Impact of Color on Learning Environment of Autistic Children

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Submitted to the
Institute of Graduate Studies and Research
in partial fulfillment of the requirements for the degree of

Master of Science
in
Interior Architecture

Eastern Mediterranean University
August 2020
Gazimağusa, North Cyprus

Approval of the Institute of Graduate Studies and Research

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ABSTRACT

The autism spectrum is one of the most difficult spectrums that children may be affected with, due to the problems that this spectrum may cause in their sensory system in order to become more sensitive compared to healthy children. Therefore, it is necessary to choose suitable colors within their educational environments, because color preferences greatly affect their feelings and mood. The main objective of this thesis is to define the enabling aspects of educational environments, how to use color and physical factors in educational environments as a way to aid in treatment and increase the desire to continue education, a discussion about colors and their importance with the impact they create in learning environments for autism also to clarify the spatial requirements of learning environments. This goal is set for answering the research question: How to achieve a successful educational environment for children with autism using colors? This study was evaluated based on three autism educational centers in Amman - Jordan, namely Consulting Center for Autism, Lubna Special Education Center and Autism Academy of Jordan, through the topics covered in the literature. To achieve this goal, this thesis adopted qualitative research methods by reviewing previous books, articles and letters on this topic. The results of this research showed some of the important colors of children with autism and how they are used in designing the educational environment, also found some important requirements for these environments.

Keywords: Autistic Children, Color, Learning Environment, Functional Emotions, Color Space Relationship

ÖZ

Tum spektrumuyla otizm, bu durumu olan cocukların daha duyarlı hale gelebilmesi için duyusal sistemlerinde neden olabileceği problemler nedeniyle, etkilenebilecekleri en zor durumlardan biridir. Bu nedenle, eğitim ortamlarında uygun renkleri seçmek bu durumun iyileştirilebilmesi için önemlidir, çünkü renk tercihleri duygularını ve ruh hallerini büyük ölçüde etkiler. Bu tezin temel amacı, eğitim ortamlarının olanaklı yönlerini, eğitim ortamlarında renk ve fiziksel faktörlerin tedaviye yardımcı olmak ve eğitime devam etme arzusunu arttırmak için nasıl kullanılacağını tanımlamak, renkler hakkında tartışmalar ve bunların önemi ile öğrenme ortamlarında yarattıkları etki, öğrenme ortamlarının mekansal gereksinimlerini de netleştirmek için odaklanmaktır. Bu hedef araştırma sorusunu cevaplamak için ortaya konuldu: Otizmli çocuklar için renkleri kullanarak başarılı bir eğitim ortamı nasıl elde edilir? Bu hedefle, çalışmada, Amman - Ürdün'deki üç otizm eğitim merkezinin, isimleriyle Otizm Danışmanlık Merkezi, Lubna Özel Eğitim Merkezi ve Ürdün Otizm Akademisi temel alınarak literatürde ele alınan konularla değerlendirilmesi yapılmıştır. Bu hedefe ulaşmak için bu tez, bu konuyla ilgili önceki kitap, makale ve çalışmaları inceleyerek nitel araştırma yöntemlerini benimsemiştir. Bu araştırmanın sonuçları, otizmli çocukların renkleri ve eğitim ortamının tasarlanmasında bunların nasıl kullanıldığını, bu ortamlar için bazı önemli gereksinimler bulunduğunu göstermiştir.

Anahtar Kelimeler: Otistik Çocuklar, Renk, Öğrenme Ortamı, Fonksiyonel Duygular, Renk Mekan İlişkisi

DEDICATION

I dedicate my dissertation work to my beloved family and many friends. A special feeling of gratitude to my supportive and lovely parents, Mahmoud Almaqbool and Maysoon Tawfiq whose encouragements, support and kind advices were the main reason that gave me the strength and the determination to succeed and do my best efforts to prove all my capabilities. Without forgetting my dear brothers and sisters, a special dedication to my eldest brother, Mohammed Almaqbool, also Ali, Ayham, Abdulkareem and Tamer, also my adored sisters, Rawaa, Roaa, Maryam and Yaqeen that never skimp on me with their prayers and never left my side.

To my adorable paternal grandmother, Maryam, although she is no longer of this world, her memories continue to regulate my life, and I was really hoping her to be present and attend my success, and my maternal grandmother Fayza for her praying that hold up with me till the end.

I also dedicate this dissertation to my best friend Orwh Jaser, Amer Essa and Ali Fayad that supported me with their prayers. All of you have been my best cheerleaders.

ACKNOWLEDGMENT

I would like to thank my great family parents, brothers and sisters for their support, praying and motivation that make me more patient, strong, comfortable and encourage me to do my research.

I would like to express my special gratitude and so many thanks to my beloved supervisor Assoc. Prof. Dr. Ayşe Banu Tevfikler for her guidance and support throughout this research, I appreciate also her patience and encouragement and she kept in contact with me all the time giving me advices, orientations, feedbacks and encouragement, and without all this, I would never be able to complete my thesis in the proper way.

A special thanks to the jury members Asst. Prof. Dr. Kamil Güley and Assoc. Prof. Dr. Huriye Gürdallı for their valuable suggestions and comments that gave to my research a better value and worth, their passion and enthusiasm about my topic encourages me so much to work on it harder which helped me to give the best for my thesis.

And a special thanks to my girlfriend Sara Timsahi because she helped me and encouraged me constantly during my preparation for the thesis, she stands by my side during the difficult period of quarantine full of stress and anxiety, she was always able to make me relaxed and released from all this bad energy.

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LIST OF ABBREVIATIONS

Acoustiblok	Insulated Walls
IDEA	Individuals with Disabilities Education Act
LED	Light Emitting Diodes
RGB	Red, Green and Blue Color Mixing System

Chapter 1

INTRODUCTION

1.1 Background of the Study

Learning environments are very important in any person's life. In formal learning settings, treatment issues with children with disabilities manifest in a variety of behavioral patterns that can conflict with instructional tasks: they have trouble sustaining focus for a given amount of time, which may mean both preserving selection purpose and defending this aim from disturbances but sometimes they forget what exactly they were meant to do and struggle to complete the tasks (Imhof, 2004).

Especially, children with special needs in general and autism in particular need more attention in their learning environment. Therefore, the design of these environments is very important, the usage of color in these environments seems to be one of the most important aspects in regard to design, most of the researches on designing for special groups, accessibility codes and design guidelines are based on the functional needs of the users, meanwhile, it is very important to explore the potential of behavioral aspects to design for autistic children.

According to Mostafa first suggested as a continuum by Wing, the most descriptive term Autism Spectrum Disorder has been widely used to define a broad variety of behaviors and difficulties encountered by individuals with autism. The sensory theory of autism indicates that these behaviors and difficulties contribute to the variety of

sensitivities that the person on the spectrum has against the five senses of hearing, sight, touch, smell and taste (Mostafa, 2018).

Some of the most critical aspects of training is to bear in mind that the child's training is the primary aim through which the child learns, adapts and understands the world around him by acquiring skills in all areas of development. Many autistic children love routines, and all rely on visual memory to learn and work on their skills. One of the problems that an autistic child faces is that he or she has little ability to anticipate, relate or plan events or sequences, and one of the most efficient ways to manage the education process is to be reinforced with visual aids, schedules and space management in a way that decreases child tension, outbursts of frustration and the emergence of undesirable behaviors. The visual guide must be used particularly if the child does not speak, the child has to understand what he or she needs, to predict what happens next, especially, in the skills that the child does not understand and does not anticipate what happens next for example visiting a dentist or a hospital , visiting a barber or any new place, it is preferred to prepare some pictures signs that are useful and helpful for the child, this is a perfect way to give him a hint or a sign about what's going to happen in this visit. The visual guide in the class is very important to know the tasks and what to do in the right order, even when the activity that it does is identified through pictures, signs or colors that have a beginning and an end.

This study explains in the literature review (Chapter Two) the definition of children with autism, the impact of environmental design and the appropriate educational environment for them, and the special needs and color in the learning environment for children with autism. Given the difference in the needs of autistic children, their high

sensitivity to things around them, their reactions against the healthy children, their responses are easy when the right environment is provided. The aim of this study is to determine the factors affecting the educational environment, choose the appropriate colors and know their impact on children with autism which will lead to a successful and inclusive educational environment for children with autism.

1.2 Problem Statement

Although many studies suggest that there may be some differences in perception of colors in humans, there has been few studies, as I searched in scholar studies like articles, books, previous thesis and also I used some websites , it was noticed that not many studies that direct the color preferences for children with autism were covered. There are theoretical reasons for addressing this issue for example, study of the preferred colors and its perception in autistic children. Also, a better understanding of cognition and color perception in autism may help motivating them to enhance their education process in the learning environments centers. Additionally, the educational environment is necessary for every one especially to the autistic children, it is so important to provide the safe , physical and sensory environment for them because they are so sensitive than the normal children because they can be easily affected by the environmental factors in the class rooms especially the factor of color, so there must be a wise choice of colors in the classes to feel cozy, to stay focused and to remove any distraction and stress that might be occurred. To sum up, this topic needs more researches and studies.

1.3 Research Questions

The main research question is:

- How to achieve a successful educational environment for children with autism using colors?

The sub-questions of this study are:

- Can colors affect concentration and improve the learning of children with autism?
- What are the necessary needs for autistic students in the learning environment?

1.4 Aim of the Study

The objective of this study is to determine the enabling aspects of educational environments and to know the needs and services that must be provided to autistic students, how to use color and physical factors in educational environments as a method to help in treatment and increase their desire to continue education, discussion about the colors and their importance with the impact in learning environments for autism also to clarify the spatial requirements of learning environments through literature survey.

1.5 Research Methodology

According to the literature review, autism is generally one of the most common and sensitive disorders, especially children with autism. Therefore, it is necessary to achieve the appropriate physical and educational environments to meet their needs, to help them continue and increase their desire for education. To achieve the structure of appropriate educational environments and fulfil the needs of children with autism, the topic of autism must be studied with focus and knowledge of the things that affect autistic people, especially children within the educational environment and at home

(such as colors, texture, furniture, and raw materials used) and know the services needed for them, this is through the experiences of service and care providers.

"Colors and its impact on children with autism in educational environments" were chosen because they are one of the most important factors that directly affect the feeling and reactions of children with autism, because of their increased sensitivity to things around them and help to achieve a comfortable and appropriate educational environment.

An autism educational environment will be used as an example to illustrate what the literature means and study the colors used in the structure of the environment along with the services provided in the educational environments.

This study will be a qualitative research, by collecting data and all the information needed for this topic relying on articles, previous thesis, books and some websites, then a table was made through the subjects covered to do an evaluation through literature surveys, observations, and documentation of selected examples of learning environments for children with autism that paid attention to the usage of color and a discussion of findings and results that were concluded from the evaluation done previously. In this way, knowledge from theory can be crosschecked with its application. The literature survey will be carried out from books, academic articles, websites and the like. Additionally, potential articles and books will be identified by a systematic review of color theory, psychological and physiological reactions to color and how to achieve a good characteristic of educational environment for children with autism. After reviewing the articles and books, depending on educational

environments, this study will find out what are the appropriate and important colors that can help learning abilities of children with autism feel comfortable in the educational environment. After discussing the subject with theoretical information, examples of learning environments will provide an evaluation platform to cross-check the importance of this subject, the tables of evaluation will be prepared, through the selected examples of built educational environments for autistic children the effect of color on the improvement of their learning will be explained through pictures that were taken by the author and some websites, and the information that were gotten by author through communicating directly with the centers, and the tables also will explain the color were used in the specific spaces through the simple square colors, a photoshop was used to design the tables properly.

