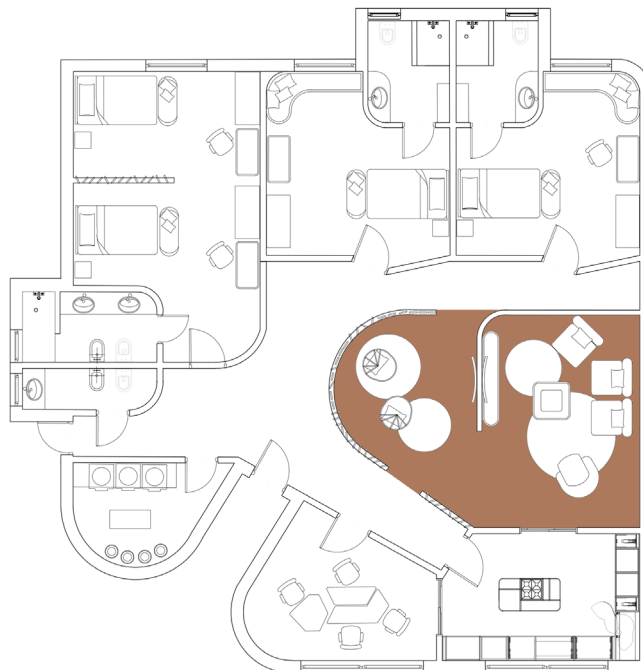


fig 73 : plan with marked communal area

5.3.1. Relax area



fig. 74: 3d visualisation of relax area, view 1



fig. 75: 3d visualisation of relax area, view 2

5.3.2. Living room



fig. 76: 3d visualisation of living room, view 1



fig 77: 3d visualisation of living room, view 2

5.3.3.Kitchen

Because of the smell and sounds, the kitchen is partitioned and well insulated.

The window is positioned 180 cm from the floor so that the outside environment can not attract the attention of the household, and also through it enters a decent amount of natural light needed to work in the kitchen. All appliances react cold to touch in order to avoid unpleasant situations such as burns. The appliances are installed so that more people can use kitchen at same time. In the middle there is an island as an additional useful area where trash can is located for recycling option.

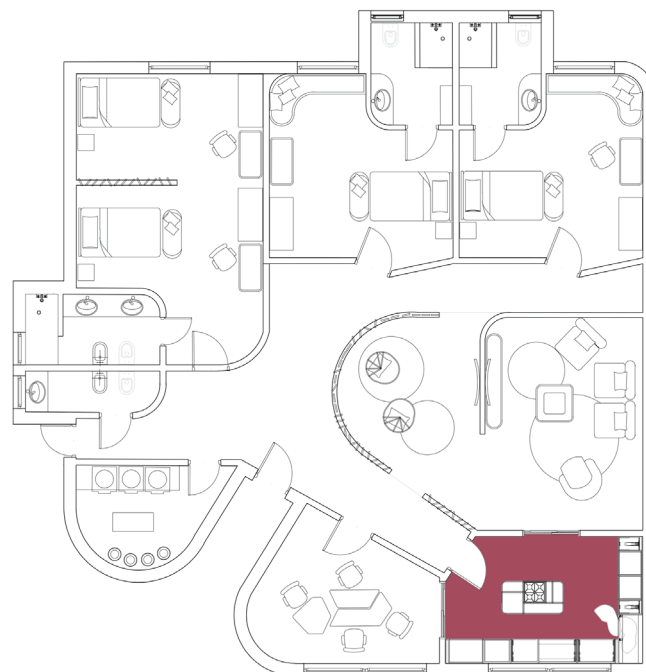


fig 78: plan with marked kitchen



Corona Renderer | Intel(R) Core(TM) i7-8750H CPU @ 2.20GHz | Mem: 1.13.34 | Passes: 43 | Primitives: 19,810,593 | Rays: 2,854,667

fig. 79: 3d visualisation of kitchen, view 1



fig. 80: 3d visualisation of kitchen, view 2

Corona Renderer | Intel(R) Core(TM) i7-8750H CPU @ 2.20GHz | Time: 4.05.04 | Resources: 119 | Primitives: 19,810,533 | Rays/tr: 2,385,98

5.3.4. Dining room

As in most rooms in the dinning room, acustic panels are installed in the ceiling.

On the floor there are ceramic tiles tthat make easy to maintain cleanliness of space. Tere is also possibility of changing the amount of light in the room by lowering the blinds. The table is designed so that it can be easily divided into 3 separate parts to meet the need for a person with autism to be isolated if necessary. Dinning room si connected to the kitchen with sliding transparent door, and another door with semi-fhinished part leads to the haalway.

