Arab American University – Palestine

Faculty of Graduate Studies

Effectiveness of information technology methods used for rehabilitating children with autism spectrum disorder in Palestine as perceived by their therapists; mixed methods

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DECLARATION

I declare that the thesis was submitted for a master's degree and has not been submitted to another university for a higher degree. The work presented in this thesis is based on my own efforts

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DEDICATION

"I dedicate this work to the Almighty Allah for preserving my life", to my parents and family, to all who support me in my life who give me the power, love, confident to go on …

Finally I dedicate this work to myself to achieve my dreams,

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ABSTRACT

Background: Autism spectrum disorder (ASD) refers to a neurodevelopment disorder that is characterized by difficulties with social communication and social interaction and restricted and repetitive patterns in behaviors, interests, and activities. By definition, the symptoms are present early on in development and affect daily functioning. The term 'spectrum' is used because of the heterogeneity in the presentation and severity of ASD symptoms, as well as in the skills and level of functioning of individuals who have ASD (American Psychological Association [APA], 2016).

Objective: The main objective of this study is to examine the effectiveness of using some information technologies in rehabilitation of children with autism spectrum disorder who have learning and communication difficulties as perceived by their therapists, in selected centers in Palestine.

Method: A descriptive cross-sectional study. The sample is composed of 79 therapists who work at rehabilitation centers for children with ASD who complain of communication and learning difficulties in Palestine.

Results:

Study revealed that 81% of Therapists positively think that using IT systems in ASD children rehabilitation increases the effectiveness of the therapy, another finding is that 80% Therapists positively believe that using an IT system in ASD children rehabilitation does have a number of clear benefits that can't be achieved otherwise. Lastly, 88%of Therapists positively have the shared opinion that using IT systems in ASD rehabilitation

in a wrong or untrained way can have dangers, pitfalls or negative effects that should be considered and avoided.

Conclusion:

The study confirmed that most of the participants agree toward the effectiveness of using IT systems in rehabilitation of ASD children and the great benefits of its impact. Therapists viewed the IT methods a new and unique way to get the attention of the child, they break the usual routine therefore is very attractive. Also help the child to focus on the task required during sessions.

Although the study acknowledged the negatives in terms of the costs and dangers if used with no professional supervision, the therapists agreed that benefits outweigh the cost of using them.

Keywords: ASD, learning and communication difficulties, rehabilitation, information technology

ABBREVIATIONS

Abbreviation	Explanation
SPSS	Statistical Package for Social Sciences
ANOVA	Analysis of Variance
t-test	t student statistical test
AAUP	Arab American University Palestine
ASD	Autism Spectrum Disorder
IT	Information Technology
SM A	Simple Moving Average
SD	Standard deviation

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Chapter One

Introduction

1.1 Background

Autism spectrum disorder (ASD) refers to a neurodevelopment disorder that is characterized by difficulties with social communication and social interaction and restricted and repetitive patterns in behaviors, interests, and activities. The symptoms are present early on in development and affect daily functioning. The term ‘spectrum’ is used because of the heterogeneity in the presentation and severity of ASD symptoms, as well as in the skills and level of functioning of individuals who have ASD (APA, 2016).

Currently, autism spectrum disorder (ASD) affects a significant number of people who have difficulties with communication and socialization, which results in complexities for their learning (**World Health Organization, 2019)** Studies have examined the use of technology and computer-based interventions to teach people with ASD language and social skills Specifically, students on the autism spectrum enjoy playing games, which provides a safe environment (Valencia,K., Rusu,C., Quiñones,D., and Jamet, E,.2019). And According to (World Health Organization [WHO], 2019) one in 160 children has autism spectrum disorder (ASD) and begins in childhood and continues into adolescence and adulthood. Children with ASD usually have physical and mental disturbances that prevent their normal activity; most of them face children with ASD in social association, verbal and non-verbal communication, and repetitive behavior. This means that they do not know how to respond to situations that sometimes lead to aggression or running away (Shoaib, Hussain, Mirza, and Tayyeb, 2017) .Due to the increase in diagnosed cases of

ASD, software and hardware dedicated to persons with autism have been developed for several decades. These solutions reinforce ASD sufferers' strong points and work on their weaknesses, helping them to increase their vocabulary and communication skills. These studies mostly concentrate on one of the core areas affected by ASD, "the worse their communication problems, the more severe the symptoms of ASD are". (Bartolome & Zapirain, 2014).

Autism in Greek mean "self" and it's used to describe the self-absorbed, private world they seem to be in that actually give them limited ability to interact and communicate with others, some other will know problems ASD children have are the inability to understand others and develop language skills and the problem they face in nonverbal communication (hand gestures, eye contact, and facial expressions.) The ability of each different ASD child varies in their language and communication skills and these are some behaviors found in ASD children: - Repetitive or rigid language, Narrow interests and exceptional abilities, Uneven language development and Poor nonverbal conversation skills (WHO, 2019)

In the Palestinian theater, there are numbers of centers that provide rehabilitation to children with ASD by using different information technologies (IT) such as: interactive tablet that is linked with a number of equipments Like display devices (Monitors and TVs) that allow the child to control what he send and choose between a number of options that Direct the child toward a number of therapeutic goals mainly improving communication and learning. Interactive mattress that is color-coded. This mattress produces sounds and light that tell the child to step on the specific color-coded area depending on the sound he hears or the color he sees. Interactive 3D projection, this is an

advanced technology found in a number of sensory rooms; it works by projecting a picture that the child can easily interact with (e.g. A pool of water full of fish) this system has many programs and projections installed which some of them education-oriented.(Ganim , 2015).

So the purpose of this study is to examine the effectiveness of information technology rehabilitation of Palestinian children with learning and communication difficulties as perceived by their therapists.

ASD is a developmental disability characterized by persistent impairment in social interactions as well as the presence of repetitive patterns of behavior, interests, and activities of the patient. Delay in treatment of ASD leads to negative consequences in the autism treatment. The earlier the treatment of ASD the more positive outcome in eliminating severe development of ASD (Solovyova, Oleksii, and Kravchenko, 2020).

ASD is characterized by communication difficulties, although these difficulties may vary but delayed language is often a core component of ASD and can have significant effects on various aspects of a child's life. Developing spontaneous communication is an important goal and it is the key factor for the child ability to learn.

In the past 50 years, different types of interventions have been implemented in an effort to meet the varying and complex communication needs of children with ASD (Bush, Stahmer, & Connelly, 2016). Among interventions that are used for learning communication is information technology, which means the use of information to meet human needs for purpose including reference to the use of technology devices as phones, laptops, computer software and many other web tools (Spector, 2018).

Professionals work with ASD children individually or in combination that is mainly (Special education, Occupational therapy, Physiotherapy, Nurse and Physician) use a number of approaches that can be broken into one of these categories (Behavior and Communication Approaches, Dietary Approaches, Medication and Complementary and Alternative Medicine). The approach that is used and discussed in our paper is the non-medical approach (Autism society, 2014)

Using technology with ASD children has a number of benefits, the first of them being that it is mostly portable; a child with Autism can use handheld devices, such as tablets, with ease. Since they are flexible and portable, kids can carry them wherever they go (King, 2017).

The second Accessibility, Touch screens are much more accessible to those with Autism than a keyboard. Tapping and sliding motions are easier than typing on a keyboard.(Chen, 2012)

They can Improve Communication; Using tablets to improve nonverbal communication with others. Handwriting is a challenging motor skill for Autistic children. By using a tablet or phone, they can engage in written communications such as texting and email.(Shoaib et al., 2017).

They encourage visual learning; many of those with Autism are visual, literal thinkers. They retain more information when they are presented with graphic images and words. Computer graphics can be used to teach children with autism visually (Mohd, Azni, Shahbodin, and Jano, 2019)

Even though the benefits of using them are great, using IT systems have obvious pitfalls, the first of them being Addiction; Autistic children are particularly attracted to screen-based technology, such a phones or tablets. They are prone to developing an addiction to the technology with smaller amounts of exposure than the average child (Valencia,K.,et al 2019).

The second is sleep disturbances; there is a lack of melatonin (which helps regulate sleep) in children with Autism. Screen time suppresses melatonin even more, disrupting sleep.(Valencia,K.,et al 2019)

Using them can impair social skills; Children with Autism do not have fully functioning social skills such as eye contact, reading facial expressions and body language, and empathy. Screen time hinders the development of these same skills (Bonnot, Bonneau, ,Doudard & Duverger, 2016)

More over it can increase anxiety; Children with autism are prone to anxiety. They are more likely to have obsessive-compulsive traits and social anxiety. Screen time is associated with increased risk for OCD and social anxiety (Bonnot et al., 2016)

1.2 Problem statement

ASD in Palestine has recently increased. This could be attributed to increased exposure to mass media, in part, and disseminated research in the region and elsewhere. The incidence and prevalence of ASDs in Palestine is still unknown, according to the Palestinian ministry of health due to the lack of major epidemiological studies to achieve these objectives. “Autism is known as a complex developmental disability. Experts

believe that autism has an impact on normal brain function, affecting a person's communication and social life" (Assbee, 2016).

Literature focuses on the different technologies that have been used to help children with ASD in communication and learning difficulties; however, limited studies have been identified that focused on the effectiveness of these technologies in the areas of communication and learning. In addition, limited studies on whether or not the therapists who used such technologies found them effective in improving communication and learning difficulties. (Koumpouros & Kafazis, 2019)

Moreover, Therapists are in direct contact with children with autism, and their feedback on the effectiveness of such technologies has an impact on improving communication technologies and learning difficulties for children with autism. For this reason, this study will focus on therapists' opinions about the effectiveness of technologies used for the rehabilitation of children with ASD. (Autism society, 2014)

1.3Significance of the study

Information and Communication Technologies (ICTs) can compensate and support the education of students with special needs, and particularly people with ASD. ICTs make it possible to create controllable predictable environments; they offer multisensory stimulation, which is normally visual; they foster or make it possible to work autonomously and develop the capacity for self-control and are highly motivating and reinforcing, encouraging attention and lessening the frustration that may arise from making mistakes. (Bartolome & Zapirain, 2014).

In the Palestinian context, there are different institutions that provide these technologies for children with ASD rehabilitation that treat communication and learning disabilities, including interactive tablets, interactive mattresses and interactive 3D projections.

Most ASD studies focus on the illness itself, diagnosis, types of disease, and medical care. Limited studies have focused on learning and communication difficulties and rehabilitation. In addition, these limited studies focused on some aspects of ASD learning and communication rehabilitation. Limited attention is paid to the varied use of technology for children with autism. Therapists who use information technologies have an important role to play in the rehabilitation of ASD, the role is in determining the effectiveness of these technologies in addressing communication and learning problems for children with ADS, as they are in direct contact with those children and are the users and teachers of such technologies.

1.4 Purposes of the study

The main purpose of this study is to examine the effectiveness of information technology methods used in rehabilitating children with autism who have learning and communication difficulties in Palestine as perceived by their therapists.

1.5 Research questions and hypothesis

To achieve the goal of the study, the research questions were:

1. What is the level of effectiveness of information technology methods used in rehabilitating children with autism who complain of learning and communication difficulties in Palestine as perceived by their therapists?

2. What is the relationship between demographic factors and the level of effectiveness of information technology methods used in rehabilitating children with autism who complain of learning and communication difficulties in Palestine as perceived by their therapists?