1.6 Limits of the Study

This study will focus on the effect of colors on the behavior of children with autism from 7 to 15 years old because the centers that were chosen were focusing and giving a big attention to this age group, and the impact of color on their learning enhancement in the educational environment, the necessary services for autistic children and how to know their needs and how to deal with them through the teachers in educational environments. In this study, there has been selected three well known, credible centers from Jordan which are Lubna Special Education Center, Autism Academy of Jordan and Consulting Center for Autism as examples of built educational environments for autistic children, to explain the impact of color on learning betterment, these centers were designed to provide safe and sensational environment, also the spatial requirements were available in a proper way that is convenient for student's needs in each center, also, different, appropriate and favorable colors were used in specific spaces in these centers to make students more comfortable, they were caring about

children who were between three and eighteen years old and they were chosen because it was easy to find information and there was a quick response from the responsible people of these three centers.

1.7 Structure of the Thesis

This table is showing the topics this thesis will be discussing in a detailed way in the literature review which is containing the chapter 2 and chapter 3 relying on some references as articles, books, previous published thesis and some websites.

Table 1: Structure of the Thesis

Chapter1	Introduction
	Background of the Study | Problem statement | Research questions
	Aim of the study | Research methodology | Limits of the study
Chapter 2	Spatial Characteristics of Learning Environments for Children with Autism
	Definition of Autistic Children
	Services that Children with Autism Need in their Education
	Spatial Requirements of Learning Environments for Children with Autism
	Learning Environment For Autistic Children
Chapter 3	Color in the Learning Envirinments
	- Color Perception theory in the Surrounding Environment. - Physiological and Psychological Responses to Color. - Role of Lightness in Color Discrimination among Children with Autism. • Color Perception in Autistic Children and its Impact on their Learning. • Physiological and Psychological Responses of Children with Autism towards Color.
Chapter 4	Evaluation of the Theoretical Information via Chosen Examples
	• Consulting Center for Autism • Lubna Special Education Center • Autism Academy of Jordan
Chapter 5	Discussion of Findings
Chapter 6	Conclusion

Chapter 2

SPATIAL CHARACTERISTICS OF LEARNING ENVIRONMENTS FOR CHILDREN WITH AUTISM

According to Weeks problems and influences that impede the movement of education effectively in the educational environment, it may be a major reason why students do not want to continue education according to their needs, especially students with autism. A successful learning environment designed according to the needs of users may increase students' desire and encourage them to education and help them adapt and feel comfortable (Weeks, 2001).

2.1 Definition of Autistic Children

According to Issa, autism is a serious condition that makes a person's ability weak, and reduces his ability to communicate with other people and interact with society well, autism is a problem in the nervous development system. Autism is one of the strongest conditions that affect nervous growth. One of the problems that autism causes is a major disorder in social communication, which leads to the patient’s unwillingness to communicate with others, which also causes a disorder in the professional life and the person’s inability to carry out daily activities and activities like others (Issa, 2017). Autism at its beginnings causes problems in a child's life. Among these problems are poor verbal and non-verbal communication, such as poor speech and difficulty in movement (Speaks, 2011).

The interests of some people with autism is limited, their behavior is different compared to others, such as their behavior in eating, sleeping, or going to harm themselves, by hitting their heads with things around them or biting their hands. The skills of some people with autism may be weak or unable to move easily, and their sensitivity will be weak. In addition, autism does not affect all people with the same effect, it may be influencing unevenly from one person to another (Issa, 2017).

2.2 Services that Children with Autism Need in their Education

The disorder that the children with autism are suffering from has occurred so many features that helped in creating so many worries and questions that needs answers in the field about services. There are numerous factors that had to do with increasing the intensity and the level of these fears and concerns, it includes : the huge number of the children with autism that can't get the right care in the center due to the lack of skills and the weak quality of services provided in the center, the different type of services and the mutual recommendation between the teachers and parents for service afforded for the children in the center (Dymond, 2002).

The services that are offered to the children with autism have been portrayed as hard to reach and not easy to provide it to children in the right and appropriate way that will effectively contribute in getting effective results for the autistic children, it is also difficult for parents to have an easy access to it, as well as it is restricted and costs a lot (Fong, 1993)& (Koh99)& (Sperry, 1999)& (Dymond, 2002)& (Whitaker, 2002). The next part will explain in details the process of providing services relying on some factors.

2.2.1 Coordination of Services and Expertise of Service Providers

Service providers for autistic children face difficulty in knowing what services they need. Kohler described the services of children with autism as limited, difficult to reach and know without the involvement of parents. Parents also struggle to specify services for their autistic children. Many service providers rely on themselves to select services without going back to their parents and listening to them to learn and define the services that their children need because parents are closer to their children than service providers (Kohler, 1999). Parent participation is important, because it encourages service providers to provide support services. But sometimes disputes arise between service providers and parents, due to the parents' dissatisfaction with the level of service provided to their children, so parents are not constantly contacted to determine services (Gilson, 2007). The (Figure 1) is showing how the service providers should be more comprehensive and good listeners when it comes to dealing with the autistic children, they must understand their feelings and their needs, also the good communication is required while having this direct contact with the children because they are so sensitive and they need a special and a very unique way of communication.

Figure 1: The Way the Providers deal with Autistic Children Directly. (URL 1)

2.2.2 Type and Amount of Services

According to Gilson each country has its capabilities to provide services to people, therefore the provision of services to children with autism depends on the place and the state plus its ability to provide them with needs (Gilson, 2007). Decisions were issued that it is necessary to provide the appropriate services to children with disabilities rather than optimal services, because according to the amendments to the Persons with Disabilities Education Law (IDEA) in 1997 that education is free and commensurate with all the needs of all children with disabilities (Vacca, 2000). Therefore, countries depend on providing services on available resources according to the capacity, which means that not all services are provided at the same level, but they differ from one region to another.

2.2.3 Service Needs

According to Gilson there are many challenges that people with autism face during adolescence and childhood, such as the difficulty in communicating and explaining their weaknesses and strengths including what services they need. Therefore, it is better to communicate directly with parents because they are often more familiar with their children's needs (Gilson, 2007). Therefore, communication with parents is the

most important thing that service providers need in order to provide an optimal service for children with autism. The aim of these studies (Sammy J. Spann, 2003)& (Gilson, 2007) was to find out what makes parents satisfied with the services provided to their children, what services must be provided, what are the problems in obtaining services and how to reach their children's needs to provide it. As a result of these studies, many parents want services that are not available to meet the needs of their autistic children. There are also some parents who are unable to know the service their children need. It is necessary to provide assessments of the level of service satisfaction by the parents, whether the evaluations are negative or positive, to know the fears of the parents and to know the problems in the way the service is provided to their children, because the service providers can provide the best possible services (Gilson, 2007).

According to Simpson providing the service to children with autism in the learning environment depends heavily on the experience of its providers such as teachers and management. First, it is necessary to know if the student is socially benefiting from the learning environment, and this depends on if the student with autism has an awareness with a goal for education, and has the ability to respond to interactions in the learning environment such as imitation of adult behavior, social endeavor to develop appropriate behavior and carry out his duties. Secondly, it is necessary to know if the student benefits from the academic process of education, and this is through knowing if the student is able to acquire new skills and participate in the classroom, such as activities and duties (Simpson, 2003). Or if he is able to share the acquired skills with others. In the classroom, teachers must treat students with respect as students who have the right to education like other healthy students, provided that they are treated and interact directly with students to make them feel equal, to motivate

them to learn that they have the ability to continue to practice their daily lives (Simpson R. L., 2001). In the (Figure 2), helping the autistic children in coping with the activities in the learning environment is done through the aid that the providers provide them in the classes by showing them how each activity or task must be done in the right way.

Figure 2: Helping Children with Autism in Learning Environment. (URL 2)

2.2.4 Recommendations for Improving Services

According to Sperry information was obtained from the participants through an experiment in 20 countries and was composed of four groups. The results of this experiment were many of the recommendations of parents to improve the service delivery system, and these recommendations are:

- Development of communication and cooperation between service providers and parents.
- Increased service options and financing provided.
- The services must be with the consent of the parents.
- Check with autistic children before serving them.

- Training service providers to develop their skills in dealing with children with autism.
- Increase in the interaction of teachers or service providers with children (Sperry, 1999).

In fact, there is a difference from one country to another in providing services, as there are some recommendations in every country through service providers, such as finding realistic ways for the experiences and opinion of parents in services in all regions of the country, and applying the recommendations of parents in other regions and taking them into consideration. Therefore, the provision of services depends on the parents ’input and recommendations to improve the service (Gilson, 2007).

The good thing in the educational environment for autism that the process of service providing is shared with the parents to give recommendations for their children regarding their needs based on their daily life in their houses because the parents are the most people that are close and know better about their children than the service providers, that’s why the recommendation for improving services are important in the educational environment.

2.3 Spatial Requirements of Learning Environments for Children with Autism

To achieve educational friendly environments for autism, we must focus on many requirements that help to provide comfort and services for students with autism, also help to integrate children improve in their learning environments (Altenmüller-Lewis, 2017).

2.3.1 Spatial Sequencing

According to Suskind this criterion depends on the concept of beneficing on the closeness of the people with autism to the routine and the ability to predict. Identical to what already selected later on by Suskind like closeness therapy, this basis stratifies to people with autism specified affinity to routine and the ability to predict like a spatial appearance (Suskind, 2016). Connected with the norm of Sensory Zoning, which will be argued in a short way, Spatial Sequencing demand that zones are regular in a logical way, construct on the exemplary programmed use of such areas. Spaces should flux as much as it can be from one performance to the next through one direction rotation whenever possible, with minimum disturbance and distraction, through using Transition Zones which are discussed below (Mostafa, 2018). The (Figure 3) shows that this class room is respecting all the spatial criteria that must exist in every center of autistic children, as the distance between the tables, the space defined between each student, and divided in regular order that plays a big role in giving the autistic children a great feeling of tranquility and peace, also the high level of concentration will be much higher than ever.

Figure 3: The Achievement of Spatial Sequencing Zones by Regular and Logical Way. (URL 3)

2.3.2 Escape Spaces

The goal of exploiting these spaces is to make autistic users more comfortable than to increase the stimulation that exists in their own environments (Mostafa, 2008). Experimental research has demonstrated the positive effects of the spaces that are being used to provide convenience to users in particular learning environments (Mostafa, 2018). It is possible that some places contain small areas divided into several parts in some quiet areas in the rooms or inside the building in general as quiet corners, it is required that they have a negative sensory environment through these spaces in addition to reducing the motivation that provides people with autism the possibility In order to customize it to provide the necessary sensory inputs (Mostafa, 2008). (Figure 4), the picture is demonstrating the class room that is containing several furniture to create a kind of diversity in the room so the children stay all the time energetic and dynamic by moving from a place to another without feeling bored or lazy.