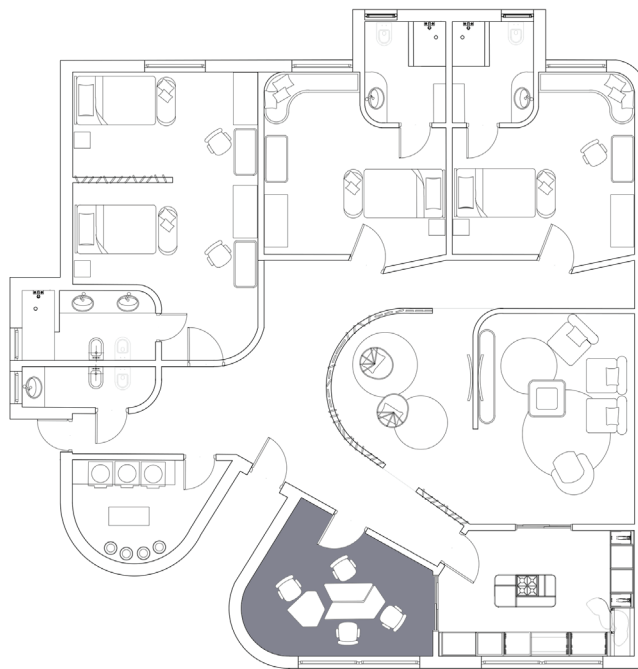


fig. 81: plan with marked dining room



fig. 82: 3d visualisation of dining room, view 1



fig. 83: 3d visualisation of dining room, view 2

5.3.5. Laundry

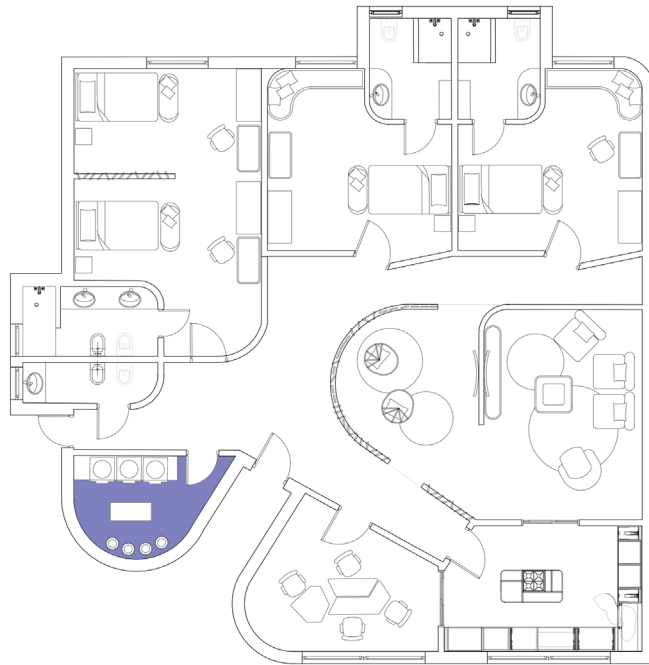


fig. 84: plan with marked laundry room



Corona Renderer | Intel(R) Core(TM) i7-8750H CPU @ 2.20GHz | Time: 0:33:37 | Passes: 21 | Primitives: 18,853,817 | Rays/sh: 3,380,872

fig. 85: 3d visualisation of laundry room

5.4.Private zone

The apartment has two single rooms that are designed to provide intimacy and comfort. The window with roller shutter controlled by remote control and dimmer lighting are provided.

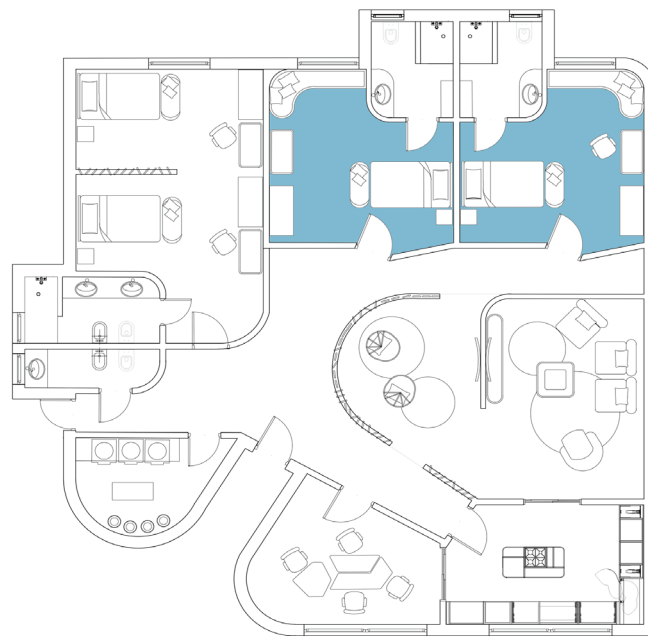


fig. 86: plan with marked single rooms

5.4.1. Single room



fig. 87: 3d visualisation of sigle rooms, view 1



fig. 88: 3d visualisation of sigle rooms, view 2

Corona Renderer | Intel(R) Core(TM) i7-8750H CPU @ 2.20GHz | Time: 0:56:34 | Passes: 45 | Primitives: 18,488,282 | Raytr: 3,526,647

5.4.2. Master room

Master room has the same characteristics as single rooms. In this room, the intimacy for both members is achieved by panels between the beds with rotating plates. Due to the fact that every person with autism has his or her needs when it comes to decorating the space, the private part of this apartment is solved so that each person has the space to influence his or her own appearance. For that reason all furniture pieces are moveable. Also, most of the walls are not treated so that the future resident can decorate them according to their wishes.