The hypotheses of the two questions are as follow:-

1. Therapists commonly believe that using IT methods in ASD children rehabilitation is effective and add a great benefits to the therapy
2. There should be no difference in perceptions regarding the use of IT methods regarding demographic factors as none of the factors have a relation to a widely accepted idea as the effectiveness of using IT methods in any medical applications

1.6 Variables of the study

- **Independent Variables:** Sociodemographic data of therapists such as: gender, age, Social status variable, level of education, place of residence, and years of work experience

- **Dependent variables:** Therapists' perceptions of the effectiveness of information technology methods used in rehabilitating children with autism who have learning and communication difficulties.

1.7 Conceptual definition:

1.7.1 Effectiveness

Is the degree to which something is successful in producing a desired result; success.

(Oxford Languages, 2021.)

1.7.2 Perception

Perception means the way in which something is regarded, understood, or interpreted.

(Oxford Languages, 2021.)

1.8 Operational definition:

1.8.1 Therapists perceptions scale was developed by researcher based on reviewed literature used to measure the effectiveness of information technology methods used in rehabilitating children with autism who have learning and communication difficulties as perceived by therapists.

1.8.2 ASD Rehabilitation centers: centers that provide rehabilitation for children with special needs and difficulties like autism, some of them deal with ASD alone and other as a part of a larger group

to measure the effectiveness of information technology methods used in rehabilitating children with autism who suffer from learning and communication difficulties as perceived by therapists, a number of rehabilitation centers were visited, 2 in jenin , 3 in tulkarem and 4 in nablus

1.9 Conceptual framework

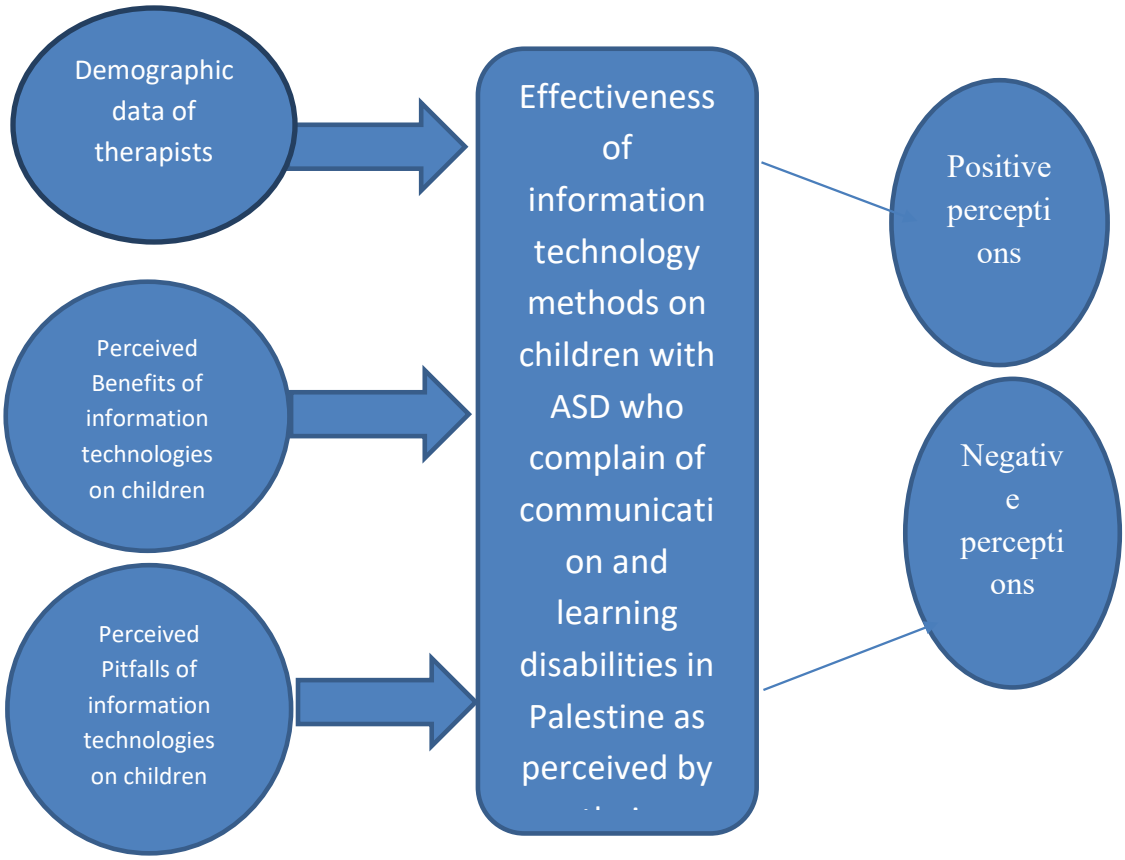

Figure 1-1 conceptual framework of the study

Chapter Two

Literature

2.1 Introduction

The literature review focused on the effectiveness of IT methods, therapists' perception, factors that influence therapist perceptions, and previous study recommendations.

The purpose of this research is to evaluate the effectiveness of information technology methods used for rehabilitating children with ASD who complain from learning and communication difficulties in Palestine as perceived by their therapists. The study will examine therapists' opinions through interviews and a developed instrument in order to examine the effectiveness of information technologies used in the Palestinian rehabilitation centers in rehabilitation of communication and learning difficulties of the children with ASD.

In this literature review I have reviewed the published research articles that studied the relationship between autism children, health IT systems, therapists, health centers, learning and communication disabilities.

I searched the electronic libraries like Google scholar, pubMed, researchgate, SAGE Journals IntechOpenand sciencedirect , For the following terms (autism children , ASD , IT systems , learning difficulties , communication difficulties , health centers , occupational therapy , rehabilitation , physical therapy , sensory rooms , quality of life)

My inclusion criteria was (original research, in English, available in full text, published no longer than 10 years ago)

I found over 30 and after applying the inclusion criteria I ended up with 21.

2.2 literature review

Autism spectrum disorder (ASD) is a complex developmental condition that involves persistent challenges in social interaction, speech and nonverbal communication, and restricted/repetitive behaviors. The effects of ASD and the severity of symptoms are different in each person. We are going to represent a number of research talking about the subject that connects the use of information technology with helping children with ASD (APA, 2021)

A 2017 study illustrated the role played by technologies in ASD rehabilitation, and then continued to describe the condition at hand and how does it affect the person's quality of life, which he claims that these technologies can effectively face. "Education is the key and education at younger ages is better" (Shoaib et al., 2017);they also described how Computers represent a considerable and valuable part in educational techniques of ASD with software programmed specifically for that job using a gaming interface that is suitable for children. "That Virtual Reality based frameworks are very helpful to estimate a different kind of fears faced by autistic people "(Shoaib et al., 2017)

This research shows that according to the findings there is a strong association between the use of innovative technologies and the rehabilitation of children, which is useful as a supporter for this research hypothesis.

People with ASD enjoy interacting with computers (Valencia et al., 2019) a systemic review believes that the interaction here is safe. 94 studies was reviewed on this paper to reach the same conclusion about using IT systems to develop skills for ASD children "how these approaches consider aspects of user experience, usability and accessibility, and how game elements are used to enrich learning environments." (Valencia et al., 2019)Asks and then answers afterwards, "The use of technological advancements such as virtual agents, artificial intelligence, virtual reality, and augmented reality undoubtedly provides a comfortable environment that promotes constant learning for people with ASD." (Valencia et al., 2019)

This research too, shows a strong correlation between the use of information technology and the rehabilitation of ASD; the strong point about it is the big number of studies reviewed which makes the finding truer.

Chen (2012) reinforced the previous study by focusing more on multitouch interfaces. "These innovative technologies, alone or in conjunction, can be used beneficially in a number of critical areas affecting individuals with autism, their families and professional who support them." This paper talks about multitouch tabletop technology for ASD and identifies positives and challenges with designing and applying with ASD

This third research has a different view from other types of IT systems used with ASD; the findings too add up to the previous strong correlation.

A 2013 report about (HANDS) The "Helping Autism Diagnosed Navigate and Develop Socially" project developed a suite of mobile apps for smart phones, which support children with Autism Spectrum Disorders (ASD) with social and life skills functioning – areas of ability which tend to be impaired in this population. This project was tested in a number of special education schools, this paper done by (Mintz, 2013) is to give a report in order to motivate reaching their goal but we are going to focus on the meaningful points needed in our paper, this paper mention an interesting point about the policies and laws of using smart phones in schools and classrooms, there aim is to shade light on the potential use of smart phones to promote inclusion of children with ASD

This project is considered a valuable reference to be used as a proof of the effectiveness of implementing widespread used IT systems like apps and smart phones in daily life situations.

A 2016 study illustrated that “Introduction Longitudinal studies on the evolution of autism spectrum disorder (ASD) symptoms are limited and have primarily used repeated measurements performed several months apart “, there is a need to be focus more on the real life of the person and his family. (Bonnot et al., 2016)

The interesting part about this paper is the tool they used, an app called SMARTAUTISM, which enables the conduction of longitudinal studies by recording data about the child during a 6-month period from their real-life perspective and over multiple weeks. This app has the ability to assess the anxiety parents of children with ASD experience and assess the functional symptoms of the children, that app was used to

collect data from a hundred families with at least 1 child with ASD with primary and secondary goals (Bonnot et al., 2016)

A 2019 systemic review on the literature of wearable and mobile technologies for ASD interventions was done to give an insight of in order to enhance the development of market production of this kind of devices. “Nowadays, in the Internet of Things era, wearable, mobile technologies and enhanced communication and computing capabilities has led to the upsurge of innovative mobile health solutions” the paper finally deducted the increase of wearable devices for ASD manufacture sector in the near future it then give a engorgement to develop devices that can be use in the real world rather than a controlled environment which is fairly good point that was mentions before in our literature review (Koumpouros & Kafazis, 2019)

The study of using wide- spread devices in the natural environment rather than a controlled environment is a unique and valuable take on the subject, as ASD children tend to have most of these problems and limitations at homes rather than health centers where they spend less time in.

King (2017) has conducted a qualitative study with a number of professionals that use tablets with ASD children, through a focus group method, all the professionals are working in a special school that provide classes for ASD children and use tablets, these focus group sessions gave insight, information , and context on the use of these tablets and how to use them, the main results were talking about the use, the challenges and the value of using tablets “this study suggest that education professionals have unique and insightful opinions related to tablets. There appears to be gaps between the current

research base on tablet use in CWASD and “real world” practice, suggesting that further research is needed in the implementation of tablets in classrooms of children with ASD”

Once more, another research shows another unique perspective and a special kind of control environment which is rarely presented in educational institutions; the findings too suggest a positive relationship between the use of IT systems and children with learning difficulties.

Recently many computer based education methods for persons with autism that can change their abnormal behaviors (Noor, Shahabodin & Pee, 2012). Learning and educational tools developed for the restoration of children with autism. The majority of these tools depend on computers by software program- teaching platforms for the purpose of teaching ASD children. Platforms facilitate children with ASD to recognize objects based on size, color and type (Noor et al., 2012).

Solovyova, Oleksii, and Kravchenko (2020) on the other hand added that many handheld devices like mobile phones and tablets are very useful devices for addressing and overcoming several issues of autism. These devices are flexible, portable, and lightweight, therefore easily used by children with ASD. The touch screen and user interfaces provide an easy learning environment for children and less effort than writing

Information technology offers new perspectives in the treatment of children with ASD because it is used in different ways and settings and is attractive to the patients. Children with ASD have high incidence of visual perception problems and have difficulty in remembering, organizing and interpreting visual images; as a result, they are easily

confused in situations when written or pictorial symbols are utilized for learning (Mohd et al., 2019).