Figure 4: Create Comfortable Environment and Escape Spaces. (URL 4)

2.3.3 Compartmentalization

According to Mostafa what is mentioned in her research, the philosophy resulting from this criterion is to arrange a semester or an entire building in booths and choose a sensory environment suitable for each activity or task. In addition, it is necessary for each room to have at least one clearly defined job, the resulting quality and sensory efficiency, and that the separation of each room be easy and lenient (Mostafa, 2018). Achieving this standard comes through, covering the floors in different ways, arranging the furniture in suitable ways, making each level different from the other by creating various lighting. Each area must also be provided with its sensory characteristics in order to be able to define and choose its function, separate it from the room or other space. This will result in the strengthening of the conditional sensory responses so that the user can give the expected reaction in every space he is in,

reducing ambiguity, increasing clarity, limiting the time of change and making users More interesting to raise the level of effectiveness (Mostafa, 2014).

2.3.4 Transition Zones

According to Mostafa the presence of transitional zones helps users to re-perceive their senses while they are moving from the catalytic level to the next level by working to simplify the sensory division and spatial sequence. It is possible that these areas are created in various forms and may be related to the distinct node, which indicates a change in the blood circulation to a fully sensory room to allow the user to calibrate the degree of sensory encouragement before leaving the high stimulus to any area of low stimulation (Mostafa, 2008). The acoustic pods were used as transitional areas by revealing a method of greater use of these areas at a level greater than expected in general. For this reason, recent evidence began using the pods. Voice pods include the use of space as a positive encouragement tool and as a safer area to activate social activities with their colleagues and members of the school environment. Although there is some research, but more research is needed to confirm this use according to (Mostafa, 2018). In the (Figure 5), it shows a planning that clarifies in detail the division of the areas in the learning environment as a good way to divide the whole place in the more logical and understandable way while moving from a place to another as example, there is a special entrance just for children and one other for the admins and the staffs.

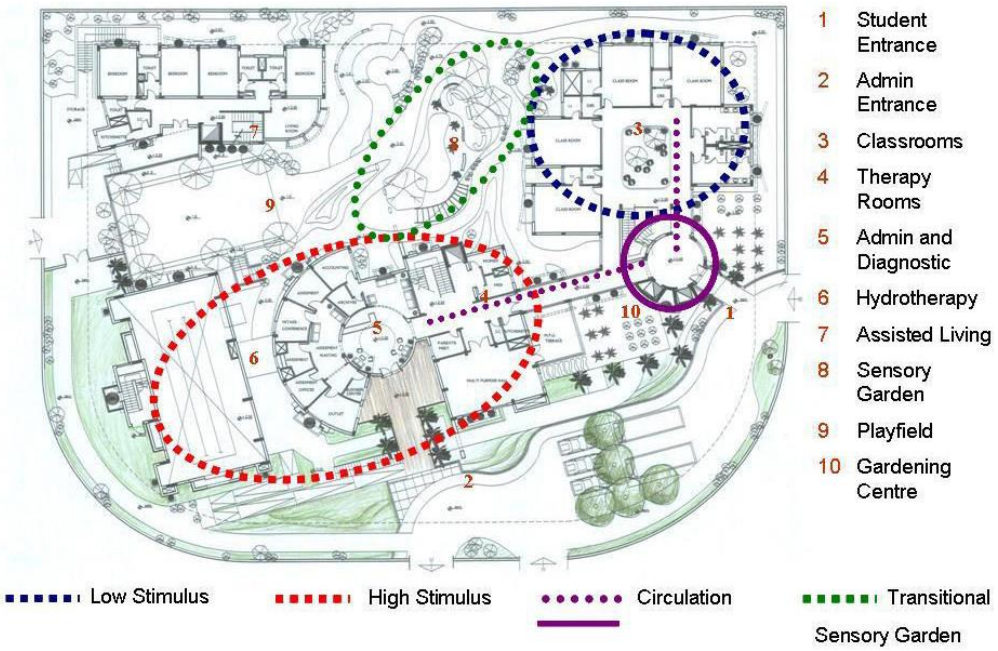


Figure 5: The Division of Transitional Stimulus Areas into an Autism Education Environment. (URL 5)

2.3.5 Sensory Zoning

The design for people with autism is somewhat different from the design for healthy users, in which it is required that the spaces be organized according to their sensory quality, in contrast to the typical architectural design in the division of functional spaces (Mostafa, 2008). It is also through this standard that spaces are arranged in places of low and high stimulation, depending on the level of stimulation permitted. The arrangement is as follows, the first areas include a high level of focus, such as physiotherapy and areas for building full motor skills. The following areas include computer skills, libraries, and places of study, such as spaces for speech assistance. These areas are called transitional areas because the user can move from one region to another. This standard is completely dependent on the concepts of sensory design (Mostafa, 2018).

2.4 Learning Environment for Autistic Children

The literature that was studied previously indicated that the educational environment is important for increasing social participation and achieving it appropriately with patterns of education and sensory problems in autism. This section of the literature will explore the design of educational environments for people with autism ideally and the factors to consider in designing educational environments for autistic children.

2.4.1 Engagement of the Children with Autism into the Learning Environment

According to Brooks results have appeared in many research studies for children with autism in particular, the effect of the physical educational environment greatly on the performance of students in the classroom to focus on the benefits through achieving an appropriate educational environment (Brooks, 2010). To facilitate the understanding and focus of students in participating in activities in the classroom, a clear, well-built visual environment has been shown to reduce distraction and sensory overload thus encouraging them to participate in classroom education (Heflin, 2001). As some studies have shown, curricula and teaching methods have a major impact on the participation of people with autism in the classroom. In addition, relying on visual strategies such as tables of photographic or symbolic activity help them to participate in education. Numerous studies have examined the environmental and social impacts of teachers, careers, and teaching methods on the psychology of children with autism. These studies showed that people with autism respond positively by improving social interaction between children and taking into account their emotional and social performance, which increases their level of interest and interaction in the classroom. It is imperative that the teacher style be highly encouraging and engage with children to encourage them, by participating in activities and guiding them collectively (Brooks, 2010). We conclude from the above that the method of teaching, the

educational environment, the social environment are important factors that greatly help to achieve an educational environment that motivates them to participate as effective learners and as healthy students (Doke, 1972). The two pictures in the (Figure 6) are portraying the participation of the teachers in the course of the activities, and pretend to be as one of them to make the children feel comfy and pleasant, also it encourages them to stay active and dynamic in the class rooms.

Figure 6: Teaching Method and Teachers' Participation for Autistic Students in Activities. (URL 6)

2.4.2 Environmental Design for Autism

There are many special needs for people with autism to increase their level of participation in the classroom, for this it is necessary to provide educational environments designed appropriately to meet their needs (Reiber, 2004)& (Schilling, 2004). In addition to the importance of a comprehensive design to help people with physical disabilities, because autism is a disability for life, the injured person cannot be cured of this spectrum. This is why if the needs of people with autism are not met, there will be problems accompanying them throughout life that will hinder their movement and deny them to lead their lives normally (Khare, 2009)& (Brooks, 2010).

According to Brooks when designing the environment in general, you should think about the characteristics of users, their needs and environmental considerations. The social environment must also be taken into consideration, such as the teacher's method of teaching and resources. In addition, taking into account the physical learning environment to understand the organizational and sensory problems experienced by people with autism. This is to achieve an educational environment suitable for all disabilities in autistic patients, such as sensory, social and cognitive disabilities (Brooks, 2010).

2.4.2.1 The Safe Environment

According to Mostafa, general safety in design is an important factor that must be achieved, and it is one of the most important factors for children with autism whose feeling changes based on their environment (Mostafa, 2018). Safety is a very important factor that can never be ignored in learning environments. Results in some research have shown that the number of injuries and deaths increases significantly among individuals with autism differently from healthy people, this is because of their increased sensitivity (Lee, 2008)& (Mouridsen, 2013). There are some factors and things that achieve safety and reduce risks, such as choosing strong materials of high quality that are not removable, providing safety for protection from hot water and ignoring the excess edges, sharp corners and hanging things, because they cause a great danger to children with autism (Mostafa, 2014).

Examples include achieving safety in design for autistic children in learning environments. According to Mostafa, a building for a school for autistic children included many positive physical, spatial and operational features that were provided

to achieve an educational environment suitable for autistic children among these features that the building included:

- Smart boards.
- Invisible safes for chaos control.
- Spacious spaces and high ceilings for a comfortable feeling and open spaces.
- Quiet colors and neutral colors.
- To avoid using public baths, bathrooms were placed in the classroom.
- Using (Acoustiblok) walls between rooms to avoid disturbance.
- Full use of (LED) lighting in the building.
- Place cameras around the building to monitor movements through the control hall.
- Furniture and equipment for a specialized playground in compliance with international design with accessibility and ease of use.
- Provide classrooms with windows to reduce distraction and distracting and increase focus.
- Private laboratories (Mostafa, 2018).

2.4.2.2 The Physical Environment that Affects the Sensational States of Children with Autism

Comparing society groups, children with autism are the most vulnerable. This largely indicates the design of the built environment and its impact on disability and user performance. The reason being autistic children are affected by the surrounding environment, they must be motivated by feeling that their environment is suitable and providing everything that makes them feel comfortable (Belmonte, 2004)& (Wainwright, 1996)& (Brooks, 2010). Because their sensitivity is great compared to others, there are also many sensory factors affected by people with a sense of education

in the educational environment, such as borders through materials and furniture, such as books shelves in the classroom or adhesive tapes on the ground to know where students gathered (Heflin, 2001)& (Brooks, 2010). In addition, because the environment is one of the most important factors affecting the education process. According to Kang, there are many Physical factors that affect the sensory states, such as color, texture, size, and contrast. For example, blue affects a person's pleasure and emotions. There is also a strong relationship that links the sensory state with pleasure and excitement through color (Kang, 2011). Developing people's feelings and emotion depends on designing the physical environment through the choice of colors, lighting, the shape of furniture, decoration, and environmental planning (Bitner, 1992).

The main factor in making decisions among people is their feelings through their senses (smell, touch, hearing and sight) in the surrounding environment (Havlena, 1986)& (Robert, 1982). Therefore, the sensory environment is one of the necessary factors that encourage the user to desire to continue. The importance of using in the built environment signs or panels as stop, to attract the attention of the students and to easily know what are the things that are forbidden and that are not which is a great way to spread the order in the place (Figure 7).

Figure 7: The Use of Colored Boundaries and Signboards as a Sign of Attention. (URL 7)

2.5 Chapter Conclusion

It was noted in this study that the autism spectrum is a serious condition that continues throughout life, therefore it is necessary to take care of them in a way that suits their health situation, especially in educational environments. There are many necessary necessities for autistic children as the types of services provided, such as therapeutic and educational services, support and other activities, the experience of service providers in addition to the mutual recommendations between parents and teachers about their children's needs. There are also spatial requirements for learning environments for children with autism that must be taken into consideration, such as transitional areas, escape spaces, sensory division, and spatial sequencing. The design of the educational environment is one of the most important factors that help motivate students to communicate in the education process, such as providing a safe environment, physical environment and sensory environment through lighting and colors, choosing appropriate colors and taking into account their increased sensitivity when designing educational environments and their differences from others.