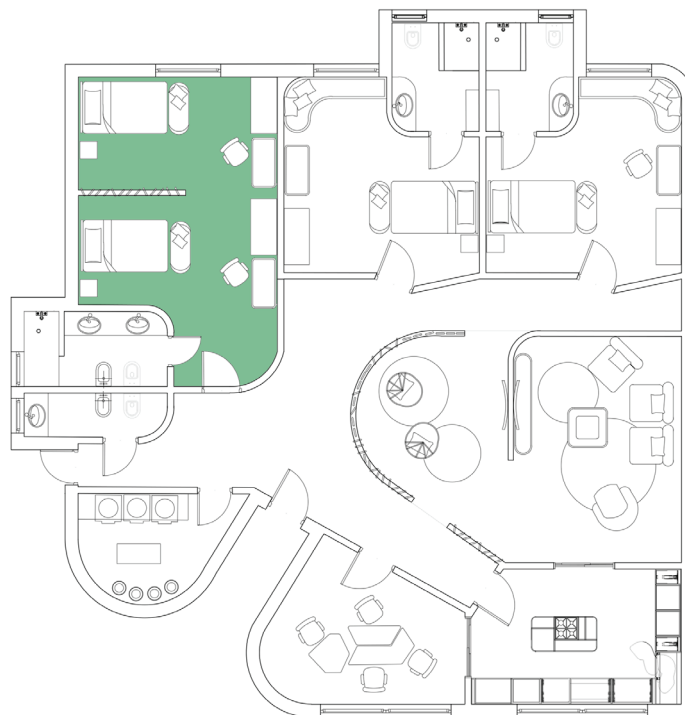


fig. 89: plan with marked master room



fig. 90: 3d visualisation of master room, view 1



fig. 91: 3d visualisation of master room, view 2

5.4.3. Bathroom

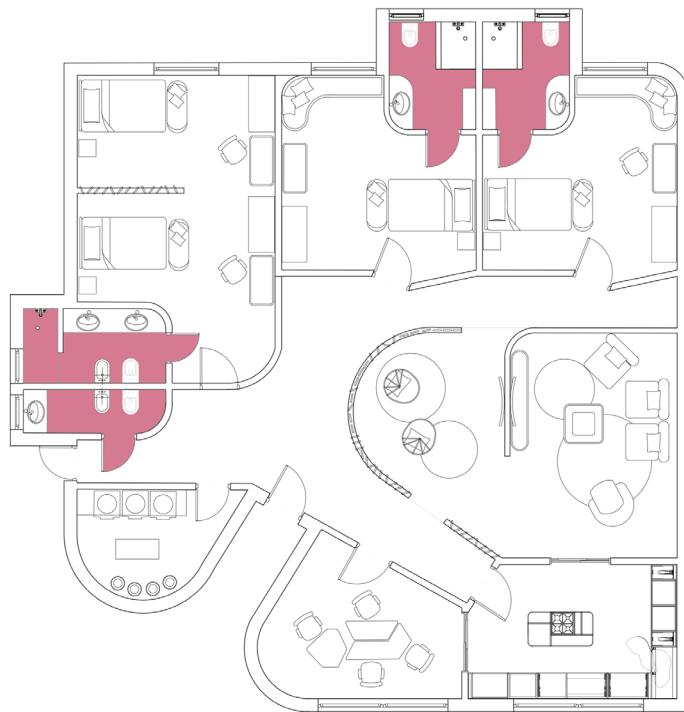


fig. 92: plan with marked master room



fig. 93: 3d visualisation of bathroom

5.5. Garden

Literature finds that colour, visual texture, form, movement, light, and shadow stimulate the sense of sight. Different colours can promote activity or have a soothing effect. Warm colours like red, orange and yellow have this promoting effect, while cool colours like blue, purple, and white, have a tranquil effect (Shaikh, 2017), see figures 106 and 107. Roses are a great feature, but make sure they are placed away from the paths, prickly thorns might stimulate the touch a little too much (Planet Natural, 2017).