A 2019 study focuses on analyzing the impact of technology on people with autism spectrum disorder based on research published during the last 10 years and available on the relevant scientific databases. The analysis shows an increase in the papers published on this topic over the years, which indicates an increasing research interest in the area. (Valencia et al., 2019).

Valencia et al, in their study on the impact of IT on children with Autism illustrated that future studies should be careful with the use of such technological approaches, as brain activity may be misleading when working with people with ASD, especially in tasks that require recognizing emotions from facial expressions or movements. We believe that user experience is important and that future studies should consider accessibility and usability tests to ensure positive experiences and comfort with the use of their solutions, as there is a lack of research that applies these concepts correctly and that provides details about the user groups that participate in interventions. Moreover, their findings show that there is a lack of evidence about the effect of the use of game elements in gamification, e-learning, and serious game solutions. We believe that future studies should consider and validate the use of game

According to DSM5, ASD has a specific diagnostic criteria (American Psychiatric Association, 2013), the main method is that when a child presents 3 main deficits and a number of secondary behaviors, the main 3 need to be all presented in the person while two of the repetitive behaviors need to be presented in the person or child to be considered autistic or a person with ASD.

The 3 main deficits can be summarized as the following, 1) Deficits in social-emotional or abnormal behavior 2) Deficits in nonverbal communicative behaviors 3) Deficits in relationships either in developing, maintaining or/and understanding. While secondary behaviors can range from repetitive movements to hypo/hyper sensations (Center of Disease Control and prevention [CDC], 2020)

Prevalence of ASD

There is a claim about a current autism epidemic, and the large increase in recent years actually support this claim, Chiarotti and Venerosi (2020) have reviewed ASD prevalence from 2014 to 2020 and came up with the following conclusion: “data confirm a high variability in prevalence across the world, likely due to methodological differences in case detection, and the consistent increase of prevalence estimates within each geographical area.”

According to autism speaks organization website:-

- In 2020, the CDC reported that approximately 1 in 54 children in the U.S. is diagnosed with an autism spectrum disorder (ASD), according to 2016 data.
    - 1 in 34 boys identified with autism
    - 1 in 144 girls identified with autism
- Boys are four times more likely to be diagnosed with autism than girls.
- Most children were still being diagnosed after age 4, though autism can be reliably diagnosed as early as age 2.
- 31% of children with ASD have an intellectual disability (intelligence quotient [IQ] <70), 25% are in the borderline range (IQ 71–85), and 44% have IQ scores in the average to above average range (i.e., IQ >85).
- Autism affects all ethnic and socioeconomic groups.
- Minority groups tend to be diagnosed later and less often.
- Early intervention affords the best opportunity to support healthy development and deliver benefits across the lifespan.

- There is no medical detection for autism.(autism speaks,2021)

Clinical picture/symptoms of ASD

Communication difficulties

Santric and Begovac (2011) in their study which was done to review a number of literatures from PubMed database on communication of children have shown that ASD children are the most who suffer from communication difficulties, the paper then present a number of facts regarding their finding as follow “Motor abilities are important for later acquisition of language skills. The development of communication ability is difficult to predict. Verbal skills often "catch up" with the nonverbal ones.”

Mody and Belliveau (2013) also illustrated that in autism diagnosis, the most and earliest sign is language,” individuals with ASD tend to have very limited language, with progress depending on IQ, comprehension and attention skills. In general verbal children on the spectrum do not have difficulty with speech sound articulation, though their speech can be quite preservative, with an unusual vocal quality (e.g., monotonic, nasal, atypical stress). The core difficulty, however, is one of language pragmatics: children who have ASD show limited use of language in social context (e.g., rarely to comment or request information), pointing to a strong link between language and social skills in autism.”

This is how autism affects communication according to Salus university website, 2020: -

- Repetitive or rigid language. Often, children with ASD who can speak will say things that have no meaning or that do not relate to the conversations they are having with others. For example, a child may count from one to five repeatedly in a conversation that is not related to numbers. Or may continuously repeat words he or she has heard—a condition called echolalia. Some children with ASD speak in a high-pitched or sing-song voice or use robot-like speech.
- **Narrow interests and exceptional abilities:** Some children may be able to deliver an in-depth monologue about a topic that holds their interest, even though they may not be able to carry on a two-way conversation about the same topic. Others may have musical talents or an advanced ability to count and do math calculations. Approximately 10% of children with ASD show "savant" skills, or extremely high abilities in specific areas, such as memorization, calendar calculation, music or math.
- **Uneven language development:** Many children with ASD develop some speech and language skills, but not to a normal level of ability, and their progress is usually uneven. For example, they may develop a strong vocabulary in a particular area of interest very quickly. Many children with autism have good memories for information just heard or seen. Some may be able to read words before age five, but may not comprehend what they have read. They often do not respond to the speech of others and may not respond to their own names. As a result, these children are sometimes mistakenly thought to have a hearing problem.
- **Poor nonverbal conversation skills:** Children with ASD are often unable to use gestures, such as pointing to an object, to give meaning to their speech. They often

avoid eye contact, which can make them seem rude, uninterested, or inattentive. Without meaningful gestures or other nonverbal skills to enhance their oral language skills, many children with ASD become frustrated in their attempts to make their feelings, thoughts, and needs known.

Learning difficulties

A 2006 study has compared normal children that have learning difficulties and ASD children with learning difficulties through conducting two experiments. The first concluded that "children with autism were at least as likely as normal children to employ articulator rehearsal (criterion: evincing the "word length effect") and that they had superior spans to that of children with moderate learning difficulties." (Russell, Jarrold & Henry, 2006) And the second experiment was done on working memory (which is the capacity that someone can hold small information to use in cognitive skills) and concluded that "The performance of the children with autism was inferior to that of the normally developing group and similar to that of the children with moderate learning difficulties." (Russell et al.)

Sun, Cortez & Fernandes (2019) added, ASD children have disadvantages in learning due to their general social disability, "Children with autism spectrum disorders often present signs of cognitive strategies that are not within the expected developmental profile. Therefore, it should be expected that the learning process of children with this disorder should be the focus of several studies regarding schooling and literacy."(Sun et al.)

Types of learning disabilities according to Additude magazine website in 2021:

- Dyslexia which is a language-based learning disability. Individuals with dyslexia may have trouble with letter and word recognition, understanding words and ideas, reading speed and fluency, and general vocabulary.
- Dyscalculia which is a number-based learning disability. People with dyscalculia may struggle with recalling sequences of numbers, calculating using math functions, organization of numbers, operation signs, number facts, counting, and telling time.
- Dysgraphia which is a writing-based learning disability. Individuals with dysgraphia may have problems with neatness when writing, illegible handwriting, copying letters and words, spelling, and organizing their thoughts on paper. (additude mag, 2021):

Emotional and social difficulties

A 2020 study have indicated that a very key feature of ASD individuals are Deficient social and communication skills, in their study that aimed to identify whether implicit social cognition factors and explicit social cognition factors can be used to predict autistic behavior, it concluded that "both implicit (the effect of a past event on some task which does not require conscious recollection) and explicit (the conscious recollection of a past even) social cognition factors optimally predicted outcomes, implicit social cognition factors were relatively more predictive. Findings have important implications for the conceptualization and measurement of social functioning as well as

the development of targeted social interventions in autism spectrum disorder populations."(Keifer, Mikami, Morris, Libsack & Lerner, 2020) .

Moreover, according to applied behavior analysis website all of these social skills problems are rooted in some of the **basic elements of ASD:**

- Delays and difficulty in acquiring verbal communication skills
- Inability to read non-verbal communication cues
- Repetitive or obsessive behaviors and insistence on an adherence to fixed routine
- Overwhelming sensory inputs

These combinations of traits make it enormously difficult for ASD patients to acquire the basic social skills that most of us take for granted. (Applied behavior analysis, 2021)

Behavioral difficulties

It is notable that children with ASD have uncontrolled or unacceptable behavior, but that is undecided to be the cause of the autism disorder or the lack of disciplinary methods conducted by the parents on the children while justified by being symptom related, a study conducted in 2020 , has discussed about this matter and concluded that there is actually a correlation between this two subjects as follow "The findings contribute to the limited literature on parental attributions, parenting discipline, and child problem behavior, and can inform the parents about future interventions for child problem behavior, particularly in the area of parent training." (Berliner, Moskowitz & Braconnier, 2020)

Emotional and behavioral problems in children with autism spectrum disorder can be as follows:

- Sleep, toileting and eating problems
- Hyperactivity
- self injury
- sensory difficulties
- anxiety
- tantrums
- aggression towards others

Impact of ASD on children and families

Physical Impact

Having children in general bring extra expenses to the family even more if its ASD children, it even brings more related stress, even though the central role of dressing ASD needs is played by the parents and they directly interact with medical intervention . Parents face more stress when they realize the slow process of therapy with ASD children "A parent's ability to carry out adaptive functions is, in part, related to their levels of stress and psychological well-being. Thus, there is a transactional process in which parents are both impacted by and have an impact on ASD interventions for their child." (Estes, Swain & MacDuffie, 2019) this paper provided an overview of 3 types of interventions. (1.early intensive behavioral intervention, 2. parent-implemented intervention, and 3.programs directly targeting parent stress) the paper concluded that

“research on the impact of ASD intervention on parents of young children with ASD is a promising avenue for improving the lives of children with ASD and their families.” (Estes et al., 2019)

Psychosocial Impact

Parenting ASD children always comes with a great amount of stress, therefore a number of studies address the psychological impact of parenting ASD children on parents. Weiss, Cappadocia, MacMullin, Viecili & Lunsky (2012) examined the relationship of empowerment and acceptance with a parent’s mental health “As child problem behavior increased, parent psychological acceptance decreased, resulting in an increase in parent mental health problems. These findings suggest that for problems that are chronic and difficult to address, psychological acceptance may be an important factor in coping for parents of young people with ASD” (Weiss et al., 2012)

Socioeconomic Impact

The impact of socioeconomic on ASD was found to be debatable between different Areas of the world, mainly between America and Europe, as the latter suggest that (low socioeconomic status is associated with an increased risk of ASD.) While it still varies. A study carried out by Delobel-Ayoub et al (2015) aimed to “clarify the links between socioeconomic status and the prevalence of ASD”. This study was done on a number of 500 hundred children in France with different socioeconomically statuses to try to link between it and intellectual dysfunction below 50 IQ and resulted with this clear

paragraph “The prevalence of ASD with associated ID and of severe isolated ID is more likely to be higher in areas with the highest level of deprivation.” (Delobel-Ayoub et al.)

Quality of life of children and families with ASD child

A study conducted by Vasilopoulou and Niisbet (2015) that addressed the concern about the quality of life of parents of ASD children as mentioned in previous papers, which aimed to examine the quality of life of parents that have children (under 18) and the associated factors by conducting an electronic database search. This paper simply indicated that “QoL among parents of children with ASD compared to parents of typically developing children or to population norms and Variables associated with lower parental QoL within this group included child behavioral difficulties, unemployment, being a mother and lack of social support.” (Vasilopoulou & Nisbet)

Summary

By reviewing the previous literature, we can easily have a general idea of the perception about autism in general in all domains; these children need a great deal of help toward reaching a better quality of life which can be more easily achieved in modern countries. But how these children and their required care are dealt with in developing country like Palestine, the question to be raised would bear health centers and health professionals really equipped with the required materials, skills and technologies needed for assisting these children on the spectrum, are interventions used in therapy evidence-based?