Chapter 3

COLOR IN THE LEARNING ENVIRONMENTS

According to Freed there are many students who are affected by colors in the classroom or learning environments in general, such as students with autism or students who suffer from lack of attention, due to the strength of their sensory responses and their strong ability to distinguish visual objects, so they are more sensitive to color than healthy students, and attention must be paid Because they are different from others (Freed, 1998).

It is easy to have a comprehensive classroom for education environments. The physical environment will be developed in order to provide psychological comfort for students in the classroom, due to their increased sensitivity, by avoiding all influencing and harmful things on their sensory system, therefore the teaching staff must know how color affects students' performance and behavior. The focus must also be at the beginning of building the learning environment, choosing appropriate materials, and paying attention to the final finishes, because organization of building is one of the most important factors affecting students' behavior in the learning environment (Gaines, 2011).Many studies have shown that people with autism are greatly affected by the educational environment. Everything that can influence their behavior in the classroom must be obtained before starting to build and avoiding it to provide a comfortable and appropriate environment.

3.1 Color Perception Theory in the Surrounding Environment

The color perception varies according to the place and the environment, because the color is formed through sunlight, and through the color theory it is perceived, the theory states that color originates through sunlight and then the wavelengths of sunlight fall on an object, such as a piece of furniture or a wall, the body or surface absorbs all the colored rays falling from the light and loses the rays reflected from the surface. The color is perceived by the cells surrounding the retina. Each person has three cones so that the person can define the visible colors, blue, red and green. There are also a small number of animals and women have four cones. Through these cones the colors are known and the level of contrast (Morton, 1995).

Colors are deciphered and perceived by absorbing shapes and colors by sending them to the brain, and then the brain sends its pulses to the main glands to obtain emotional and psychological reactions by regulating the endocrine glands. Two systems consist of colors through these inputs, the first is red and green, the second is yellow and blue. There are basic colors and they are three colors, yellow, blue and red. Primary colors can be combined with each other to obtain secondary colors, but they cannot be mixed with other colors. There is a group of three colors formed by mixing the secondary colors, it is easy to obtain a lot of shades of colors by mixing them with white and black colors. Colors contain basic characteristics, color value, saturation, and dye, and they mean the name of the color, such as green, yellow, etc. The color value is light or dark color, the value of the color can be controlled by mixing it with white to make it a light color or mixing it with black to make it a dark color. Color saturation means its intensity or classification according to color gamut. The colors are divided into two parts according to the temperature, the first is the warm colors, and the second is the

cold colors. Red and yellow indicate warm colors and blue to cool colors. Children in school or before school generally prefer warm colors, but high school students prefer cold colors (Gaines, 2011).

3.2 Physiological and Psychological Responses to Color

According to Gaines the person is affected by the color, these effects result in emotional and psychological reactions. There are changes through physiological responses, such as a change in blood pressure, brain development and eye fatigue, when receiving things in the environment around the person such as colors (Gaines, 2011). A person's mood and attention changes through reactions from the person's interaction with things. There are, some examples of colors and the changes caused by it:

- Red color affects the heart and palpitations faster and causes an increase in blood pressure and a change in the sense of smell in a person.
- The blue color causes many changes, such as helping to reduce the pulse rate and reduce the human body temperature and appetite (Engelbrecht, 2003).

There are hormones released by the brain that produce effects and changes on a person's mood, and these hormones can affect an increase or decrease in a person's energy level or mental clarity when the color is transferred through the eye (Gaines, 2011). According to Torrice children are affected by the colors of the surrounding environment, these effects cause a decrease in their aggressive behavior and blood pressure. Color preferences are divided according to the interaction of children. There are results that show that active children feel comfortable when interacting with cold colors, unlike negative children who prefer warm colors (Torrice, 1989).

It is necessary to pay attention to adding and choosing colors appropriately when designing the learning environment because color is an important design factor that increases students 'desire for education (Gaines, 2011). There is a theory (detection of signals) this theory states that continuing to arrange visual information depends on the human mind. Because of the influence of some colors or movements on the distraction, which makes the process of organizing visual information difficult, and consequently, it will affect the human mind (Verghese, 2001). This figure represents the 7 color meanings that affect on the mood of the children in the learning environment, some of the colors have a huge impact on their psychology, as changing their mood from time to time, affecting on their behaviors and feelings towards things, it is either have an effect on them positively or negatively.

Figure 8: Color Psychology: How Color Meanings Affect. (URL 8)

3.3 Role of Specific Color Variations on Children with Autism in the Learning Environment

Some researchers conducted studies on the topic of color and its preferences. The most important topics of studies were on many issues, such as color preferences and their difference with autistic children, how colors are used to treat some of their problems, their preference for colors. Some researchers also got to know the many colors that make children hate things of specific colors through doctors, teachers and service providers (Choi, 2019).

Found by Grandgeorge in a recent study through an experiment on children with autism and their preferences for colors. This experiment was between 6 colors, green, blue, brown, yellow, red and pink in a hospital. As a result of this experience, a group of autistic children preferred the green and brown colors significantly, and they did not feel comfortable during the interaction with the yellow color compared to the rest of the group (Grandgeorge, 2016). According to Choi some studies have examined the benefits of color in the treatment process, such as reducing visual fatigue and developing the performance of people with autism and their interaction with others, color helps increase the level of emotional responses among students with autism in the educational environment and helps students to read faster and change their perception for their daily practices. The figure 9 and 10 shows the preference of children of some colors on other colors, it is explained by how they reacts towards the colored toys or objects and what colors they choose spontaneously based on their psychological tranquility (Choi, 2019).

Figure 9: The Preferences of Autistic Children towards Colors. (URL 9**)**

According to Scott including color in a learning environment can have a significant effect on student interest, actions and attainment. Many students with autism disorder inside the classroom are especially prone to color. The movement toward comprehensive autism education is growing, and rising the number of children with special needs, including the wide variety of learning disorders, means more important than ever are the color choices you make in your classroom. Color is one of the simplest ways in which caregivers and teachers can make sure that people with autism can improve their living and learning environment. Except in a public space like a classroom, there are plenty of ways to fulfill individual learners' color preferences. Colored things like paper and glasses, and art products like beads both fit well. Using favorite colors as decorations in apparel and decor is a perfect option for parents with children with autism where individual color choices may not be the greatest choice in terms with mood and behavioral effect (Scott, 2009).

Since classrooms are shared spaces that represent learners with a range of color needs and answers, choosing a appropriate color scheme poses some specific challenges.

Research into this subject indicates that balance is the key. Classrooms that are overly distracting may have a highly negative impact on autistic learners leading to activities such as flapping paws, repetitive staring, focused looking at the lights and running fingertips back and forth in front of the nose. Both kinds of responses indicate links to decreased contact, poor attention and less social interaction (Imhof, 2004).

Figure 10: Role of Specific Color Variations on Children with Autism in the Learning Environment. (URL 10)

3.3.1 Color Perception in Autistic Children and its Impact on their Learning Environment

According to Hochhauser and Iarocci children with ASD are often exposed to atypical sensory processing. "Sensory perception" refers to the relationship between sensory triggers and adaptive behavioral self-regulation techniques. Through a therapeutic perspective, sensory under-responsiveness and/or over-responsiveness will contribute to actions that either produce or resist sensory input in an attempt to help the ASD child deal with external stimuli. To order to ensure that inclusive curriculum strategies are successful for children with ASD, educators must become more aware of sensory coping issues and contextual adjustment to the classroom must be introduced (Hochhauser, 2010) & (Iarocci, 2006). In this figure 11, it is demonstrating the way

that is used by the providers to help the autistic children to perceive the colors one by one through activities and sensory rooms which is offering colored games.

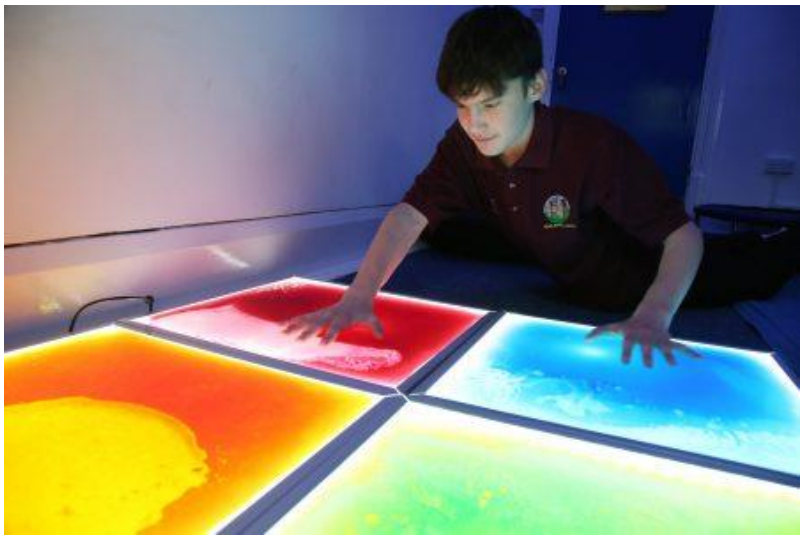


Figure 11: Color Perception in Autistic Children through Sensory Rooms that used in Educational Centers. (URL 11)

Color perception is an important factor in the educational environment in children with autism. Each color has its own features and is perceived differently from the other. According to Howlin and White, information was obtained from some parents about the awareness of their autistic children of some colors, and it was found that they reject green foods, they prefer largely blue things and prefer drinking from a red bowl. Information was also obtained from a child with autism that refused to look at his gift because of its yellow color, upon adding red color to it, he realized that it was burning because of the orange color resulting from the combination of colors. Some children with autism improve physically and emotionally by looking at the colored lighting (Howlin, 1996)& (White, 1987). So, the use of colors in learning environment in specific spaces and spatial requirements must be taken in consideration and to pay attention more to the choice of colors for each space such as spatial sequencing in class room (Figure 12), transition zone like corridors, stairs (Figure 13) and the escape

spaces must be divided to many parts with different colors so the students can go from a place where they felt bored to the other place where they can be more comfortable and restful (Figure14). Using the right colors in these spatial requirements in learning environment plays a big role in creating a soft, calm and cozy place and environment for the children with autism.

Figure 12: The Use of Color in Class Rooms to create the Right Spatial Sequencing. (URL 12)

Figure 13: Specific Colors and its Utilization in the Transition's Zones in Learning Environment. (URL 13)

Figure 14: The Way of Employing Colors in Classrooms to Generate Escape Spaces. (URL 14)

According to Williams and Ludlow, a woman with autism realized the effect of colored lighting on her psychological comfort, mood, accuracy in seeing things clearly, the red color helped her to pay attention, awareness and activity instead of inactivity and laziness. The color controls people with autism through their feelings and perceptions (Williams, 1998)& (Ludlow, The effect of coloured overlays on reading ability in children with autism, 2006). Colors affect reading in educational environments through eye strain and cognitive problems such as obfuscation and lack of clarity of letters and numbers. It also caused children's minds to be distracted by the appearance of shapes or the opposite of colors on the reading page (Irlen, 2005)& (Wilkins, 1987). In these 2 pictures, we can notice the different reactions or feelings that took place once the children were facing some situations as, perceiving colors while playing with colored games, thus, either anger, anxiety is produced, or joy and happiness. Figure 15.