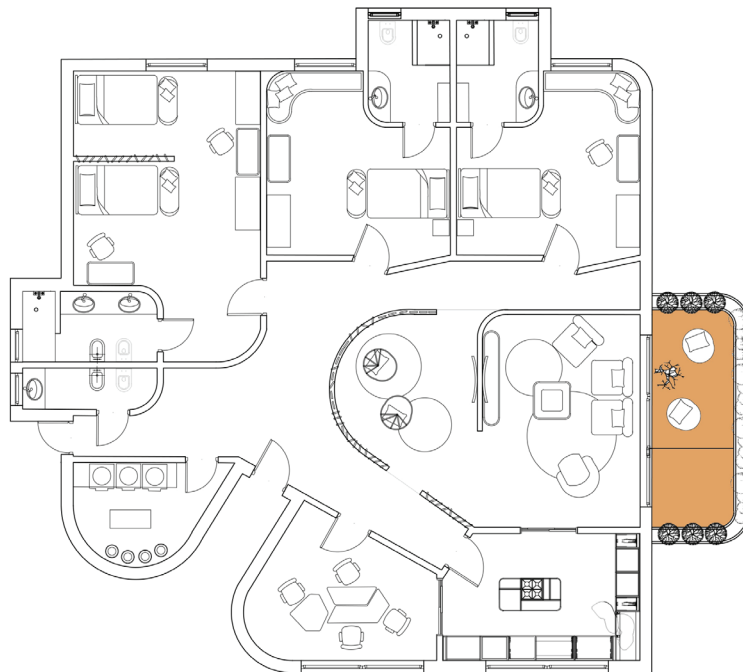


fig. 94: plan with marked garden



fig. 95 : 3d visualisation of garden, view 1

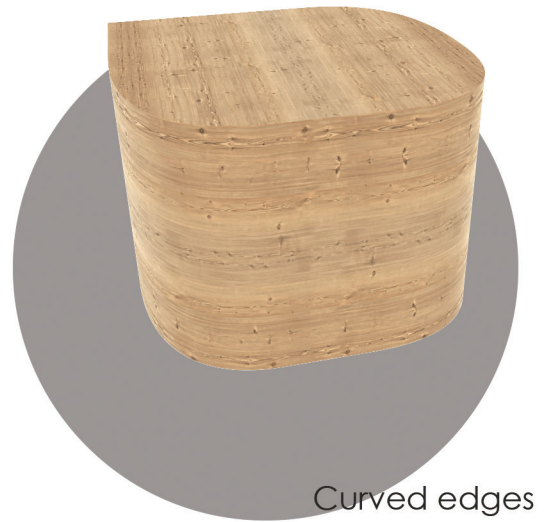


fig. 96 : 3d visualisation of garden, view 2

6. Furniture design ides

Each piece of furniture was treated as a separate unit so that each household could personalize their room. The emphasis was on avoiding sharp edges and thus avoiding potential injuries. The cabinet inside has a built-in LED lighting that turn on by the sensor when the cabinet door opens. The door also has with transparent panels built in to make the purpose of the wardrobe clearer.