Chapter three

Methodology

3.1 Introduction

The current study methodology is described in the following sections: study design, setting, population and sample, study instruments, data collection methods, data analysis, and ethical considerations.

3.2 Study design:

The current study is a mixed methodology that consists of a quantitative cross-sectional, descriptive study and a qualitative interview to assess the effectiveness of information technology used for rehabilitating children with Autism who complain of learning and communication difficulties as perceived by their therapists.

3.3 Setting of the study:

Health care centers in Palestine that provide ASD children rehabilitation that are present in all major cities in North West Bank (Jenin, Tulkarm, and Nablus). Some of them as a standalone center that mainly deals with ASD children and their problems in all areas and some of them provide this service in a specific department.

3.4 Study population:

Seventy-nine therapists who are responsible for the rehabilitating of children with ASD that complains of communication and learning difficulties Therapists have the following

specialties: (special education, occupational therapy, physiotherapy, nurse and Physician).

3.5 Inclusion criteria

The Inclusion Criteria included any health worker that participates in ASD children rehabilitation using any kind of IT systems in the targeted centers

3.6 Exclusion criteria

Participants, who only use conventional methods, refuse to use IT systems or have no training in using them

3.7 Study sampling and sample size

The sampling method was convenient sampling and the sample size after data gathering was 79 participants.

3.8 Instrument of the study

The study was completed with a self-administered questionnaire that consists of the following parts (Appendix A):

1. Demographic data of the therapist

It includes therapists' age, specialty/profession, gender, total years of clinical experience, total years of clinical experience on information technology method in the selected center, kind of information technology has been trained/worked on,

2. Therapist's general perceptions on the effectiveness of IT methods used in rehabilitation

The instrument consists of 10 items highlighting general therapists' perceptions regarding information technology methods used in the centers where they provide rehabilitation to children with ASD.

3. Perceived Benefits of Technology for Kids with Autism (4 items)

4: Pitfalls of Technology for Kids with Autism (4 items)

Tool Scale scoring system:

The questionnaire items score on a 5-points **Likert scale** ranging from 1 (strongly disagree/dissatisfied) to 5 (strongly agree/satisfied). The scoring system is classified into two groups: (1) high level of perception for domains and statements if their mean scores are between 3-5, and (2) poor level for domains and statements if their mean scores are less than 3.

The Arabic version of this instrument was translated by a specialist and then validated by a specialized committee in the field too.

The second part of the questionnaire is a qualitative design using open-ended question:

The final section of the questionnaire gives the users the opportunity to elaborate on their perceptions regarding the effectiveness of IT methods they use in rehabilitating children with ASD.

The researcher has used the **Thematical analysis** method for analyzing the qualitative question.

Resolution Stability Coefficient:

Stability is defined as the accuracy in estimating the individual's true score on the trait measured by the test and the stability of the study tool used by the researcher is according to the reliability coefficient using Cronbach's alpha equation, and it was 0.83 on all the paragraphs of the questionnaire, and this indicates that it is suitable for statistical analysis and for the purposes of the study.

3.9 Pilot study

A pilot study has been conducted on 8 therapists (nearly 10% of the population) first to evaluate the questionnaire, costs and any other limitations that can happen during data gathering. (They were excluded from the main data collection process)

3.10 Ethical considerations

1. Ethical consideration has been be ensured by receiving permission from the IRB at the Arab American University.
2. With the permission of the administrators at the target rehabilitation centers to carry out the study, the administrators received a cover letter containing the name of the researcher, the purpose of the study, the questions that have been asked during the interview and a copy of the questionnaire that have been used to collect the data.
3. The participants (therapists) have been informed that their participation will be voluntary. Explanation of the purpose of the study and data collection process has been provided to them. The participants have the right to participate and withdraw from the study at any time without harm or risks. The anonymity and confidentiality of the

participants will be protected by not disclosing their names and identification in the data collection, analysis and reporting results. Also, privacy and confidentiality of the interview setting have been closely handled during the individual interview sessions.

3.11 Data collection

The researcher interviewed all the therapists who worked at the identified centers in the northern area of the West Bank, all with different specialties.

The researcher visited10 ASD rehabilitation centers after receiving approval from the Arab American University. The approval also was obtained from the rehabilitation center's managers. Then we contacted all the therapists who met the inclusion criteria. The researcher provided a complete description to the participants, and those who agreed to participate were assigned informed consent. The researcher clarified to the participants that participation was voluntary and that they could withdraw from the study at any time. The data collection period lasted from October 1st to October 31st 2021.

3.12 Data analysis

Data were analyzed using Statistical Package for Social Sciences using SPSS ver.25. Descriptive statistics including: Mean (M), frequency, percentage, range and standard deviation (SD). Also, independent t test, one way ANOAV, and Correlation were used. Finally, the p-value<0.05 were considered statistically significant.

The qualitative data that will be obtained through interview transcripts. Audio recordings will be analyzed through a process of categorizing verbal data. Developing and applying codes, then identifying themes and patterns of relations and finally summarizing data. (Thematical Analysis Method)

CHAPTER FOUR

Results

4.1 Introduction

This chapter deals with the data collected for analysis. The statistical method allowed the investigator to deduce, analyze, coordinate, measure, evaluate and convey numerical information. The aim of data analysis is to provide answers to questions about the study. The data analysis strategy comes directly from the question, the design and the data collection process and the level of measurement of the data. This chapter edits, tabulates, analyzes and interprets the data collected.

This chapter expresses the findings concerning examining the effectiveness of information technology methods used in rehabilitating children with autism who suffer from learning and communication difficulties in Palestine.

Statistical analysis was directed to examine **two research questions:**

1. What is the level of therapists' perception of the effectiveness of information technology methods used in rehabilitating children with autism who suffer from learning and communication difficulties?
2. What is the relationship between demographic factors of therapists 'and their perceptions towards the effectiveness of information technology methods used in rehabilitating children with autism who suffer from learning and communication difficulties?

4.2 Response rate

87 participants out of 95 questionnaires (91.5% response rate) were completed 8 from the pilot study were excluded leaving 79 returned to be analyzed.

1.3 Participants' characteristics

The findings reveal that **91%** of therapists were male, **46%** of them aged between 18-24 years old, **82%**had bachelor degree education, **65%** of the participants were single, **44%** of therapists lived in villages and refugee camps, **79%** of therapists had clinical experience of 6 months to five years.**89%** had total clinical experience using IT methods with children with AS between 5 months -5 years. **52%** of therapists did not receive any training on how to use IT methods.**58.2%**did not receive any training on how to deal with children with ASD/learning difficulties and communication problems. In relation to the Kind of information technology methods available, study revealed that**58%** of rehabilitation centers had **interactive tablets** with **82%**usage. as shown in **table 4-1**

Table 4-1 Distribution of the study sample according to demographic data (n=79)

Variable	Category	Frequencies	percentage
Gender	Male	72	91.1
	Female	7	8.9
	Total	79	100.0
Age	24-18	36	45.6
	29-25	24	30.4
	34-30	9	11.4
	40-35	8	10.1
	More than 40	2	2.5
	Total	79	100.0
Marital statue	Married	26	32.9
	Single	51	64.6
	Divorced	2	2.5
	Total	79	100.0
Education level	Diploma degree	8	10.1
	Bachelor degree	65	82.3

	Master degree	6	7.6
	Total	79	100.0
Place of residence	City	9	11.4
	Village	35	44.3
	Refugee camp	35	44.3
	Total	79	100.0
Total clinical experience	6 months – 5 years	62	78.5
	6-5 years	7	8.9
	More than 11 years	10	12.7
	Total	79	100
Total clinical experience using IT methods with children with ASD	6 months – 5 years	70	88.6
	5-6 years	3	3.8
	11-15 years	4	5.1
	16-21 years	2	2.5
	Total	79	100
Did you receive any training toward how to use IT methods	Yes	38	48.1
	No	41	51.9
	Total	79	100
Did you receive any training on how to deal with children with ASD/learning difficulties and communication problems	Yes	33	41.8
	No	46	58.2
	Total	79	100
Kind of information technology methods available at your institution	Interactive tablet	46	58.2
	Interactive mattress	12	15.2
	Interactive 3D projection	12	15.2
	Other	9	11.4
	Total	79	100
Kind of information technology methods you have used at your institution	Interactive tablet	33	41.8
	Interactive mattress	11	13.9
	Interactive 3D projection	26	32.9
	Other	9	11.9
	Total	79	100

4.4 Testing research questions

Research question 1: What is the level of effectiveness of information technology methods used in rehabilitating ASD children who complain of learning and communication difficulties in Palestine as perceived by their therapists?

Results showedthat**81.5%** of the respondents indicated that information technology methods have achieved their intended goals, whether by result or effect, and about **81%**

of the respondents indicated that information technology methods are enjoyable and useful for the child and thus increase the child's commitment to treatment and that information technology methods contribute to education Children of the autism spectrum in the topics of cognitive skills, as indicated by about **78%** of the respondents, the methods of information technology contribute to the education of children of the autism spectrum in the topics of practical skills in general as shown in table **4-2**

Table 4-2 Therapists' perceptions on effectiveness of IT methods. (n=79)

#	Paragraph	SMA	s – deviation	Percentage
1	**IT methods achieved its intended objectives, in relation either to outcomes or impacts**	4.0759	.69378	81.518
2	**IT methods adequately address the 'needs' of the issue or problem**	3.8481	.75258	76.962
3	**IT methods' objectives have been achieved at lowest cost**	3.2405	1.02801	64.81
4	**Overall effects of the measure – both intended and unintended, good and bad – contributed to intended improvement**	3.4937	.88973	69.874
5	**IT methods is understandable and usable by children, therapists and families regardless of their capabilities**	3.3924	1.05512	67.848
6	**I am generally satisfied with the system or service after using it**	3.8608	.82794	77.216

7	**IT methods are fun but purposeful therefore can improve patient adherence for treatment**	4.0506	.71430	81.012
8	**IT methods contribute to the education of people with autism spectrum disorder in terms of Conceptual Skills**	4.0506	.63848	81.012
9	**IT methods contribute to the education of people with autism spectrum disorder in terms of Practical Skills**	3.8861	.89137	77.722
10	**IT methods contribute to the education of people with autism spectrum disorder in terms of social skill**	3.7342	.95688	74.684
	Total field	3.7633	.55150	75.266

According to therapists' perceptions on the benefits of using IT methods, The results in Table 4-3 indicate that about **85%** of the respondents indicated that children with autism comprehend and remember more information when the information is presented to them in the form of pictures or words, as among about **77.7%** of the respondents that portable devices are flexible and easy to move, and the child can carry them with him wherever he goes between the two of them. About **80.5%** of the respondents, touch screens are more user-friendly than the keyboard for children on the autism spectrum. In general, we find that the use of information technology on children on the autism

spectrum in the areas of communication and learning difficulties from the point of view of therapists is effective, as indicated by about **80%** of the respondents. As shown in **4-3**

Table 4-3Therapists' perceptions of effectiveness of using technology with autistic children (n=79)

#	**Paragraph**	**SMA**	**s – deviation**	**Percentage**
1	**handheld devices are flexible and portable, kids can carry them wherever they go**	3.8861	.76774	77.722
2	**Touch screens are much more accessible to those with Autism than a keyboard. Tapping and sliding motions are easier than typing on a keyboard**	4.0253	.83166	80.506
3	**Handwriting is a challenging motor skill for Autistic children. By using a tablet or phone, they can engage in written communications such as texting and email**	3.8228	.91651	76.456
4	**ASD children retain more information when they are presented with graphic images and words. Computer graphics can be used to teach children with Autism visually**	4.2658	.67385	85.316
	Total field	4.0000	.55758	80

According to therapists' perceptions on the pitfalls (dangers) of using IT methods with ASD children, the following results are illustrated in table 4-4

Table 4-4 indicates that about **88%** of the respondents believe that autistic children are highly susceptible to addiction to technology if compared to normal children, as among about **78%** of the respondents that exposure to electronic screens negatively affects the development of social skills such as visual tracking, discriminating facial expressions, body language And empathy in general, as about **75.7%** of the respondents indicated that children on the autism spectrum are more vulnerable to obsessive-compulsive diseases and social phobia. The view of the therapists has an effect, as indicated by about **81%** of the respondents.