Figure 15: The Feeling Occurred by Autistic Children towards Colors in Learning Environment. (URL 15)

3.3.2 Physiological and Psychological Responses of Children with Autism towards Color

According to Ludlow the way to treat children with autism depends on choosing the right color for each case, there are recent experiences to use the correct colors that can increase focus, activity, the ability to learn, understand and remember children with autism. Surrounding the body with a mixture of colors, wearing clothes, changing room lighting, coloring the line when reading varies from case to case, is often noticed during the treatment of some cases with autism that there are cases that sleep calmly on the color blue, others in green by distinguishing them overnight (Ludlow, 2008). Most responses to some colors are as follows:

- The yellow color contributes to stimulating memory.
- Avoid the red color in children who suffer from hyperactivity.
- Stay away from the black color because it gives him negative energy.
- Orange stimulates the child to mix.
- Blue and green colors help to sleep better, others may prefer green only (Grandgeorge, 2016).

Figure 16. The several methods that the teachers in the learning environment use to help the students with autism in the class rooms by treating their anger or displeasure about colors, as noticed in the pictures, some students can be responsive with the treatment but some others face some issues and might need more time to cope with the treatment.

Figure 16: Physiological and Psychological Responses of Children with Autism towards Color. (URL 16)

3.4 Chapter Conclusion for Associating Color in the Learning Environment

The theory of color perception in the surrounding environment depends on the fundamental characteristics of color, saturation and hue. Colors are also divided into two parts according to temperature, the first is warm colors, the second is cold colors, color perception varies according to place and environment, because color is formed through sunlight and through the color theory that is perceived. The physiological and psychological responses to color differ from person to person, the person is affected by colors, these effects lead to emotional and psychological reactions. Multiple changes may occur through the physiological and psychological responses of individuals.

As for the role of specific color differences in children with autism, color preferences help in the treatment process for children with autism, as color perception is an important factor in their educational environments, each color has its own advantages and is seen differently from the other. There are some physiological and psychological responses for children with autism towards color, it is like an increase in focus, activity, ability to learn, understand and remembering in autistic children.

Table 2: The Frame of Work of the Study

Example				
The subject covered		**Explanation**	**Colors used in those specific spaces**	**Photographs**
Services given to various needs	Type and Amount of Services			
	Process of Providing Services			
Requirements of Autism learning environments	Spatial Sequencing, Escape of Spaces, Compartmentalization, Transition Zones and Sensory Zoning			
Environmental Design for Autism	The safe and the Physical Environment that affects the sensational States of Children with Autism			
Impact of color on autism in the learning environment	Color Perception in Autistic Children and their Physiological and Psychological Responses towards Color and its Impact on their Learning.			

The frame of work was done depending on the subjects covered in the literature review to evaluate the theoretical information through the selected examples, and the most part of this table which is the limit of this research is the Impact of color on autism in the learning environment that is discussing the color perception , the physiological,

and the psychological responses in different spaces in the educational environment for each centers.

Chapter 4

EVALUATION OF THE THEORETICAL INFORMATION THROUGH CHOSEN EXAMPLES

In this chapter, the theoretical study will be evaluated through selecting some examples of built learning environments for children with autism. This chapter will specifically study, the impact of colors on advancement of learning. Materials used in the designed environment and spatial design considerations will also be issued. How to design educational environments in general and the services provided in those environments will also be addressed. The assessment in this chapter is based on a literature review done previously on subjects such as the effects of colors and environments on the overall education process.

The research criteria was based on the reputation, the credibility of the centers and they are also the best and most known centers in Jordan, Amman, the spatial requirements were designed in the appropriate way that is suitable for each student's case in the centers, they were a caring and giving attention to every detail in the learning environment to create a great ambiance for the autistic children, adding to that, it was so easy to reach and contact them to get the information needed for this thesis research.

In the learning environment, some students such as autistic children may be more sensitive to color due to heightened sensory responses and high visual processing

capabilities. Teachers and school administrators need to consider how color influences autism behavior in students. By recognizing and removing adverse sensory effects, a thoughtfully designed physical environment will enhance the psychological comfort of the most sensitive students (Gaines, 2011). In the due course of avoiding sensory overload and achieving an optimal learning environment for children with autism, consideration must be given to the significance of the special color preference.

4.1 Consulting Center for Autism

The Consulting Center for Autism is a specialized center for the treatment and education of autistic children; It is located at the center of Amman - Jordan. The center consists of six floors (Two are in the basement, and the other four floors are shown in the (Figure 17)), three of which are student housing, and the other three include several facilities, such as:

- Occupational therapy room
- Physiotherapy room
- Speech therapy room
- Games rooms
- Department of education
- Sensual stimulating room.

The center has a capacity of 100 students, including foreign students and local students, their ages are between three to eighteen.

Figure 17: The Building of Consulting Center for Autism. (Author, 2020)

- **Provided Services**

Among the services provided by the center are early intervention services, remedial education, assessment, diagnosis and early detection, supportive medical services such as speech training, physical and occupational therapy, social skills development programs. The center includes a specialized unit for developing sensory skills, a specialized unit for development and training, in addition to the internal housing unit that receives students from neighboring countries and provides them with the necessary services, care among other things. The center communicate with children's parents all the time to know what are needs of their children and if they are satisfied of the services provided in center.

- **Spatial Parts of the Center towards Various Requirements**

As mentioned above, the center includes several facilities designed in different forms according to their purpose. They are distributed in the center in a regular spatial sequence to facilitate the process of moving students from one activity to another

(Figure 18). Organize the facilities in the educational environments for autistic students avoids confusion and distraction as it helps them distinguish regions (Mostafa, 2018).

Figure 18: The Transition Zones in the Building. (Author, 2020)

The center takes into account the provision of personal space between some student by one meter in the classroom (Figure 19), because the most children with autism prefer wide spaces and they feel intimidated when other people gets close to them.

Figure 19: Personal Space between some Student. (Author, 2020)

There are also transitional areas among the facilities in the center to motivate students for other activities. This center depends on the sensory division at the level of the students' case because most of the cases in the center are simple and intermediate cases. The center usually avoids receiving children with serious autism cases because of the arduousness in dealing with them. Therefore, teachers in their usual situations deal with simple and intermediate cases in the center because of their rapid responses and great awareness of things around them, and because they are less sensitive than serious cases. Therefore, the teachers deal with each student according to his condition and need for the facilities. Some students do not need occupational therapy, but they need speech therapy, some of them are affected by some colors, although others prefer the same colors.

- **The Built Environment Design of the Center**

As stated above, the center consists of six floors divided into three residential floors for students and the other three divided for occupational therapy room, physiotherapy room, speech therapy room, games rooms, department of education, sensual stimulating room. Each of those departments are designed in the proper way to achieve the aim and to provide students good services as well as comfortable environment.

Because there are no difficult cases of students in the center, the center uses mostly mobile furniture (Figure 21). Together with this, colored stickers and signs are used to ensure clarification of understanding of students (Figure 22). The center also includes a sensual white room for showing colorful games that students interact with as a way to change their mood (Figure 20).

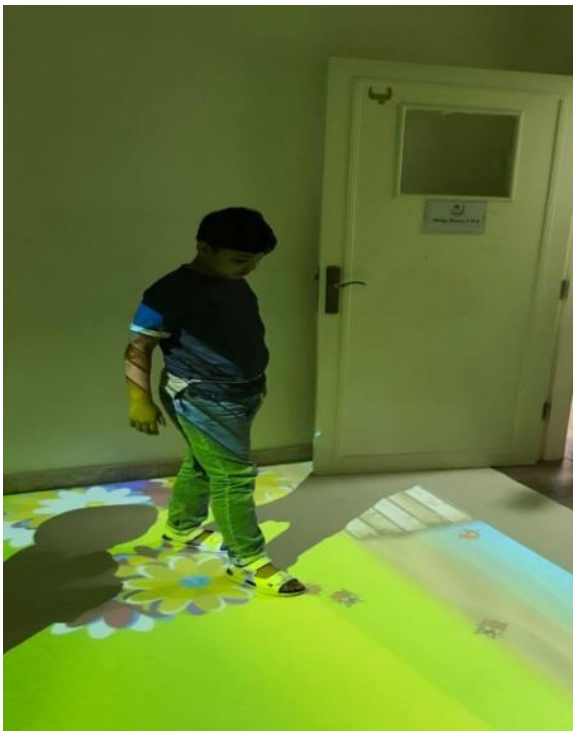


Figure 20: Sensual White Room for Showing Colorful Games. (Author, 2020)

Figure 21: Furniture that are used in Center. (Author, 2020)


Figure 22: Colored Stickers and Signs are used. (Author, 2020)

The center contains many cameras to monitor students and windows to replenish the air in the classroom. The center used the white color in most of the center's walls to show the colorful moving furniture and realize it easily, but different colors were used for the floors. The center uses moveable plastic furniture in classrooms such as chairs and tables because it is safer for children. The classrooms are spacious each room has windows to replenish air from time to time.

- **Impact of Color on Autism in the Learning Environments of the Center**

Color is considered one of the most important factors in the educational environments for students with autism. Gestalt theory is one of the most important intellectual schools and one of the most prominent theories of learning, that is the basic idea of the school to the possibility of learning with insight. The theory suggests that the process of land learning is largely determined by sensory perception and human senses. According to this theory, there are basic principles of visual perception that explain how the brain understands visual images that lack any arrangement. Through this basic principle of the theory Gestalt is that the human mind constitutes a world

through the identification of patterns and similar elements, which are proximity, similarity, Symmetry, continuity, Figure–Ground, closure and common regain (King, 2005).

The center uses Gestalt theory in designing colors in most facilities to helps students realize things around them easily, such that the background is white and the shapes and other parts are colored, such as furniture, curtains and toys (Figure 25). The center uses the blue color everywhere in the center because it is one of the most comfortable colors for students and it helps to concentration and reduces distraction in classroom. According to (Engelbrecht, 2003), the blue color causes many changes, such as helping to reduce the pulse rate, the human body temperature and appetite and that aid the active children to feel comfortable when interacting with cold colors as blue color, unlike the negative children who prefer warm colors. In addition, many physical factors affect the sensory states, such as color, texture, size, and contrast. For example, blue affects a person's pleasure and emotions (Kang, 2011).

Red color is used the most in the occupational treatment rooms (Figure 23), it is not used in classroom because it negatively affects the performance of some students. As mentioned in the literature review, red color affects the heart palpitations making them faster which causes a spike in blood pressure also a change in the sense of smell in a person with autism (Engelbrecht, 2003).

Green, pink, yellow, orange and blue colors have been used in the center through furniture and curtains because it makes the students feel safe as stated previously in

chapter 3 (Grandgeorge, 2016). Brown is used in windows to reduce sunlight due to its effect on some students.