fig. 97 :night table



Curved edges



fig. 98 : wordrobe

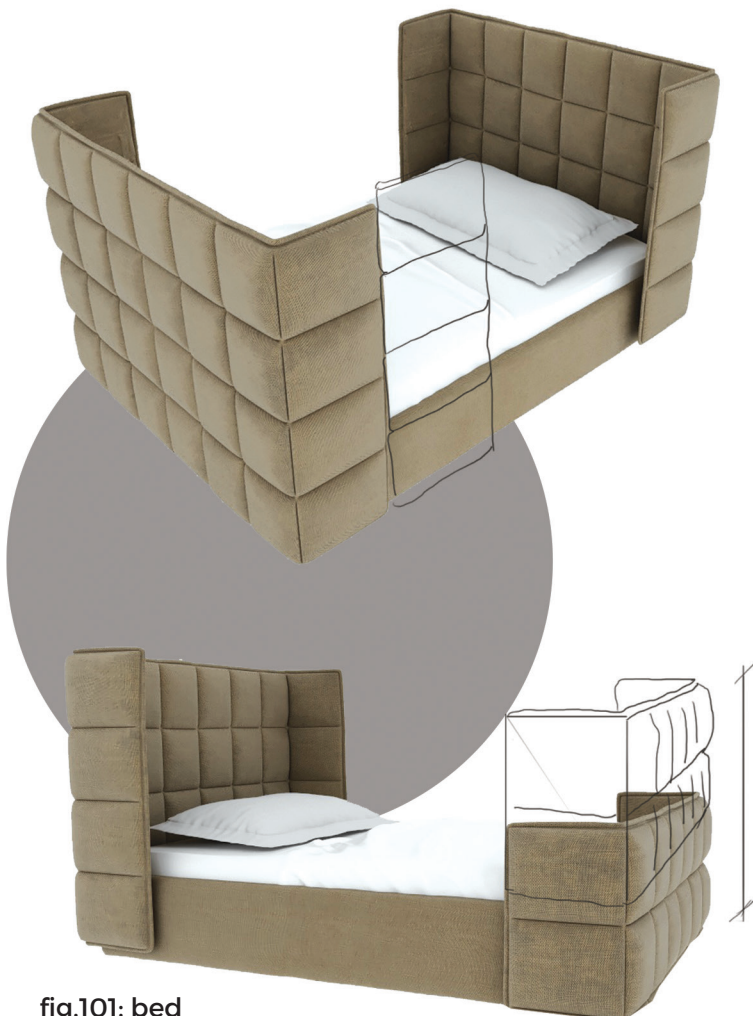
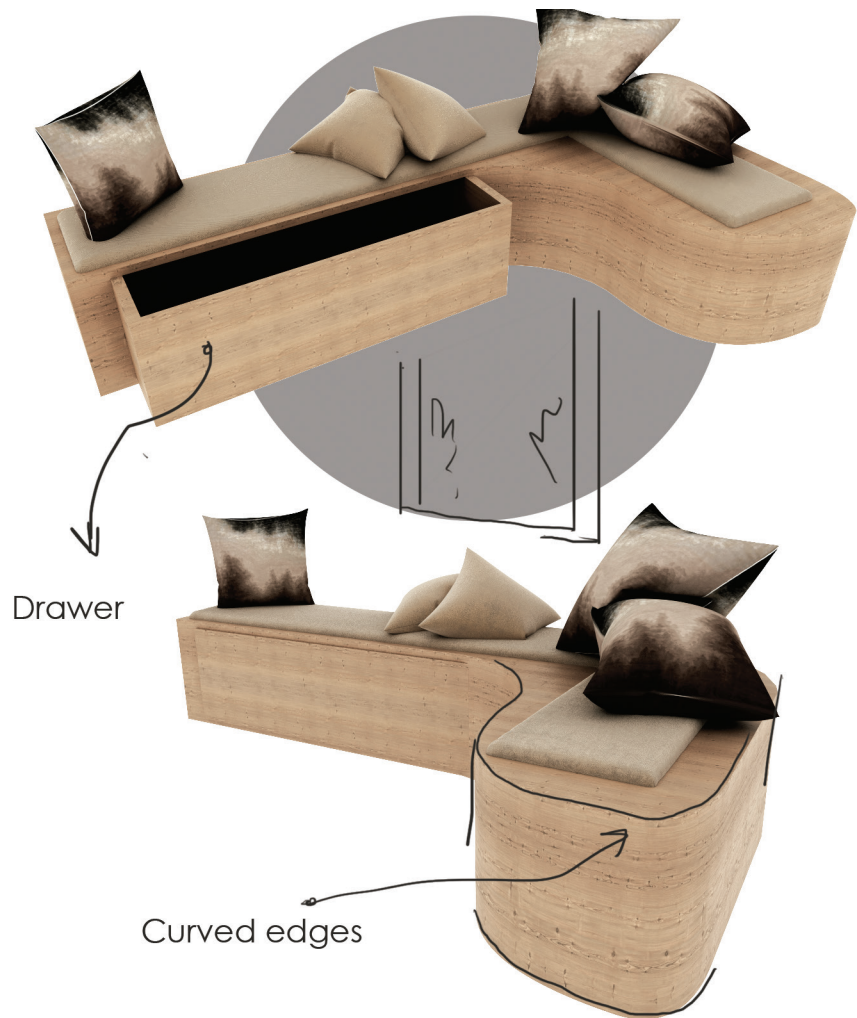


Desk

fig. 99 : desk

Bench

Window seat with view of garden giving continuous awareness of the weather and time of day and year. It has a built in storage and curved edges.



Bed

The advantages of this bed are that it is possible to determine the height of the panels that serve to make people with autism feel even more isolated in their private rooms. At the request of the user and his sensibility, this bed can be more or less conceived as a shelter. This idea addresses the need for autistic people to have a part of the apartment where they will feel safe.

fig.101: bed



Sofa

The sofa in the living room has the ability to transform so that each room member can be separated if needed when staying in the common part of the apartment.



fig. 102 : sofa

Armchair

The living room also has an armchair that has high head and sides so it is a more intimate place to sit. There are several different types of seating in the communicational space so that the residents can choose the place that is most comfortable for them.



fig. 103 : armchair

Coffe table



fig. 104: coffe table

The coffee table and the commode under the tv set do not contain sharp edges. They contain drawers as well as recesses that also serve as storage for disposal.

Commode



fig. 105 : commode



Inflating seating

fig. 106: inflating seating

In relaxation area there is a sort of comfortable hanging tent in which an individual can sit and have some privacy. An overstimulated individual with autism can sit or lie in this type of furniture while it is inflating. Through the pressure, the nerves will relax again and the individual can also get calm.

Dinning table

The dining table has a specific shape. It consists of three parts that have different form. Since dining room is also a common room for all the people in this apartment, it also has the option of separating these three parts. The panels are made of Corian and the legs are made of wood.