Table 4-4 Therapists' general perceptions on disadvantages or risks of using information technology n=79

#	Paragraph	**SMA**	**s - deviation**	**percentage**
1	**Children with ASD are prone to developing an addiction to the technology with smaller amounts of exposure than the average child.**	4.4051	.75987	88.102
2	**There is a lack of melatonin (which helps regulate sleep) in children with Autism. Screen time suppresses melatonin even more, disrupting sleep.**	4.1772	.84367	83.544
3	**Screen time hinders the development of social skills such as eye contact, reading facial expressions, body language, and empathy.**	3.8987	.99479	77.974
4	**Children with autism are more likely to have obsessive-compulsive traits and social anxiety. Screen time is associated**	3.7848	1.04600	75.696

	with increased risk for OCD and social anxiety.			
	Total field	4.0665	.68373	81.33

In general, the following table highlights the main three domains of the study which revealed that **75%** of the respondents found that Information technology for autism spectrum children ***is perceived to be effective***, as well as **80%** perceived them to have ***benefits***. Moreover, **81%** of therapists perceived IT methods as ***having dangers*** for children with ASD. as revealed in table **4-5**

The arithmetic mean (SMA) revealed a result between 3-4, this yields to a result of good perceptions, as proposed previously before data collection. Good perceptions means therapists show good perceptions related to effectiveness and benefits of using IT methods for children with ASD from their points of view. The positive perceptions related to pitfalls or dangers of using IT methods are also noted by them if used with no supervision.

Table 4-5Therapists' general perceptions on all fields of study n=79

#	**Paragraph**	**SMA**	**s - deviation**	**Percentage**
1	**Therapists' general perceptions on the effectiveness of IT methods used in rehabilitation**	3.7633	.55150	75.266
2	**Perceived Benefits of Technology for children with ASD**	4.0000	.55758	80

3	**Pitfalls(dangers) of Technology for Kids With Autism**	4.0665	.68373	81.33

Research question 2: What is the relationship between demographic factors and therapists 'general perceptions of the three study domains?

The t test was performed to assess significant differences between the mean Patients' perception on general perceptions score and the **gender**. The analysis revealed that there are no statistically significant differences at the level of significance ($\mu = 0.05$) in the general perceptions of both effectiveness and benefits according to gender ($P>0.05$). on the other hand, analysis revealed there is a significant difference on perceptions of pitfalls and **gender** ($P< 0.05$), as seen in **table 4-6**

Table 4-6 The differences between the therapist' general perceptions on IT methods used for ASD children and gender (N=79)

Field	Male (n=7)		female (n=72)		t - value	significance level
	SMA	s - deviation	SMA	s - deviation		
Therapists' general perceptions on the effectiveness of IT methods used in rehabilitation	3.2714	.64476	3.8111	.52233	2.558	.012
Perceived Benefits of Technology for children with ASD	3.5000	.55902	4.0486	.53675	2.573	.012
Pitfalls(dangers) of Technology for Kids With Autism	3.6786	.70289	4.1042	.67494	1.587	.117

The second hypothesis:

In order to test this hypothesis, the arithmetic averages and standard deviations of the general perceptions of therapists related to effectiveness, benefits and pitfalls of IT methods, according to the age variable. To test whether these differences are statistically significant, one-way analysis of variance was used,

The analysis revealed that there are no statistically significant differences at the level of significance ($\mu = 0.05$) in the general perceptions of both effectiveness and benefits and pitfalls according to **age** (P>0.05)as shown in **table 4-7**

Table 4-7 the differences between the therapist' general perceptions on IT methods used for ASD children and age (N=79)

fields / variable	variation source	Degrees of freedom	Sum of Squares	mean deviations	P - calculated	significance level
Therapists' general perceptions on the effectiveness of IT methods used in rehabilitation	between groups	4	.833	.208	.673	.612
	within groups	74	22.890	.309		
	Total	78	23.724			
Perceived Benefits of Technology for children with ASD	between groups	4	1.696	.424	1.391	.245
	within groups	74	22.554	.305		
	Total	78	24.250			
Pitfalls(dangers) of Technology for Kids With Autism	between groups	4	4.207	1.052	2.413	.056
	within groups	74	32.257	.436		
	Total	78	36.464			

The third hypothesis

In order to test this hypothesis, the arithmetic averages and standard deviations of the general perceptions of therapists related to effectiveness, benefits and pitfalls of IT methods, according to social status. To test whether these differences are statistically significant, one-way analysis of variance was used,

The t test was performed to assess significant differences between the mean Patients' perception on general perceptions score and **social status** The analysis revealed that there are no statistically significant differences at the level of significance ($\mu = 0.05$) in the general perceptions of both effectiveness and benefits and pitfalls according to **social status** ($P>0.05$). As shown in **table 4-8**

Table 4-8 the differences between the therapist' general perceptions on IT methods used for ASD children and social status (N=79)

fields / variable	Contrast source	Degrees of freedom	Sum of Squares	mean deviations	P - calculated	significance level
Therapists' general perceptions on the effectiveness of IT methods used in rehabilitation	between groups	2	.900	.450	1.498	.230
	within groups	76	22.824	.300		
	Total	78	23.724			
Perceived Benefits of Technology for children with ASD	between groups	2	.929	.465	1.514	.227
	within groups	76	23.321	.307		
	Total	78	24.250			
Pitfalls(dangers) of Technology for Kids With Autism	between groups	2	1.998	.999	2.203	.117
	within groups	76	34.465	.453		
	Total	78	36.464			

Fourth hypothesis:

In order to test this hypothesis, the arithmetic averages and standard deviations of the general perceptions of therapists related to effectiveness, benefits and pitfalls of IT methods, according to level of education. To test whether these differences are statistically significant, one-way analysis of variance was used,

The t test was performed to assess significant differences between the mean Patients' perception on general perceptions score and **level of education** The analysis revealed that there are no statistically significant differences at the level of significance ($\mu = 0.05$) in the general perceptions of both effectiveness and benefits and pitfalls according to **level of education** ($P>0.05$). As shown in **table 4-9**

Table 4-9 the differences between the therapist' general perceptions on IT methods used for ASD children and level of education (N=79)

fields / Variable	variation source	Degrees of freedom	Sum of Squares	mean deviations	P - calculated	significance level
Therapists' general perceptions on the effectiveness of IT methods used in rehabilitation	between groups	2	1.048	.524	1.756	.180
	within groups	76	22.676	.298		
	Total	78	23.724			
Perceived Benefits of Technology for children with ASD	between groups	2	.149	.075	.235	.791
	within groups	76	24.101	.317		
	Total	78	24.250			
Pitfalls(dangers) of Technology for Kids With Autism	between groups	2	.010	.005	.010	.990
	within groups	76	36.454	.480		
	Total	78	36.464			

Fifth hypothesis:

In order to test this hypothesis, the arithmetic averages and standard deviations of the general perceptions of therapists related to effectiveness, benefits and pitfalls of IT methods, according to place of residence. To test whether these differences are statistically significant, one-way analysis of variance was used,

The t test was performed to assess significant differences between the mean Patients' perception on general perceptions score and **place of residence** The analysis revealed that there are no statistically significant differences at the level of significance ($\mu = 0.05$) in the general perceptions of both effectiveness and benefits and pitfalls according to**place of residence** (P>0.05). as shown in table **4-10**

Table 4-10 the differences between the therapist' general perceptions on IT methods used for ASD children and place of residence (N=79)

fields / variable	variation source	Degrees of freedom	Sum of Squares	mean deviations	P - calculated	significance level
Therapists' general perceptions on the effectiveness of IT methods used in rehabilitation	between groups	3	1.693	.564	1.921	.133
	within groups	75	22.031	.294		
	Total	78	23.724			
Perceived Benefits of Technology for children with ASD	between groups	3	1.811	.604	2.017	.119
	within groups	75	22.439	.299		
	Total	78	24.250			
Pitfalls(dangers) of Technology for Kids With Autism	between groups	3	1.505	.502	1.077	.364
	within groups	75	34.958	.466		
	Total	78	36.464			

Sixth hypothesis:

In order to test this hypothesis, the arithmetic averages and standard deviations of the general perceptions of therapists related to effectiveness, benefits and pitfalls of IT methods, according to years of practical experience. To test whether these differences are statistically significant, one-way analysis of variance was used,

The t test was performed to assess significant differences between the mean Patients' perception on general perceptions score and **years of practical experience**. The analysis revealed that there are no statistically significant differences at the level of significance ($\mu = 0.05$) in the general perceptions of both effectiveness and benefits and pitfalls according to **years of practical experience** (P>0.05). as shown in **table 4-11**

Table 4-11 the differences between the therapist' general perceptions on IT methods used for ASD children and therapist's years of practical experience (N=79)

fields / variable	variation source	Degrees of freedom	Sum of Squares	mean deviations	P - calculated	significance level
Therapists' general perceptions on the effectiveness of IT methods used in rehabilitation	between groups	3	.540	.180	.582	.628
	within groups	75	23.184	.309		
	Total	78	23.724			
Perceived Benefits of Technology for children with ASD	between groups	3	.552	.184	.583	.628
	within groups	75	23.698	.316		
	Total	78	24.250			
Pitfalls(dangers) of Technology for Kids With Autism	between groups	3	3.008	1.003	2.247	.090
	within groups	75	33.456	.446		
	Total	78	36.464			

Seventh hypothesis:

In order to test this hypothesis, the arithmetic averages and standard deviations of the general perceptions of therapists related to effectiveness, benefits and pitfalls of IT methods, according to years of practical experience in the use of IT methods. To test whether these differences are statistically significant, one-way analysis of variance was used,

The t test was performed to assess significant differences between the mean Patients' perceptions on general perceptions score and**years of practical experience in the use of IT methods**. The analysis revealed that there are statistically significant differences at the level of significance ($\mu = 0.05$) in the general perceptions of both effectiveness and benefits according to years of practical experience in the use of IT methods. ($P \leq 0.05$)on the other hand, study revealed no statistical difference between perceptions on pitfalls and **years of practical experience using IT methods**($P \geq 0.05$)as shown in table **4-12**