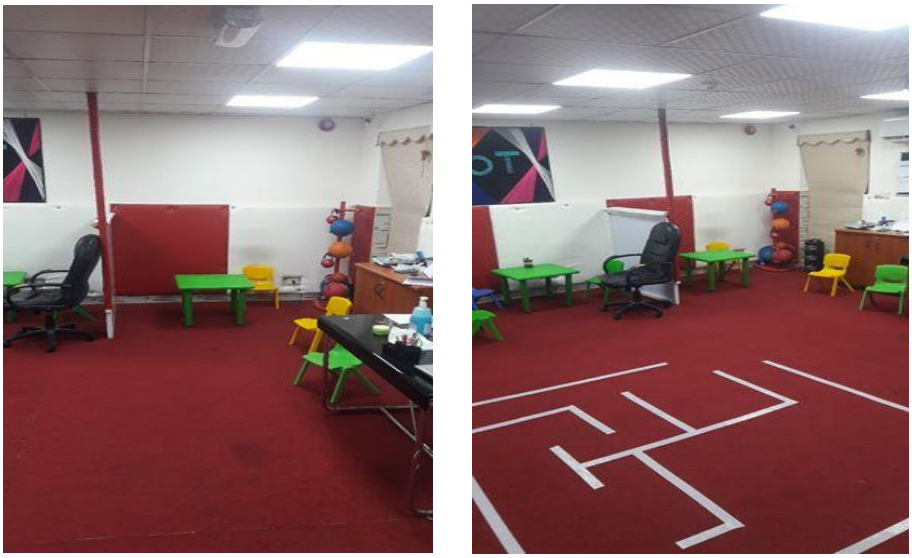


Figure 23: Occupational Therapy Room. (Author, 2020)

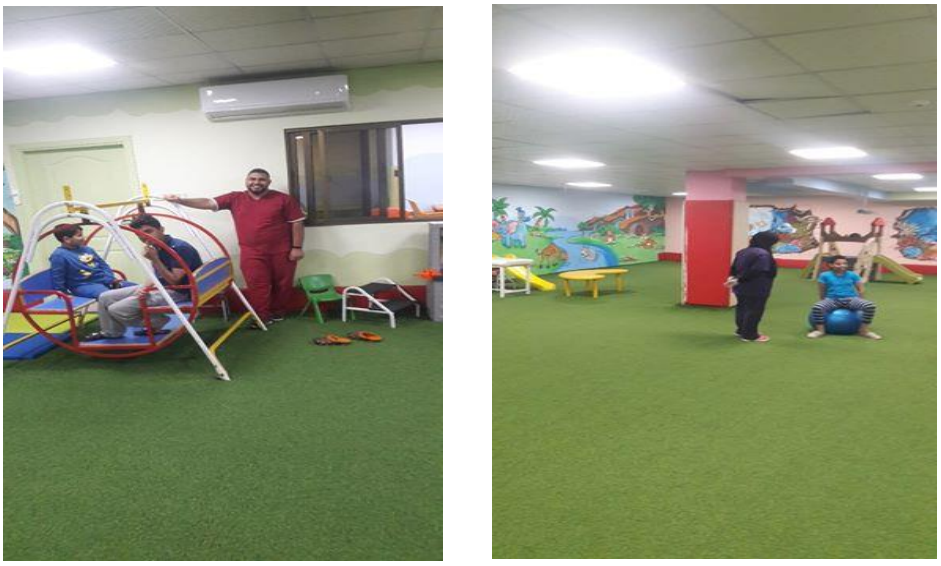
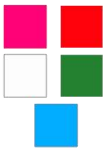
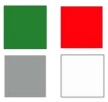
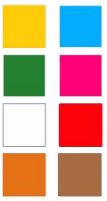


Figure 24: Indoor Game Rooms. (Author, 2020)

Figure 25: Children's Education Rooms. (Author, 2020)

Table 3: Evaluation Sheet of the Color Usage and Spatial Organization of the Consulting Center for Autism

Example 1: Consulting Center for Autism				
The subject covered		**Explanation**	**Colors used in those specific spaces**	**Photographs**
Services given to various needs	Type and Amount of Services	• Medical services • Social services • Educational services		  By author, 2020
	Process of Providing Services	The process of providing services is a participatory process through communication with parents		  By author, 2020
Requirements of Autism learning environments	Spatial Sequencing, Escape of Spaces, Compartmentalization, Transition Zones and Sensory Zoning	• Multiple facilities to meet the needs of students. • Distribution of facilities in a regular spatial sequence. • Providing personal space among students. • Providing transitional areas between facilities. • Achieving the physical division taking into consideration the health situation.		  By author, 2020
The built Environment Design of the Center	The safe and the Physical Environment that affects the sensational States of Children with Autism	• Mobile furniture is the most used. • Hanging things on the walls. • Sensual white room for showing colorful games. • Many cameras to monitor students. • Windows to replenish the air in the classroom. • Colored stickers and signs to clarify some things for students.		    By author, 20 20
Impact of color on autism in the learning environment	Color Perception in Autistic Children and their Physiological and Psychological Responses towards Color and its Impact on their Learning.	• Gestalt theory have been used in designing colors. • The center uses the blue color everywhere in the center. • Red color has been used in occupational treatment rooms. • Green, pink, yellow, orange and blue colors are used in furniture and curtains. • Brown color is used in windows.		   By author, 2020

4.2 Lubna Special Education Center

Lubna Center for Special Education is a learning and treatment center for people with special needs, especially those with autism. The center is located at the west of the city of Amman - Jordan. The building consists of two floors, each floor contains several facilities, including: Medical clinic, sports activities room, music activities room, physiotherapy department, occupational therapy department, speech therapy department, classrooms and behavior therapy department. The center accommodates between 50 and 70 male and female students between the ages of 3-18.

Figure 26: Building of Lubna Special Education Center. (URL 17)

- **Provided Services**

The center provides many services and these services are divided into four sections:

- Special educational services, which include behavioral therapy by modifying the behavior of children, teaching them on social media, preparing students for academic readiness, and also includes training students who are unable to learn through the regular curriculum in particular.

- Supportive services, which include occupational therapy, physical therapy and speech therapy. Support services address students with movement problems, speech problems, and training in daily life skills.
- Activities include music and sports activities.
- Medical services.

Services are provided to students through the development of individual educational plans through the center, and then a meeting is held with the students 'families to discuss the goals of the plan.

- **Spatial Parts of the Center towards Various Requirements**

As mentioned above, there are many facilities in the center, each providing different services from the other. These facilities were divided by relying on corridors and ladders to facilitate the process of providing services to students and gathering them (Figure27).

Figure 27: The Transition Zones in the Building. (URL 18)

Each department is designed with wide areas and allocating each according to the services provided to achieve psychological comfort for students upon receiving services (Figure28).

Figure 28: Design Spaces for the Center's Facilities. (URL 18)

- **The Built Environment Design of the Center**

As mentioned above, the center consists of two floors. The first floor contains the administration and reception department and a special section for early childhood for those under 6 years old. The second floor consists of four classrooms, two of which are for students aged 6-11 and the other from 12-18 years. The second floor is on the support services section, each designed in a way that meets the needs of students. The center uses simple and mobile furniture such as chairs and tables made of plastic and wood in different colors in the classroom (Figure 29).

Figure 29: Furniture used in the Classroom. (URL 19)

Adhesive tapes are used during activities and in the classroom to facilitate students' perception process (Figure 30). A safe environment is provided for students in the center through the use of cameras to monitor student movements within the center, use of some materials, such as sponges, to hide sharp corners in the rooms because some students hurt themselves by hitting their heads against walls and rubber material in the floors to protect them when they fall to the ground, and adhesives on the stairs to avoid slipping (Figure 31).

Figure 30: Use of Colored Stickers during Activities. (URL 20)

Figure 31: Achieve a Safe Environment. (URL 21)

- **Impact of Color on Autism in the Learning Environments of the Center**

The white color resulting from mixing three cool colors, that are green, blue and red through the (RGB) mixture system, was used for all the walls of the center because it

is considered one of the favorite light colors among children with autism, that mixture can help student to feel three colors in one. As stated in literature, the cold colors help to increase focus and reduce dispersion, (Engelbrecht, 2003) (Figure 32). Furniture, curtains and floors were used in different colors, such as blue, red, green, brown, gray and pink, as mentioned in the literature, it makes students feel safe (Grandgeorge, 2016) (Figure 33). As mentioned in the literature, the color preferences of children with autism differ depending on their sensory integrity and mood (Ludlow, 2008). The teachers at the center deal with each child according to his health condition because of their different preferences for color from time to time.

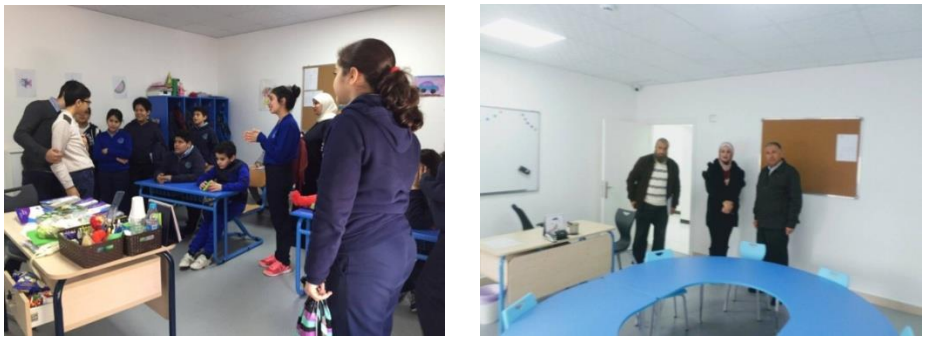
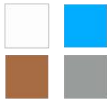
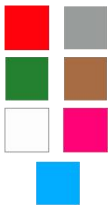
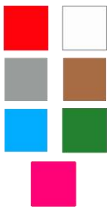


Figure 32: The Use of White Color in the Classroom. (URL 22)

Figure 33: The Use of Colored Furniture in the Classroom. (URL 23)

Table 4: Evaluation Sheet of the Color Usage and Spatial Organization of Lubna Special Education Center

Example 2: Lubna Special Education Center				
The subject covered		**Explanation**	**Colors used in those specific spaces**	**Photographs**
Services given to various needs	Type and Amount of Services	• Special educational services • Support Services • Activities • Medical services		   
	Process of Providing Services	The center organizes meetings for parents of students to know the recommendations in providing services.		
Requirements of Autism learning environments	Spatial Sequencing, Escape of Spaces, Compartmentalization, Transition Zones and Sensory Zoning	• Many facilities to provide different services. • The facilities are designed in spacious areas, each one separate from the other. • Safe transit areas, such as stairs and corridors, to reach all facilities. • Providing privacy for each student by providing some services individually.		 
The built Environment Design of the Center	The safe and the Physical Environment that affects the sensational States of Children with Autism	• The center is designed with two floors, each floor is designed for the purpose. • Use materials such as sponges, rubber, and surveillance cameras for safety. • Use of simple wooden and plastic furniture. • Use stickers on the walls and floors. • Multiple windows in the rooms.		   
Impact of color on autism in the learning environment	Color Perception in Autistic Children and their Physiological and Psychological Responses towards Color and its Impact on their Learning.	• Use the white color in the walls through the mixing system (RGB). • Furniture, curtains and floors were used in different colors, such as blue, red, green, brown, gray and pink. • The students color preferences in center differ from time to time depending on their sensory integrity and mood.		   

4.3 Autism Academy of Jordan

The Autism Academy of Jordan is an educational and therapeutic center specialized in caring for people with autism spectrum. It is located in the east of Amman - Jordan. The building consists of four floors, each floor contains nine sections in each of it there are twelve rooms divided into many facilities such as educational and therapeutic classes, games rooms and music. In addition to the internal housing for foreign students. The center accommodates from 200 to 250 students between the ages of 3 to 18.