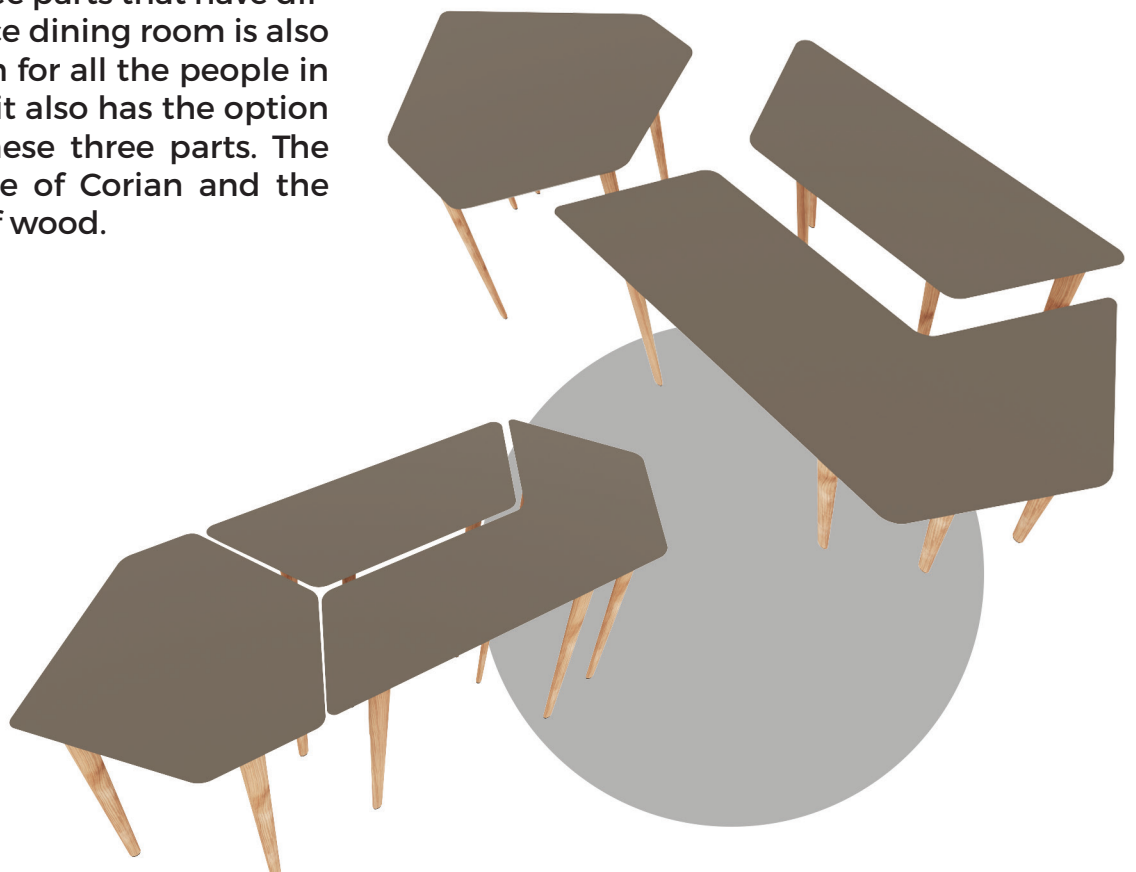


fig. 107 : dining table



Partition with rotating panels

fig. 108: partition with rotating panels

This panel, in addition to the partition, also has the role of changing the atmosphere in the space in relation to the wishes of the household. The rotation of the wooden panels can dictate the amount of light as well as the privacy of the space. The finish of these plates is designed to be comfortable to the touch, which can cause sadism in people with autism.