Table 4-12 The differences between the therapist' general perceptions on IT methods used for ASD children and therapists' years of practical experience in the use of information technology

fields / variable	variation source	Degrees of freedom	Sum of Squares	mean deviations	P - calculated	significance level
Therapists' general perceptions on the effectiveness of IT methods used in rehabilitation	between groups	3	2.819	.940	3.371	.023
	within groups	75	20.905	.279		
	Total	78	23.724			
Perceived Benefits	between groups	3	3.180	1.060	3.773	.014

of Technology for children with ASD	within groups	75	21.070	.281		
	Total	78	24.250			
Pitfalls(dangers) of Technology for Kids With Autism	between groups	3	.597	.199	.416	.742
	within groups	75	35.866	.478		
	Total	78	36.464			

Eighth hypothesis:

In order to test this hypothesis, the arithmetic averages and standard deviations of the general perceptions of therapists related to effectiveness, benefits and pitfalls of IT methods, according to years of practical experience in the use of IT methods. To test whether these differences are statistically significant, one-way analysis of variance was used,

The t test was performed to assess significant differences between the mean Patients' perception on general perceptions score and. **obtaining training to use information technology with children of the autism spectrum** The analysis revealed that there are statistically significant differences at the level of significance ($\mu = 0.05$) in the general perceptions of both effectiveness and benefits according obtaining training to use information technology with children of the autism spectrum ($P \leq 0.05$)on the other hand, study revealed no statistical difference between perceptions on pitfalls and **obtaining training to use information technology with children of the autism spectrum**($P \geq 0.05$)as shown in **table 4-13**

Table 4-13**The differences between the therapists' general perceptions on IT methods used for ASD children and obtaining** training to use information technology with children of the autism spectrum

Field	yes (n=41)		no (n=38)		t - value	significance level
	SMA	s - deviation	SMA	s - deviation		
Therapists' general perceptions on the effectiveness of IT methods used in rehabilitation	3.8293	.64476	3.6921	.62271	-1.106	.272
Perceived Benefits of Technology for children with ASD	4.0061	.55902	3.9934	.59413	-.100	.920
Pitfalls(dangers) of Technology for Kids With Autism	3.9024	.70289	4.2434	.64590	2.273	.026

The ninth hypothesis:

In order to test this hypothesis, the arithmetic averages and standard deviations of the general perceptions of therapists related to effectiveness, benefits and pitfalls of IT methods, according to years of practical experience in the use of IT methods. To test whether these differences are statistically significant, one-way analysis of variance was used,

The t test was performed to assess significant differences between the mean Patients' perception on general perceptions score and. **receiving any training on how to deal with children with ASD/learning difficulties and communication problems** The analysis revealed that there are statistically significant differences at the level of significance ($\mu = 0.05$) in the general perceptions of effectiveness and **receiving any training on how to deal with**

children with ASD/learning difficulties and communication problems (P≤0.05), on the other hand, study revealed no statistical difference between perceptions on benefits and pitfalls and **receiving any training on how to deal with children with ASD/learning difficulties and communication problems**(P≥0.05)as shown in **table 4-14**

Table 4-14**The differences between the therapists' general perceptions on IT methods used and receiving any training on how to deal with children with ASD**

Field	yes (n=45)		no (n=33)		t - value	significance level
	SMA	s - deviation	SMA	s - deviation		
Therapists' general perceptions on the effectiveness of IT methods used in rehabilitation	3.8911	52216.	3.6182	.54110	-2.246	.028
Perceived Benefits of Technology for children with ASD	4.0722	55806.	3.9091	.55838	-1.275	.206
Pitfalls(dangers) of Technology for Kids With Autism	4.0500	73004.	4.1136	.61901	.405	.687

The tenth hypothesis:

In order to test this hypothesis, the arithmetic averages and standard deviations of the general perceptions of therapists related to effectiveness, benefits and pitfalls of IT methods, according **Types of information technology systems available in your facility.** To test whether these differences are statistically significant, one-way analysis of variance was used,

The t test was performed to assess significant differences between the mean Patients' perception on general perceptions score andin the use of IT methods. The analysis revealed that there are no statistically significant differences at the level of significance ($\mu = 0.05$) in the general perceptions of both effectiveness and benefits and pitfalls with **Types of information technology systems available in your facility** ($P \leq 0.05$), as shown in table 4-15

Table 4-15The differences between the therapist' general perceptions on IT methods used with **types of information technology systems <u>available</u> in your facility n=79**

fields / Variable	variation source	Degrees of freedom	Sum of Squares	mean deviations	P - calculated	significance level
Therapists' general perceptions on the effectiveness of IT methods used in rehabilitation	between groups	3	2.225	.742	2.587	.059
	within groups	75	21.499	.287		
	total	78	23.724			
Perceived Benefits of Technology for children with ASD	between groups	3	1.431	.477	1.567	.204
	within groups	75	22.819	.304		
	total	78	24.250			
Pitfalls(dangers) of Technology for Kids With Autism	between groups	3	.903	.301	.635	.595
	within groups	75	35.561	.474		
	total	78	36.464			

The eleventh Hypothesis:

In order to test this hypothesis, the arithmetic averages and standard deviations of the general perceptions of therapists related to effectiveness, benefits and pitfalls of IT methods, according **Types of information technology systems <u>used</u> in your facility.** To

test whether these differences are statistically significant, one-way analysis of variance was used,

The t test was performed to assess significant differences between the mean Patients' perception on general perceptions score and in the use of IT methods. The analysis revealed that there are no statistically significant differences at the level of significance ($\mu = 0.05$) in the general perceptions of effectiveness, pitfalls and benefits **with Types of information technology systems <u>used</u> in your facility** ($P \leq 0.05$),) as shown in table 4-16

Table 4-16The differences between the therapist' general perceptions on IT methods used for ASD children and **types of information technology systems they have <u>used</u> in the facility n=79**

fields / variable	**Variation source**	**Degrees of freedom**	**Sum of Squares**	**mean deviations**	**P - calculated**	**significance level**
Therapists' general perceptions on the effectiveness of IT methods used in rehabilitation	between groups	3	.500	.167	.539	.657
	within groups	75	23.223	.310		
	total	78	23.724			
Perceived Benefits of Technology for children with ASD	between groups	3	.423	.141	.444	.722
	within groups	75	23.827	.318		
	total	78	24.250			
Pitfalls(dangers) of Technology for Kids With Autism	between groups	3	.684	.228	.478	.699
	within groups	75	35.780	.477		
	total	78	36.464			

4.5 Results of Qualitative data

After conducting the quantitative research by using a questionnaire developed by the researcher, the researcher found it to be fit and more beneficial to add a supportive qualitative part (Researcher decided to enrich the data by using qualitative part of data collection and analysis, the researcher used focused group.Groups consisted of 6-7 to therapists. The researcher has conducted one session during the visit of each center during break-time. In total, 11 focus group sessions were held.

The question was simply a direct open-ended question about the subject to give the most possible degree of freedom for the group to express their opinion about the matter. Each group however had the same train of thoughts and opinions inside the same health center, which may be due to the shared nature of work inside most of the health centers or the same kind of training or education they received.

The question was as follows: - what is your opinion about the use of IT systems in ASD children rehabilitation according to your perspective as a therapist in your specific health center or in general?

Data collected by audio recording, with considering the ethical principles of qualitative data collection such as privacy, anonymity, and confidentiality. Participants were asked a direct main question then allowed to answer freely about the IT system used in each separate health center where we conducted the interview.

After collecting the needed data, coding analysis was applied and two major categories of data were revealed

Thematic analysis revealed positive and negative perspectives, as follows:

Group A: - Positive themes

1. IT systems used in ASD children rehabilitation is generally are great and even a perfect tool for that task.
2. A new and unique way to get the attention of the child.
3. It breaks the usual routine therefore is very attractive.
4. It helps the child to focus on the task required during sessions.
5. It gives the therapist tools that can't be possible in other ways.
6. The IT systems are flexible enough to be changed as seen to be fit.
7. Have all the requirements needed for the job.
8. Help to increase the child endurance through therapy.
9. They help to reduce stress for the ASD child.
10. Tablets and portable devices can be used or carried anywhere

Group B: - Negative themes

1. May need an appropriate space to implement.
2. May need infrastructure to operate.
3. Ironically, some of the features presented in this system distract the child.
4. Need training or experience to operate, if it was used by an unskilled therapist, it may have negative effects.
5. May be expensive and have an operational cost.

General conclusions derived from the results:

As concluded from the data analysis of the data gathered from therapists, we have the following findings regarding our research question and hypothesis: -

1. Information technology methods are enjoyable and useful for the child and thus increase the child's commitment to treatment.

2. Information technology methods contribute positively to the education of ASD children the topics of cognitive skills.

3. The methods of information technology contribute positively to the education of children of the autism spectrum in the topics of practical skills in general.

4. Children with autism comprehend and remember more information when the information is presented to them in the form of pictures or words.

5. Portable devices are flexible and easy to move, and the child can carry it with him wherever he goes.

6. Touch screens are more user-friendly than the keyboard for children on the autism spectrum. In general.

7. The use of information technology on children on the autism spectrum in the areas of communication and learning difficulties from the point of view of therapists is effective.

8. Therapists believe that autistic children are highly susceptible to addiction to technology if compared to normal children.

9. Therapists believe that exposure to electronic screens negatively affects the development of social skills such as visual tracking, discriminating facial expressions, body language and empathy in general.

10. Therapists believe that children on the autism spectrum are more vulnerable to obsessive-compulsive diseases and social phobia.

11. Information technology on autism spectrum children in topics of communication and learning difficulties from the point of view of therapists is effective and have benefits

12. There is a difference in viewpoints between therapists **of different genders** about the effectiveness of using information technology on children of the autism spectrum in the issues of communication and learning difficulties from the point of view of therapists **according to gender.**

13. There is no difference in the views of the therapists **according to age** about the effectiveness of using information technology on children of the autism spectrum in the issues of communication and learning difficulties from the point of view of therapists according to **age**

14. There is no difference in the views of the therapists **according to different social status** about the effectiveness of using information technology on children of the autism spectrum in the issues of communication and learning difficulties from the point of view of therapists **according to the variable of social status**

15. There is no difference in the views of the therapists **according to the different level of education** about the effectiveness of using information technology on children of the autism spectrum in the issues of communication and learning difficulties from the point of view of the therapists **according to the level of education**

16. There is no difference in the views of the therapists **according to the different place of residence** about the effectiveness of using of information technology on children of the autism spectrum in the issues of communication and learning difficulties from the point of view of the therapists **according to the place of residence**

17. There is no difference in viewpoints between the therapists **according to the different years of practical experience** about the effectiveness of using information technology on children of the autism spectrum in the issues of communication and learning difficulties from the point of view of the therapists **according to years of practical experience.**

18. There is no difference in viewpoints between the therapists **according to the different years of practical experience** in the use of information technology with children of the autism spectrum about the effectiveness of using information technology on children of the autism spectrum in the topics of communication and learning difficulties from the point of view of therapists **according to the gender variable**.

19. There is a difference in viewpoints between respondents of **different sexes** about the effectiveness of using information technology on children of the autism spectrum in the issues of communication and learning difficulties from the point of view of therapists **according to the years of practical experience in the use of information technology with children on the autism spectrum**

20. There is a difference in views among the respondents regarding the **difference in obtaining training to use information technology with children of the autism spectrum**, about the effectiveness of using information technology on children of the autism spectrum in the issues of communication and learning difficulties from

the point of view of therapists, **according to the variable of obtaining training to use information technology with children of the autism spectrum**.