Figure 34: Building of Autism Academy of Jordan. (URL 24)

- **Provided Services**

The center provides many therapeutic services (physical therapy, occupational therapy, speech therapy) and educational services such as learning difficulties and how to communicate with others. There are also some services such as sports activities like football, other games and musical activities to entertain students from time to time. Some services are provided to students individually, such as therapeutic services and some other services due to the different students' cases. Services are provided to students through mutual recommendations between parents and teachers, through

meetings with students' families individually every month and sometimes every week depending on the students' needs.

Figure 35: Some of the Treatment Services Provided in the Center. (URL 25)

Figure 36: Some Sports and Music Activities in the Center. (URL 26)

- **Spatial Parts of the Center towards Various Requirements**

As previously mentioned, the center consists of four floors divided into many treatment rooms and classrooms, each floor in the center is divided into several sections through corridors and stairs in several forms to separate each section from the other to meet the need of it easily (Figure 37).

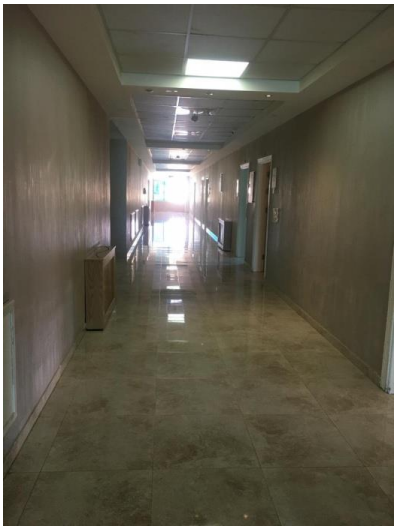
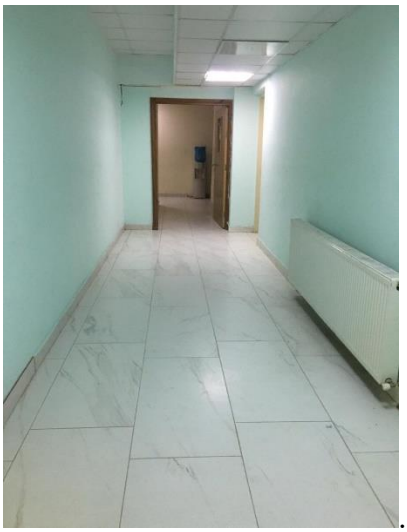



Figure 37: Transitional Areas and Division of Rooms through Corridors. (Author, 2020)

Each facility in the center has a special design, such as providing large spaces in facilities that offer group activities like class and games rooms. There are also individual services such as physiotherapy, occupational therapy and speech therapy rooms designed in a simple way to help the student focus (Figure 38).


Figure 38: Spatial Parts of the Center towards Various Requirements. (URL 27)

- **The built Environment Design of the Center**

As shown above, the building of the center consists of four floors on each floor, nine spacious classrooms and some rooms are divided into 4 treatment units for individual services such as occupational therapy, speech therapy and other support services

(Figure 39). In addition to the widely designed classroom and physiotherapy rooms (Figure 40).

Figure 39: Individual Service Rooms Design. (URL 28)

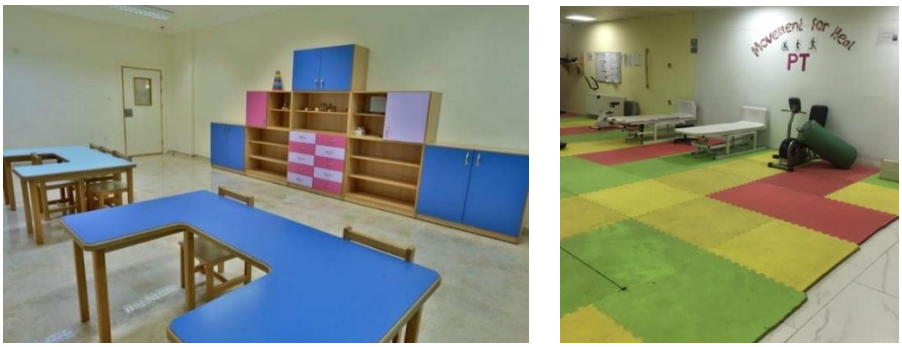


Figure 40: Classroom and Physiotherapy Rooms Design. (Author, 2020)

In classroom rooms, the center uses windows to obtain natural light and to refresh the air from time to time, the use of mobile plastic furniture for age groups 3 to 7 years, and wooden furniture for ages 7 to 18 (Figure 41). To achieve a safe environment for students, the center uses wooden covers to hide the central heating AC, and sponge floors for the safety of students when they fall to the ground, the center contains many cameras to monitor students everywhere in the center (Figure42).

Figure 41: Furniture and Windows used in Classrooms. (Author, 2020)

Figure 42: Some of the Materials used to Achieve a Safe Environment. (Author, 2020)

- **Impact of Color on Autism in the Learning Environments of the Center**

As mentioned in the literature, most children with autism prefer cool colors because they help to focus (Engelbrecht, 2003). That is why the center used the white color in the walls of the center to help students perceive things easily (Figure 43). Furniture, windows and curtains inside the classroom with different colors for instance blue, red, brown, gray, white, yellow, orange, green, and pink, as they increase the student's sense of security and enable him to perceive it easily (Grandgeorge, 2016) (Figure 44).

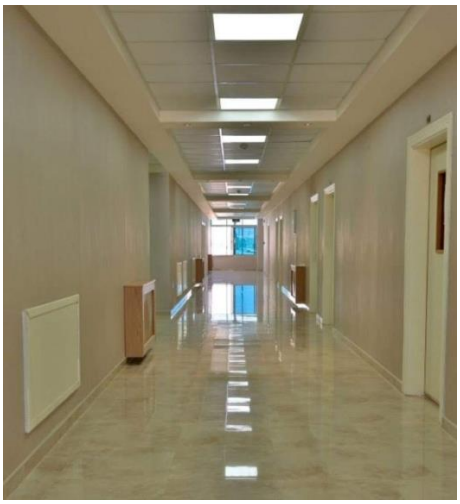


Figure 43: The Use of White Color in the Walls of the Center. (URL 29)

Figure 44: Furniture, Windows and Colored Curtains. (Author, 2020)

Some students get distracted from some of the bright colors present in the teachers' dresses, so there are recommendations from the administration for teachers to choose the quiet colors of their clothes while providing services to students (Figure 45).

Figure 45: Some Students are Distracted by the Colors of the Teachers' Clothes. (URL 30)

Table 5: Evaluation Sheet of the Color Usage and Spatial Organization of Autism Academy of Jordan

Example 3 : Autism Academy of Jordan				
The subject covered		**Explanation**	**Colors used in those specific spaces**	**Photographs**
Services given to various needs	Type and Amount of Services	• Therapeutic services • Educational services • Music and sports activities • Medical services		
	Process of Providing Services	Mutual recommendations between parents and teachers, through meetings with student families individually each month and sometimes every week depending on the student's need.		
Requirements of Autism learning environments	Spatial Sequencing, Escape of Spaces, Compartmentalization, Transition Zones and Sensory Zoning	• Many facilities to provide different services. • The facilities are designed in spacious areas, each one separate from the other. • Transition areas, such as stairs and corridors, to reach all facilities. • Providing privacy for each student by providing some services individually.		
The built Environment Design of the Center	The safe and the Physical Environment that affects the sensational States of Children with Autism	• The center is designed with four floors, each floor is divided in different facilities. . • Use materials such as sponges, gypsum board material, and surveillance cameras for safety. • Use of simple wooden and plastic furniture. • Multiple windows in the rooms for natural lighting and air regeneration.		
Impact of color on autism in the learning environment	Color Perception in Autistic Children and their Physiological and Psychological Responses towards Color and its Impact on their Learning.	• Use the white color in all the center walls. • Furniture, curtains and windows have been used in different colors such as blue, red, brown, gray, white, yellow, orange, green and pink. • Recommendations from the administration for teachers to choose the quiet colors of their clothes because it affect the students 'focus.		

4.4 Comparative Analysis, Discussion and Findings

In the previous parts of this chapter, an evaluation was made of some autism centers that were chosen to achieve the purpose of this study. This evaluation is based on the existing centers based on the topics specified in of the literature review. However, in this chapter, the study of the examples specified in the previous parts will be compared with what was mentioned in the study of literature according to the results achieved during the study of the built environment and the colors used and the services provided in three educational centers for autistic children. In the next parts, the results will be mentioned in relation to the preferred colors and its effects together with the necessary needs for children with autism in educational environments.

4.4.1 The Various Centers Selected for the Study

To have a good understand of the impact of color on learning environments of autistic children, a comparative analysis was done with the various examples that were selected for the study all located in Jordan, these include the Consulting center for autism, Lubna special education center and Autism academy of Jordan. The comparative analyses are divided into two; the first is the part compares the explanation of the subject covered by the selected centers, while the second analysis is dedicated to colors that were used in the centers.

Table 6: Table Comparative Analysis of the Subjected Covered by the Centers

The subject covered	Explanation	Consulting Center for Autism	Lubna Special Education Center	Autism Academy of Jordan
Services given to various needs	Type and Amount of Services	• Medical services • Social services • Educational services	• Special educational services • Support Services • Activities • Medical services	• Therapeutic services • Educational services • Music and sports activities • Medical services
	Process of Providing Services	The process of providing services is a participatory process through communication with parents	The center organizes meetings for parents of students to know the recommendations in providing services.	Mutual recommendations between parents and teachers, through meetings with student families individually each month and sometimes every week depending on the student's need.
Requirements of Autism learning environments	Spatial Sequencing, Escape of Spaces, Compartmentalizatio n, Transition Zones and Sensory Zoning	• Multiple facilities to meet the needs of students. • Distribution of facilities in a regular spatial sequence. • Providing personal space among students. • Providing transitional areas between facilities. • Achieving the physical division taking into consideration the health situation.	• Many facilities to provide different services. • The facilities are designed in spacious areas, each one separate from the other. • Safe transit areas, such as stairs and corridors, to reach all facilities. • Providing privacy for each student by providing some services individually.	• Many facilities to provide different services. • The facilities are designed in spacious areas, each one separate from the other. • Transition areas, such as stairs and corridors, to reach all facilities. • Providing privacy for each student by providing some services individually.
The built Environment Design of the Center	The safe and the Physical Environment that affects the sensational States of Children with Autism	• Mobile furniture is the most used. • Hanging things on the walls. • Sensual white room for showing colorful games. • Many cameras to monitor students. • Windows to replenish the air in the classroom. • Colored stickers and signs to clarify some things for students.	• The center is designed with two floors, each floor is designed for the purpose. • Use materials such as sponges, rubber, and surveillance cameras for safety. • Use of simple wooden and plastic furniture. • Use stickers on the walls and floors. • Multiple windows in the rooms.	• The center is designed with four floors, each floor is divided in different facilities. . • Use materials such as sponges, gypsum board material, and surveillance cameras for safety. • Use of simple wooden and plastic furniture. • Multiple windows in the rooms for natural lighting and air regeneration.
Impact of color on autism in the learning environment	Color Perception in Autistic Children and their Physiological and Psychological Responses towards Color and its Impact on their Learning.	• Gestalt theory have been used in designing colors. • The center uses the blue color everywhere in the center. • Red color has been used in occupational treatment rooms. • Green, pink, yellow, orange and blue colors are used in furniture and curtains. • Brown color is used in windows.	• Use the white color in the walls through the mixing system (RGB). • Furniture, curtains and floors were used in different colors, such as blue, red, green, brown, gray and pink. • The students color preferences in center differ from time to time depending on their sensory integrity and mood.	• Use the white color in all the center walls. • Furniture, curtains and windows have been used in different colors such as blue, red, brown, gray, white, yellow, orange, green and pink. • Recommendations from the administration for teachers to choose the quiet colors of their clothes because it affect the students 'focus.