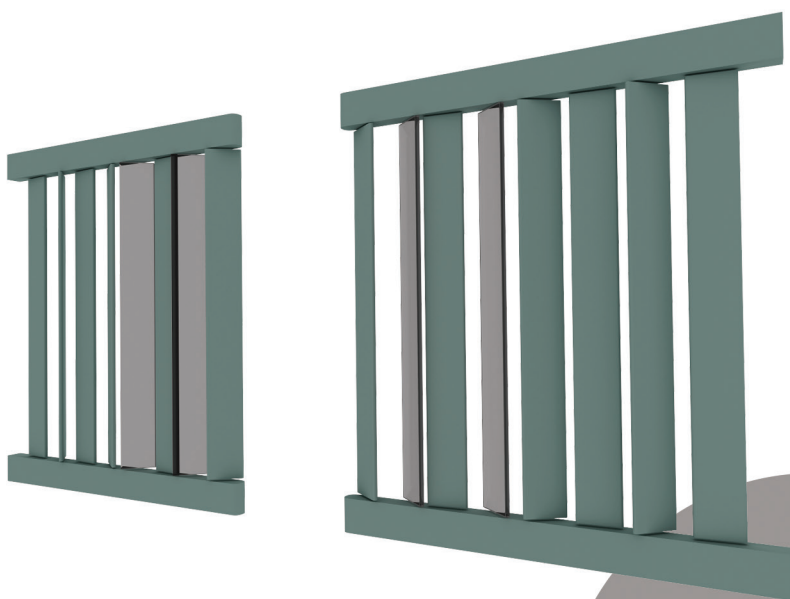


fig. 109: partition with rotating panels master room

The idea of a wall with built-in transparent segments

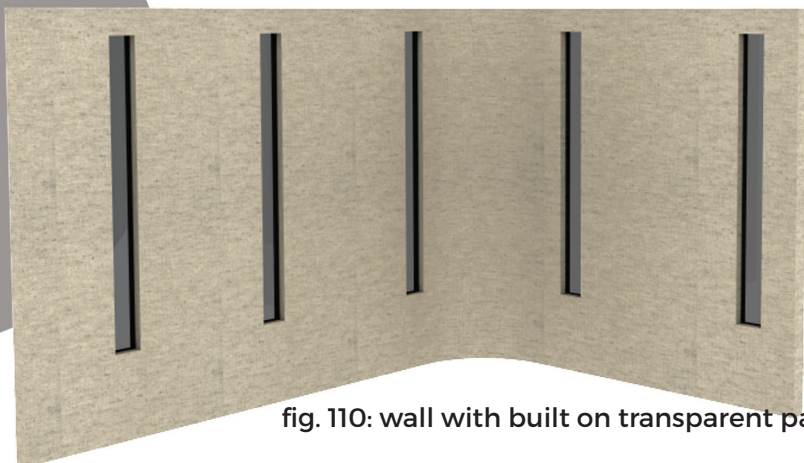


fig. 110: wall with built on transparent panels

All walls were treated to address the problem of people with autism. By incorporating transparent segments into the walls, a sense of security can be achieved in the sense that residents can be aware of what is happening on the other side of the wall and feel more comfortable in this space.

7. Materials and finishes

The main criteria for selecting the material for this project were sustainability and resistance to bacteria to maintain the wellbeing of the people staying in this space.

Use of the matte, muted materials to avoid reflection. Colors are pastel to make a comfortable atmosphere but the walls in the private area could be changed in order to provide a personalization. Decorative objects, pictures and textiles can be changed for this purpose.

Use non-reflective materials, minimal detail, and continuous and smooth surface transitions to minimize distraction.

Decorate kitchens, dining rooms, living rooms and activity spaces to clearly differentiate the spaces and indicate the appropriate activities for each room.

7.1. Floor coverage

All floors are covered with adequate material depending on the purpose of the room.

In rooms where you can spill food or drinks, such as the kitchen and the dining room, eco-friendly waterproof tile are used which are great to maintain and easy for cleaning. For toilets and laundry rooms non slip tiles are used for safety.

The floor in the living room and relax area is paved with a waterproof oak that is easy to maintain and a home atmosphere achieved.

In the private area, the bedrooms are carpeted to provide a touch of comfort and sound absorption.

7.2. Wall coverage

The walls of the building are of different structures and thickness according to the requirements for thermal and sound insulation.

The interior walls are treated with water-based dispersion and pastel shades are used to provide a comfortable atmosphere in all rooms. The sanitary walls are lined with ceramic tiles to make maintenance easier.

Most walls are curved to avoid corners and allow easier movement in the space without confusion. The idea is that these walls make the residents move in a certain direction.

Most of the walls of have slots with a transparent art to allow people with autism to be aware of what is happening in other rooms and thus get a sense of security in the space.

7.3. Doors and windows

For safety reasons, outward opening doors on communal use of toilets and bathrooms with door-locking mechanisms that can be opened from the outside in case of emergency are installed.

All the doors were repeated the same principle as on the walls, integral vision panels were installed so that the residents could be aware of what is going on behind the door before they entered the room. This principle is not used when it comes to doors of private rooms and toilets.

Safety acoustic glass is used for all windows as well as for glass sliding doors in the kitchen.

All windows include blinds that are integrated into the sandwich between the two safety glass. They allow the control of privacy and amount of natural light that enters the room and this is controlled by a remote control.

7.4. Furniture materials

For the kitchen elements and dining table I use Corian, composite non-toxic material.

Under normal temperature conditions, it does not emit gases.

When burned, it releases mainly Carbon Oxides. It has long life cycles and requires replacement over time. So this could be a perfect material for this purpose.

This material is also used for the dining table.

The furniture in other rooms are made of oak, natural material.

7.5. Mechanical and electrical solutions

The apartment has fire protection system installations that have a domestic rather than institutional appearance.

The alarm system and digital communication system with cameras were also adapted. These systems, as well as sensors and other assistive technology, can reduce the physical presence of professionals who, if necessary, assist the household.