21. there is no difference in viewpoints between the respondents **according to the difference in obtaining training for the use of information technology with children of the autism spectrum** about the effectiveness of using information technology on children of the autism spectrum in the topics of communication and learning difficulties from the point of view of therapists **according to the variable of access Training for the use of information technology with children on the autism spectrum**

22. there is a difference in viewpoints between the respondents **according to the difference in obtaining training on methods of dealing with children of the autism spectrum in the topics of communication and learning difficulties** about the effectiveness of using information technology on children on the autism spectrum in the topics of communication and learning difficulties from the point of view of therapists **according to the variable of obtaining training on methods Dealing with autism spectrum children in the topics of communication and learning difficulties,**

23. there is no difference in viewpoints between the respondents according to the different **types of information technology systems used in your facility** about the effectiveness of using information technology on children of the autism

spectrum in the issues of communication and learning difficulties from the point of view of therapists according to the **types of information technology systems used in your facility**

4.6 Summary

Study revealed that 81% of Therapists positively think that using IT systems in ASD children rehabilitation increases the effectiveness of the therapy, another finding is that 80% Therapists positively think that using an IT system in ASD children rehabilitation does have a number of clear benefits that can't be achieved otherwise. Lastly, 88%of Therapists positively have the shared opinion that using IT systems in ASD rehabilitation in a wrong or untrained way can have dangers, pitfalls or negative effects that should be considered and avoided.

CHAPTER FIVE

Discussion, Recommendations, and Conclusion

5.1 Introduction

In this chapter, discussion, conclusions, and recommendations will be explained. The conclusion will be formulated according to the purpose of the study. The purpose of this study was to examine the effectiveness of information technology methods used in rehabilitating children with autism who complain of learning and communication difficulties in Palestine as perceived by their therapists.

5.2 Discussion:

The study revealed that 81.5% of the respondents indicated that Information technology methods are enjoyable and useful for the child and thus increase the child's commitment to treatment. This is supported by the 2016 study that aim to use IT systems through phones with ASD children to gather data over six months in their specific application from a 100 families and have concluded that using IT systems is encouraging to the child and help parents adapt to their child behavior (Bonnot et al., 2016)and also supported in the 2019 study that aim to discuss the impact of IT systems with ASD that concluded that the use of technologies in conjunction with games are very promising by reviewing 74% case studies done by therapists from their total reviewed literature (Valencia,K et al., 2019).

The Paper also found that 77.7% of people indicated that information technology methods contribute positively to education of children of the autism spectrum in the

topics of cognitive skills and 75% indicated that the methods of information technology contribute positively to the education of children of the autism spectrum in the topics of practical skills in general. This is found in the “HANDS” report reviewed in 2013 (Mintz, 2013) that project aim to discuss the inclusion of smart phones in ASD lifestyle , the project support the same claim of our paper by resulting in identifying a number of themes and scenarios which is positively accomplished by using their app, The main scenario of these results is the that using IT systems in ASD to mainly support primary and secondary education in schools and to support the use of school facilities for ASD children, therefore focusing on quality of life during education which support our claim

On the other hand, the paper found that 85% of therapists have indicated that Children with autism comprehend and remember more information when the information is presented to them in the form of pictures or words. This is supported by the 2019 study that created a visual application using IT systems that aim to increase visual perception for ASD children in its design, the project hopes to result in increasing the accuracy and effectiveness of ASD children education in a number of schools in Malaysia(Mohd et al., 2019).

Moreover, 77.7% of therapists viewed Portable devices are flexible and easy to move, and children can carry with them wherever they go. This benefit of portable devices is shared in the paper that was conducted in 2017 that aim discussed the perspective on tablet use, that resulted in a number of themes mainly that They were aware of the incredible motivation tablets provided and that portable devices are fun and bring benefits that can’t be reached otherwise (Amie M King, 2017) and is more supported by another project conducted in 2020 of the same specific subject that aimed to use eye tracking

technology to identify autism by using portable devices to conduct that project which in itself support our result (Solovyova, Oleksii, and Kravchenko, 2020).

The current results showed that touch screens are more user-friendly than the keyboard for children on the autism spectrum In general, this result was supported positively by 80.5% of participants and supported by a study conducted in 2012thatreviewed a number of literature in order to discuss the use of tablets with ASD daily life , this paper talk about the use of other methods in ASD rehabilitation like tablets and other table top computer technologies and resulted in having a number of themes supporting our findings , the main themes is that multitouch tabletop technology is an applicable technology with great potentials for people with ASD and the theme of that IT systems provide the best kind of support for people with ASD , this result directly support our finding (Chen, 2012)

Moreover, this paper found that 80% of therapists have positive perceptions regarding the effectiveness of information technology on children on the autism spectrum in the areas of communication and learning difficulties as being positively effective. Which is supported and shared by a number of other papers, the first one that support this positive effectiveness, aim to discuss the impact of IT systems with AS discussing that in general, it reviewed a number of literature which resulted in positively agreeing of theses impacts of IT systems, as it concluded with the statement that They can perform many tasks simultaneously, quickly and efficiently using IT systems and that it is developed to asset ASD children(Shoaib et al., 2017) the second paper that support this is the 2019 that is a systemic review that aim to discuss the intervention of IT systems with ASD by reviewing 83 papers that also resulted in agreeing with effectiveness of using IT systems

in it conclusion by stating that The findings support the notion that this is a very promising (Koumpouros & Kafazis, 2019) , the third is the same study mentioned before in 2019 that also talk about the effectiveness of using IT systems (Mohd et al., 2019).

Therapists believe that ASD children are highly susceptible to addiction to technology if compared to normal children. This was indicated by 88% of participants. 78% of Therapists believe that exposure to electronic screens negatively affects the development of social skills such as visual tracking, discriminating facial expressions, body language and empathy in general. And lastly, 75.7% of Therapists believe that children on the autism spectrum are more vulnerable to obsessive-compulsive diseases and social phobia. All of these are warned about by a number of papers. The first was systemic review of 94 literature that aim to discuss the impact of IT systems with ASD, this paper resulted in a positive conclusion as mentioned before but still included a number of warning about the negatives in its final result that are the same as our proclaimed negatives mainly the subject of addiction, however, it claim that these aspects is not valid in details (Valencia,K.,et al 2019) , the second paper we can include that also warned about negative impact is also the previously mentioned that aim to discuss the impact of IT systems with ASD as it is generally sway to the positive of using them but still acknowledge the negatives and the impairments on development it may have if used unorganized (Shoaib et al., 2017) the third we are going mention is the “HANDS” project as despite it previous mention results he also mention the social impairments and addiction the use of IT systems with ASD children in his final result and conclusion (Bonnot et al., 2016).

5.3 Limitations of the study

Limitations of the current study were:-

1. The questionnaire was a self-administered questionnaire there therefore can be hard to monitor and subjected to dishonesty
2. As 52% of therapists haven't receive training in using IT methods and 58% haven't receive training in dealing with ASD children, this may rise some concern regarding their perspective, although, this can be compensated by their practical experience or general health education
3. Some health centers where a bit uncooperative and made data gathering harder through extra prerequisites before data gathering
4. The limitation of travel by the Covid incidence makes it harder to gather data

5.4 Strengths of the study

The major strength in this study was that it covered almost the whole population of therapists working in health centers in north Palestine, which was the intended area of this research, the second is that all data was gathered from the major and well-known health center in that same area that parents tend to send children to, which make our final goal of gathering therapists opinions very strong and real. The third strength is that diversity of people participated in terms of age, gender and experience.

5.5 Recommendations

Based on the results of the current study, the researcher recommends the following:

1- More studies should be conducted concerning therapist opinions and viewpoints, as the therapist is the center of rehabilitation of ASD children

2- More studies should be conducted concerning using IT systems in health centers and healthcare in general as this paper has proven the benefits

3- More research should focus on conducting qualitative research to explore deeply the therapist's concerns and perceptions.

4-Training courses should be provided for all health workers in dealing with IT systems and how to operate them effectively.

5- Implementing Infrastructure for health care IT systems that require them to be efficient

5.6 Conclusion

The study confirmed that 81% of the participants agree toward the effectiveness of using IT systems in rehabilitation of ASD children and the great benefits of its impact on it. This was the predicted hypothesis that is now positively confirmed

The study also acknowledges the negatives of using and the costs of implementing these technologies and the need to have infrastructure and training to use them.

Lastly, this study confirms specifically the benefits of using such technologies in the Palestinian settings in the subject of rehabilitation ASD children in the areas of learning and communication.

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Appendix 1: English questionnaire

Impact of Information Technology used for children with Autism Spectrum Disorders with communication and learning difficulties as perceived by their therapists :A cross sectional study in the north of West Bank-Palestine

Socio-demographic information:	
Gender:	☐ Female ☐ Male
Age:	☐ 18 -24 ☐ 25-29 ☐ 30-34 ☐ 35-40 ☐ more than 40
Marital Status:	☐ Single ☐ Married ☐ Divorced ☐ Widowed
Educational Level:	☐ Diploma degree. ☐ Bachelor degree. ☐ High diploma degree. ☐ Master degree. ☐ Doctoral degree.
Place of residence:	☐ City ☐ Village ☐ Camp
Work Status	
Total clinical experience :	☐ 6 month – 5 years ☐ 6 – 10 years ☐ 11 – 15 years ☐ 16 – 20 years ☐ More than 21 years
Total clinical experience using IT methods with children with ASD:	☐ month – 5 years ☐ 10 years ☐ – 15 years ☐ – 20 years ☐ re than 21 years
Did you receive any training toward how to use IT methods:	☐ Yes ☐ No
Did you receive any training on how to deal with children with ASD/learning difficulties and communication problems:	☐ Yes ☐ No

Kind of information technology methods available at your institution	□ Interactive tablet □ Interactive mattress □ Interactive 3D projection □ other : _____
Kind of information technology methods you have used at your institution	□ Interactive tablet □ Interactive mattress □ Interactive 3D projection □ other : _____

Section 2 :Therapists' general perceptions on the effectiveness of IT methods used in rehabilitation

The following questions are about assessing your general perceptions regarding impact of IT methods on children with ASD. Please put (X) on the option that matches your answer:

No	Statement	Strongly Agree	Agree	Neutral	disagree	Strongly disagree
1	IT methods achieved its intended objectives, in relation either to outcomes or impacts					
2	IT methods adequately address the 'needs' of the issue or problem					
3	IT methods' objectives have been achieved at lowest cost					
4	Overall effects of the measure – both intended and unintended, good and bad – contributed to intended improvement					
5	IT methods is understandable and usable by children, therapists and families regardless of their capabilities					
6	I am generally satisfied with the system or service after using it					
7	IT methods are fun but purposeful therefore can improve patient adherence for treatment					
8	IT methods contribute to the education of people with autism spectrum disorder in terms of Conceptual Skills					
9	IT methods contribute to the education of people with autism spectrum disorder in terms of Practical Skills					
10	IT methods contribute to the education of people with autism spectrum disorder in terms of social skill					

Section3 :Perceived Benefits of Technology for children with ASD

The following questions are about assessing your perceptions on benefits of IT for children with ASD. Please put (X) on the option that matches your answer:

No	Statement	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
11	handheld devices are flexible and portable, kids can carry them wherever they go					
12	Touch screens are much more accessible to those with Autism than a keyboard. Tapping and sliding motions are easier than typing on a keyboard					
13	Handwriting is a challenging motor skill for Autistic children. By using a tablet or phone, they can engage in written communications such as texting and email					
14	ASD children retain more information when they are presented with graphic images and words. Computer graphics can be used to teach children with Autism visually					
Section 4: Pitfalls(dangers) of Technology for Kids With Autism						
No	**Statement**	**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**
15	Children with ASD are prone to developing an addiction to the technology with smaller amounts of exposure than the average child.					
16	There is a lack of melatonin (which helps regulate sleep) in children with Autism. Screen time suppresses melatonin even more, disrupting sleep.					
17	Screen time hinders the development of social skills such as eye contact, reading facial expressions, body language, and empathy.					
18	Children with autism are more likely to have obsessive-					

	compulsive traits and social anxiety. Screen time is associated with increased risk for OCD and social anxiety.					