4.4.2 The Explanation of the Subject Covered by the Selected Centers of the Study

Under the subject covered of services given to various needs; types and amount of services; it can be noted that the three centers all provide services like medical, educational and social services. A special service that is provided by the Autism

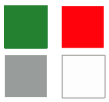
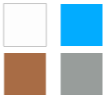
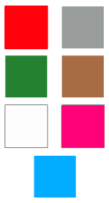
Academy of Jordan, which is not provide by the rest is the music activities. However, the process for providing the services for the centers as noted in the analysis involves the participation of the parents with the teachers, in the Lubna special Education center, recommendations are being given to the parents on how to about the education of their kids at home.

Under the subject covered for requirement of Autism learning environment; which include spatial sequencing, escape spaces, compartmentalization, transition zones and sensory zoning; it would be noted in the comparative analysis of this part that all the centers are design to meet the learning environment for Autism with having personal spaces for all for the students, specialized spaces for specific activities, well sequenced spaces for each activities, the provision of transitional spaces like stairs, corridors and hallways and spacious spaces for every activities.

Under the subject covered for the built environment design of the centers; the safe and the physical environment that affects the sensational states of children with Autism; it can be noted in the analysis that the three centers have the following; The use of camera in monitoring the students in all the spaces, the use of wooden and plastic furniture to provide a safe space for the students, the use of colored stickers and signs on the walls and on the floors to provide clarification for students, and provision of multiple windows for natural lighting and ventilation within the spaces. However, the Autism Academy of Jordan has four floors that are design to provide special services and activities for the education of the students, while Lubna Special Education Center, have two floor that are also specially design to meet the need of the students.

Under the subject covered for impact of colors on autism in the learning environment, color perception in Autistic children and their physiological and psychological response towards colors and its impact on their learning. A common trend found in both the Lubna Special Education Center and the Autism Academy of Jordan part is furniture, curtains and floors were used in different colors, such as blue, red green, brown, gray, and pink. This also found in consulting center for Autism, but just having green, pink, yellow and blue colors. The Consulting center for Autism also used Gestalt theory in designing colors (King, 2005). It also used brown color for it windows. The Autism Academy of Jordan used white colors for all it center walls, while the Lubna Special Education Center used white color on the walls through the mixing system of (RGB). The Lubna Special Education Center uses student color preference in center differ from time to time depending on their sensory mood. While the Autism Academy of Jordan provide recommendation from administration for teacher to choose the comfortable colors for their clothes because of it affect the student focus (Ludlow, 2008).

Table 7: Colors Used in Specific Spaces

Centers	Colors used in specific spaces (explanation)				
	Services given to various needs		Requirements of Autism learning environments	The built Environment Design of the Center	Impact of color on autism in the learning environment
	Type and Amount of Services	Process of Providing Services	Spatial Sequencing, Escape of Spaces, Compartmentalization, Transition Zones and Sensory Zoning	The safe and the Physical Environment that affects the sensational States of Children with Autism	Color Perception in Autistic Children and their Physiological and Psychological Responses towards Color and its Impact on their Learning.
Consulting Center for Autism					
Lubna Special Education Center					
Autism Academy of Jordan					

4.4.3 The Color of the Specific Spaces by the Selected Centers of the Study

This second table covers the color section of the comparative analysis, in which color used in the various center selected are analyzed according to the subjected covered by the study. It can be noted for the analysis above for subject covered type and amount of services the major colors that are used are white, green, Pink, blue, red, and brown, while The Autism Academy of Jordan and the Consulting center for Autism uses

yellow and orange color that were not found in The Lubna Special Education Center but gray color was neglected in the Consulting center for Autism in contrary to the other centers. While process for services see the Consulting center for Autism have more colors for space that process the services, while the other centers selected have lesser colors, white is the common color found in this part.

For the subject cover for requirements of Autism learning environment, which include spatial sequencing, escape spaces, compartmentalization, transition zones and sensory zoning; white is the common color used in all the centers selected for this study. However, the Consulting center for Autism is also noted of using more colors such as green, red, gray and white to the other centers that used just two colors each with the Autism Academy of Jordan white and brown, while The Lubna Special Education Center used white and gray color.

As for the subject cover for the built environment design of the centers; the state and the physical environment that affects the sensational states of children with Autism; Autism Academy of Jordan having same colors as the Consulting center for Autism used in this part such as orange, blue, green, pink, white, red, brown and gray, also have the color yellow that is not found in the Lubna Special Education Center. The common colors in this part are the color white, blue and green.

Under the subject covered for impact of colors on autism in the learning environment; color perception in Autistic children and their physiological and psychological response towards colors and its impact on their learning; this part has all colors that

have been used in each space for the selected centers, and as mentioned above each color has its own affect children in the learning environment.

it has been found that the colors in common between the centers are white, blue, green, pink, brown, red and gray, but the white color was the one that dominated the all spaces in centers.

4.5 Chapter Conclusion

The theoretical study was evaluated through three educational centers for autistic children, namely the Consulting Center for Autism, Lubna Special Education Center and Autism Academy of Jordan, based on the topics mentioned in the literature, first it has been discussed about the services given to various needs by giving some explanations and going through the clarification of the type, amount of services and process of providing service, then, the second one was the Requirements of Autism learning environments, this topic addressed the spatial sequencing, escape of spaces, compartmentalization, transition zones and sensory zoning, moving to another topic named by the built environment design, it had put the whole focus on describing the safe and the physical environment that affects the sensational states of children with autism, finally, the last subject that took the core place in the thesis that is representing the main topic of the entire study which is the impact of color on autism in the learning environment, it considered the color perception in autistic children and their physiological and psychological responses towards color and its impact on their Learning. In addition, knowing the colors used in each center. In the next chapter, the results achieved will be discussed in relation to how to attain a successful educational environment for children with autism through colors, and whether colors affect the

concentration and the better learning for children with autism or not, also what are the needs that must be fulfilled for people with autism in the learning environment.

It can also be noted in the comparative analysis that the color white is an important color for the learning environment of students with Autism, as it is found in all the center that were selected for this study. It has also been observed that each specific space which are design for a particular activity might require it special color. Natural lighting is also important to lighten up the spaces. Colors are also use for paths and transitional zones, spatial sequencing of space and provision of personal spaces for the student. The surfaces of the various center are padded with sponge and gypsum board, wooden and plastic furniture to provide a safe space and facilities for the student of the various center.

Chapter 5

CONCLUSION

A place of learning is critical to an individual development. In formal educational environment, treatment issues concerning children with disabilities show it in various ways of behavioral patterns that can challenge the instructional processes. Specifically, children with distinct needs in whole and particular children with autism require much more consideration in their learning environment. However, the design of these environments is very vital. The utilization of color in these special learning environments appears to be one of the key traits in respects to design. Nevertheless, it is critical to evaluate the prospect of behavioral traits to design for Autistic children.

The major research problem of this thesis was based on the observation that many of the studies concerning the designs for distinct groups, accessibility programs and design recommendations are grounded on the functional requirements of the users. Nevertheless, most researches propose that there could be some dissimilarities in the color awareness of human, still recommendation for color inclinations for the children with Autism is lacking in adequate research. The intention of this research is to deliberate on the learning environment and the color application in the place of formal education of children with Autism. The aim of this study is to determine the facilitating traits of learning environments, to identify the requirements and services that have to be made available to the autistic students and how employing of color and physical factors in learning environments. A good comprehension of the mental and physical

effect of color, as well as the awareness, would be important to provide an environment that accelerate the treatment and improve the learning process of the children. This in-depth study would provide answer to main research question of the thesis which is; How to achieve a successful educational environment for children with autism using colors? By choosing the appropriate and suitable colors for each specific space in the learning environment that help students in so many ways, like using the motivating colors which helping them in the treatment process and enhancement of learning, and also making them feel cozy, restful, relaxed and more focused in their studies, and avoiding the colors that causes any kind of stress, anxiety and distractions is required too.

The research limited its focus on the impact of colors on the comportment of children with autism from 7 to 15 years old, and effect of color on their educational development in the learning environment. The study focused on buildings that are formal educational environment for the children with autism which are three in number all located in Jordan and employed three levels of analyses to meet the aim of the study, they are; The first level of the analysis is the literature review that looks into definition of autistic children, thereby exploring the Coordination of Services and expertise of Service Providers, type and amount of Services and Service Needs. Then spatial requirements of learning environments for children with Autism, which looked into spatial sequencing, escape Spaces, compartmentalization, transition Zones, sensory Zoning and learning environment for Autistic Children, which looked into engagement of the Children with Autism into the learning environment and environmental Design for Autism, from, which a framework for the selected cases analysis was generated from. The second level is the analysis of formal learning

environment building for autism in Jordan. However, with information were extracted from the literature review and in site visit of the cases investigation, coupled with a semi-framed interview were employed in this level. The third level is the comparative analysis of all the selected buildings for this thesis with Color perception theory in the learning environment and physiological and psychological responses to Color this was possible due to the use of the framework created specifically for this level.

The result of the analyses for this thesis that are listed above is the there is a need for more research driven color Platte selection for the learning environment, that would facilitate the treatment and learning of the children with autism. Three formal learning centers for autistic children, namely the Consulting Center for Autism, Lubna Special Education Center and Autism Academy of Jordan, are the selected cases for this study, in which their analyses are grounded on the topics stated in the literature review section as Services given to various needs and Requirements of Autism learning environments and the Built Environment Design of the Center and Impact of color on autism in the learning environment. It would be observed that the centers are having similar, but slightly distinct approach to design and use of colors for various services and activities such as the use of the white color for the three centers in the walls and they are providing the same services while they are using different colors for furniture, doors, curtains, and windows, the spaces also are designed for specific activities in each of the center. The spaces are designed to be spacious and there is the provision of personal space for the students. There is also the adoption of participatory approach that involves the parent and the teachers in the educational and treatment process of the student. However, in the comparative analysis it was observed that the color white is an imperative color for the formal educational environment of children with Autism,

as it has been noted in the entire centers which were selected for this thesis. Specialize spaces were also provided in the design and spatial allocation of the spaces in the centers. Day lighting is also critical in the provision of lighting in the spaces. Colors are also adopted for spaces like paths and transitional zones, spatial sequencing of space and privacy provision for the children. The surfaces interior spaces of the selected centers are padded with sponge and gypsum board, as well as the use wooden and plastic furniture to provide a safe space for the children of the various centers.

5.1 Implication for the Study

As a result of the limit created for the thesis, the centers selected for this thesis are only three in Jordan. Hence there are many more centers for the formal education for children with Autism, which would require more in-depth research that cover more vital discussions on the design and color selection of the formal learning environment of children with Autism. There is also the need further research on color theories that would focus on the needs of children with Autism, as well as researches that would focus on the cognitive impact of colors on the treatment and learning program for children with Autism’s learning environment.

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