All toilet cisterns were isolated, a control chamber is installed to facilitate possible repairs, as well as a pump system to keep the water used at the desired temperature.

Heating systems have been adjusted to reach the desired temperature as quickly as possible and are out of reach of residents. A ventilation system has also been adapted and acoustic intakes have been applied to both systems to reduce noise in the building.

8. Conclusion

In the course of this research, I have come across a number of factors that affect the functioning of people with autism in space. Social interaction, sensory architecture, privacy, spatial layout, and personalization are some of the main aspects of this research.

First of all, what is the conclusion of this research is that we should be aware of the problems of this focused group of people who have the same needs as we do, but with more limitations, so the aim of designers and professionals should be to help people with autism overcome their problems.

On the other hand, sensory architecture for sound, light, touch and smell is not only useful for people with autism. Neurotypical person can also benefit from an architectural solution that satisfies these factors. And if we may be used to the sounds of the environment and do not pay attention to noise as people with autism, perhaps peace in our home is what everyone needs to feel better.

So when it comes to designing an environment for people with autism, the comfort of routines and confidence should be the main factors behind which designers organize architectural elements.

Through this research, I have tried to generalize to the problems that characterize this spectrum. However, an important factor that would dictate many design steps is the specific needs of each person, because in fact, the main characteristic of this spectrum is that their reactions to the environment are different. Therefore, it is necessary to listen well and consider all the needs of the person for whom the interior is designed in order to allow personalization and a sense of complete safety, which can further have a great impact on the development of independence of a person with autism.

Another conclusion that I came to through this research is that every person, regardless of his or her health status, has the right to be happy and live a life worthy of a person, so social empathy is something that we should all think about and so try to influence on the world to be a better place for everyone.

9. Bibliography

Dr Lazar Stošić, Optimum virtual environment for solving cognitive tasks by individuals with autism spectrum disorders: The questions and methods of design.

Đorđević Mirjana, Glumbić Nenad, Langher Vivianab, Some aspects of sensory disfunction in young people with autism spectrum disorder

Krsmanović Sofija, Grujičić Roberto, Herrera Alexia S., Rudić Nenad, Jeremić Marta, Pejović-Milovančević Milica, First symptoms and support / aid to families children with disorders of Autism spectrum

Potić Srećko, Stanimirov Ksenija, Đorđević Mirjana, Banković Slobodan, Physical-recreational activities and persons with disability

Kanner L. Autistic disturbances of affective contact. *Nervous Child* 2, 217-250 (1943)

Beise, M. (2014, april 05). Designing Spaces for Users with Autism and ASD. Retrieved from Rock Paper Square: <http://www.rockpapersquare.com/blog/2014/4/5/designing-for-users-with-autism-and-asd>

Accommodation. *Designing Living & Learning Environments for Children with Autism* (2006).

Naoki Higashida, *The reason I jump* (2005)

Kim Steele, Sherry Ahrentzen, *At home with autism designing housing for the spectrum.*

Kristi Gaines, Angela Bourne, Michelle Pearson and Mesha Kleibrinnk, *Design for autism spectrum disorders.*

Williams, E., and Kendell-Scott, L. (2006). Autism and object use: The mutuality of the social and material in children's developing understanding and use of everyday objects,

A.J. Paron-Wildes Interior Design for Autism
from Childhood to Adolescence

Catherine Faherty, Autism, what does it mean to
me ?

Dr.Temple Grandin, The way I see it.

Ahrentzen, S., Steele, K., & Dorgan, K. (2013).
Autism and design. Good design makes a differ-
ence. The American Institute of Architects.

Kanner, L. (1943). Autistic disturbances of affec-
tive contact. Nervous Child

Asperger, H. translated and annotated by
Frith,U. (1991) [1944]. Autistic psychopathy in
childhood. In U. Frith (?), Autism and Asperger
syndrome. Cambridge University Press

Magda M. An Architecture for Autism:
Concepts of Design Intervention
for the Autistic User. Archnet-IJAR ,
Volume 2 Issue 1 March pp.189-211
(2008)

Kovač Ana, Pavlović Dragan M, Disorders of
speech and cognition in children sufferinig tu-
berous sclerosis.

Websites

National Autistic Society, www.autism.org.uk
(accessed Jul 2019)

Autism Speaks, www.autismspeaks.org
(accessed Jul 2019)

Creating autism friendly spaces, The
National Autistic Society, www.autism.org.uk (accessed Aprile 2019)
Introduction to teacch. University of

North Carolina School of Medicine,
www.teacch.com (accessed Aprile 2019)

Building bridges because inclusion matters
<http://www.axschat.com> (accessed May 2019)

Autism-Friendly Design with Flip Schrameijer
handicaphomemods.blogspot.com (accessed
May 2019)

Autism independent, <https://autismuk.com> (ac-
cessed Julay 2019)

The famous people/ Han Asperger biographuy
<https://www.thefamouspeople.com> (accessed
July2019)