Appendix 2: Arabic questionnaire

تاثير استعمال تكنولوجيا المعلومات على اطفال طيف التوحد في مواضيع الاتصال وصعوبات التعلم مستعرضة في منطقة شمال الضفة الغربية من وجه نظر المعالجين :- دراسة مقطعية

ضع اشارهة (x) في المكان المخصص

المعلومات الاجتماعية – الديموغرافية :-	
الجنس :	**ذكر** ☐ **انثى** ☐
العمر :	**18 -24** ☐ **25-29** ☐ **30-34** ☐ **35-40** ☐ **اكثر من 40** ☐
الحالة الاجتماعية :	**اعزب** ☐ **متزوج** ☐ **مطلق** ☐ **ارمل** ☐
مستوى التعليم :	**شهاده دبلوما** ☐ **شهادة باكالوريوس.** ☐ **شهادة دبلوما عالية.** ☐ **شهادة ماجستير** ☐ **شهاده دكتوراه** ☐
مكان السكن :	**مدينة** ☐ **قرية** ☐ **مخيم** ☐
وضع العمل	
سنوات الخبرة العملية :	**6 شهور – 5 سنوات** ☐ **5 -6 سنوات** ☐ **11 – 15 سنة** ☐ **16 – 21 سنة** ☐ **اكثر من 21 سنة** ☐
سنوات الخبرة العملية في استعمال تكنولوجيا المعلومات مع اطفال طيف التوحد :	**6 شهور – 5 سنوات** ☐ **5 -6 سنوات** ☐ **11 – 15 سنة** ☐ **16 – 21 سنة** ☐ **اكثر من 21 سنة** ☐
هل حصلت على اي تدريب لاستعمال تكنولوجيا	**نعم** ☐ **لا** ☐

المعلومات مع اطفال طيف التوحد :	
هل حصلت على اي تدريب على اساليب التعامل مع اطفال طيف التوحد في مواضيع التواصل وصعوبات التعلم باستخدام تكنولوجيا المعلومات :	**نعم** ☐ **لا** ☐
انوع انظمه تنكنولوجيا المعلومات المستخدمه في منشأتك :	**تابلت تفاعلي** □ **فرشة تفاعلية** □ **بروجيكيكتور ثلاثي الابعاد تفاعلي** □ **اخرى :** _____ □
انواع انظمه تكنولوجيا المعلومات اللتي قمت باستعمالها في منشأتك :	**تابلت تفاعلي** □ **فرشة تفاعلية** □ **بروجيكيكتور ثلاثي الابعاد تفاعلي** □ **اخرى :** _____ □

اراء المعالجين العامه على فاعلية استخدام اساليب تكنولوجيا المعلومات في عملية اعاده التاهيل

No	العبارة	اوافق بشدة	اوافق	محايد	لا اوافق	لا اوافق بشدة
1	اساليب تكنولوجيا المعلومات حققت اهدافها المقصودة سواء بالنتيجة او التاثير					
2	اساليب تكنولوجيا المعلومات تتعلق بشكا واضح بالمشاكل ذات الصلة					
3	اهداف اساليب تكنولوطيا المعلومات تحقق اهدافها باقل التكاليف					
4	التأثيرات العامه للاساليب سواء مقصوده ام لا او فعاله ام لا تؤثر بشكل ايجابي على العمليه العلاجية					
5	اساليب تكنولوجيا المعلومات مفهومه وسهلة الاستعمال من قبل الاطفال والمعالجين والاهل بغض النظر عن قدراتهم					
6	اشعر بالرضا بشكل عام تجاه من النظام او الخدمه بعد الاستعمال					
7	اساليب تكنولوجيا المعاومات ممتعه ومفيدة للطفل وبالتالي تزيد من تقبل الطفل للعلاج					
8	اسالسب تكنولوجيا المعلومات تلكتساهم في تعليم اطفال طيف التوحد في مواضيع مهارات الادراك					
9	اساليب تكنولوجيا المعلومات تلك تساهم في تعليم اطفال طيف التوحد في مواضيع المهارات العملية					
10	اساليب تكنولوجيا المعلومات تلك تساهم في تعليم اطفال طيف التوحد في مواضيع المهارات الاجتماعية					

الفوائد العامة لاستخدام التكنولوجيا مع اطفال طيف التوحد

No	Statement	اوافق بشدة	اوافق	محايد	لا اوافق	لا اوافق بشدة
11	الاجهزة المحمولة مرنه وسهلة التنقل ، يستطيع الطفل ان يحملها معه اينما يذهب					
12	شاشات اللمس اكثر سهولة بالاستعمال من لوحة المفاتيح لاطفال طيف التوحد اللمس والتمرير على شاشة اللمس اسهل من النقر على ازرار لوحه المفاتيح					
13	تعتبر الكتابة اليدويةتحدي لمهرات لطفل طيف التوحد الحركيه. لذا يعتبر استعمال التابلت او الهاتف الذكي وسيلة لمشاركتهم في التواصل عن طريق الكتابة الرقميه او الايميلات					
14	يستوعب اطفال التوحد معلومات اكثر عند تقديم المعلومات لهم على شكل صور او كتابات مجسده يمكن استخدام مؤثرات الكمبيوتر لتعليم اطفال طيف التوحد عن طريقها صوريا					

سلبيات استخدام التكنولوجيا مع اطفال طيف التوحد

No	العبارة	اوافق بشدة	اوافق	محايد	لا اوافق	لا اوافق بشدة
15	يمتلك اطفال طيف التوحد قابلية اعلى للادمان من التكنولوجيا اذا ما تمت مقارنتهم بالاطفال العاديين					
16	يوجد فقر لدى اطفال التوحد من الميلاتونين "اللذي يساعد على تنظيم فترات النوم" زياده وقت التعرض للشاشات الالكترونية يحبط هذا الهرمون بشكل اكبر مما يؤدي الى اضطرابات بالنوم					
17	التعرض للشاشات الالكترونيه يؤثر بشكل سلبي على تطور المهارات الاجتماعيه مثل التتبع االبصري ، تمييز تعابير الوجه ، لغة الجسد والتعاطف بشكل عام					
18	اطفال طيف التوحد معرضين بشكل اكبر لامراض الوسواس القهري والرهاب الاجتماعي التعرض للشاشات قد يزيد من مخاطره الحصول عليها					

Appendix 3:

Arab American University
Faculty of Graduate Studies

الجامعـــة العربيـــة الأمريكيـــة
كلية الدراسات العليا

2021-8-2

الى من يهمه الامر،

تسهيل مهمة بحثية

تحية طيبة وبعد،

تهديكم الجامعة العربية الامريكية اطيب التحيات، وبالإشارة الى الموضوع أعلاه، تشهد كلية الدراسات العليا في الجامعة أن الطالب **جمال محمد غانم** والذي يحمل الرقم الجامعي 201812630هو طالب ماجستير في الجامعة العربية الامريكية تخصص معلوماتية صحية ويعمل على دراسة علمية بعنوان:"
فعالية استخدام تكنولوجيا المعلومات في علاج أطفال طيف التوحد الذين يعانون من عدم القدرة على التواصل والتعلم في فلسطين من وجهة نظر المعالجين"، نأمل من حضرتكم الايعاز لمن يلزم لمساعدته للحصول على المعلومات اللازمة للدراسة، علماً ان المعلومات ستستخدم لغاية البحث فقط وسيتم التعامل معها بغاية السرية، وقد أعطي هذه الرسالة بناءًعلى طلبه.

د. شاهيناز نجار

عميد كلية الدراسات العليا

كلية الدراسات العليا
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ملخص الدراسة

الخلفية: يشير اضطراب طيف التوحد (ASD) إلى اضطراب النمو العصبي الذي يتميز بصعوبات في التواصل والتفاعل الاجتماعي وسلوكيات نمطية واهتمامات وانشطة مقيدة بها. تظهر هذه الأعراض في مرحلة مبكره في نمو الطفل وتؤثر على الأداء اليومي. يستخدم مصطلح "الطيف" بسبب عدم التجانس في شدة أعراض طيف التوحد ، وكذلك في المهارات ومستوى أداء الأفراد المصابين بالتوحد

الهدف: الهدف الرئيسي من هذه الدراسة هو فحص فاعلية استخدام بعض تقنيات المعلومات في إعادة تأهيل الأطفال المصابين باضطراب طيف التوحد الذين يعانون من صعوبات التعلم والتواصل من وجهة نظلر المعالجين في مراكز مختارة في فلسطين.

المنهج: دراسة مقطعية وصفية. تتكون العينة من 79 معالجًا يعملون في مراكز تأهيل الأطفال المصابين بالتوحد والذين يعانون من صعوبات في التواصل والتعلم في فلسطين. وقد قام الباحث من عمل استمارة بهدف جمع المعلومات تضمن معلومات ديموغرافية واجزاء ومواضيع تتعلق بالموضوع وهي ثلاثه نطاقات

النطاق الاول هو راي المعالجين في فاعلية استخدام تكنولوجيا المعلومات مع اطفال طيف التوحد , النطاق الثاني هو فوائد استعمال تلك التكنولوجيات والنطاق الثالث يتحدث عم خاطرها وسلبياتها

النتائج: كشفت الدراسة أن 81٪ من المعالجين يعتقدون بشكل إيجابي أن استخدام أنظمة تكنولوجيا المعلومات في إعادة تأهيل أطفال طيف التوحد يزيد من فعالية العلاج ، والنتيجة الثانية هي أن 80٪ من المعالجين يعتقدون بشكل إيجابي أن استخدام انظمة تكنولوجيا المعلومات في إعادة تأهيل الأطفال طيف التوحد له عدد من الفوائد الواضحة. أخيرًا ، لدى 88٪ من المعالجين رأيًا مشتركًا بأن استخدام أنظمة تكنولوجيا المعلومات في إعادة تأهيل اطفال التوحد بطريقة خاطئة أو غير مدربة يمكن أن يكون له مخاطر أو آثار سلبية يجب مراعاتها وتجنبها.

استنتاج: وأكدت الدراسة أن معظم المشاركين متفقون على فاعلية استخدام أنظمة تكنولوجيا المعلومات في إعادة تأهيل أطفال التوحد والفوائد الكبيرة لتأثيرها عليهم. كانت هذه هي الفرضية المتوقعة للدراسة والتي تم تأكيدها الآن بشكل إيجابي.

كما تعترف الدراسة بسلبيات استخدام هذه التقنيات وتكاليف تنفيذها والحاجة إلى البنية التحتية والتدريب على استخدامها.

أخيرًا ، تؤكد هذه الدراسة تحديدًا فوائد استخدام مثل هذه التقنيات في البيئات الفلسطينية في موضوع إعادة تأهيل أطفال التوحد في مجالات التعلم والتواصل.

الكلمات المفتاحية: اضطراب طيف التوحد ، صعوبات التعلم والتواصل ، التأهيل ، تكنولوجيا المعلومات