Technology-Supported Models for Individuals with Autism Spectrum Disorder

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Abstract—Autism can be defined as a common developmental disorder that manifests itself as a disconnection in social communication. In individuals with autism, sometimes speech does not develop at all, and even if it develops, the individual does not prefer to communicate by talking. Thus, other ways are needed to communicate with individuals with autism. Today, the most important of these ways is technology, especially educational technology. The use of technology for individuals with Autism spectrum disorder (ASD) is on the rise today. The purpose of this study was to present up-to-date information on research using technology-based intervention methods in teaching skills in different developmental areas to individuals from different age groups with ASD and to reveal whether this intervention method is effective. This study was carried out using qualitative research methodology, document analysis and related content analysis. Scopus is based on the analysis of published documents searched with the keywords 'autism and technology-based' in the database. All articles published in Scopus were examined. The distribution of affiliated universities by years, subject areas, document types, country/regions and author themes were examined. Various findings emerged in terms of determining the importance of the analysis of technology-supported applications in terms of

content of individuals published in the Scopus database on individuals with ASD. A total of 95 studies were examined. It was concluded that most of the studies were conducted in 2016 and 2019. It revealed that the first study was conducted in 2008. It was mostly published as a conference announcement. The United States and United Kingdom are among the countries with the most research. The research topics were written mostly in English, and two were published in French.

1 Introduction

Individuals with distinct differences compared to their peers are called disabled people. They are divided into groups according to the characteristics of their disability. In this research, we will consider the Autism disability group. Autism comes under the social-emotional development disability group. Autism can be defined as a pervasive developmental disorder that manifests itself as a disconnection in social communication. Autism spectrum disorder (ASD) is the most common type of developmental disability after mental disability, according to official figures. The United States of America (USA) is one of the countries where OIZ is seen most frequently. Therefore, the most comprehensive researches are carried out in the USA. In individuals with autism, sometimes speaking does not develop at all, and sometimes even if it does, they do not prefer to communicate by talking. In general, communication, cognitive and focusing problems of children diagnosed with ASD is a topic frequently mentioned in the literature [7,18]. Individuals with ASD have many characteristics. Inability to make eye contact, obsession with objects, inability to start and end a conversation and repetitive behaviours are the early symptoms of ASD. Understanding gestures, using body language, echolalia (use of stereotypical and repetitive verbal expressions), difficulties in language and communication skills, spontaneous initiation and maintenance of conversation, inadequacy in peer interaction and communication, limitations in sharing common interests and pleasure, interest in extraordinary topics, using objects for extraordinary purposes and excessive insistence against order and routines are among the main behavioural characteristics seen in individuals with [1,2,4,8]. Individuals with SB respond better to visual stimuli. The use of social stories together with technology to teach appropriate social skills and provide visual clues to individuals with ASD is an appropriate instructional approach [14]. All these problems negatively affect the teaching processes of children with ASD. One of the teaching approaches that will increase motivation in the teaching processes of individuals with ASD is technology-based teaching approaches.

With the development of technology day-by-day, teaching approaches have shifted from traditional teaching to modern education supported by technological equipment. The tools that are used effectively in the teaching process enable the subjects to be understood more meaningfully by students [16,26,29,31]. In the literature review, it was seen that positive results were obtained from computer-aided applications in the field

of special education after the 2000s [3,17]. It was found that the best learning was directly proportional to how many sensory organs were affected. It was seen that the use of technology was used in the education of individuals with special needs, who differ from individuals with normal development, especially in terms of learning characteristics, as it is important to concretise abstract concepts. In many studies, it was stated that meaningful learning occured when the content was presented verbally and audio-visually in more than one form [30,15,24,25]. In short, it would be appropriate to say that the more sensory organs an individual uses in the learning process, the more effective learning takes place. In the field of special education, there are also opinions that the content designed by using multimedia is more attractive [5,6,32]. Digital technology-oriented tools attract the attention of students with ASD, and teaching in this way is often more effective [10,11,22,27]. The technological developments encourage the production of more informatics-based tools and software for individuals with developmental disabilities [20,21]. According to Sani Bozkurt [23] and Garzotto et al. [9], the possibilities provided by technology today are convenient for the use of social stories with new technologies. Social stories can be presented to individuals with ASD in different media, such as written, written-visual or video. Which environment or format to use is related to the developmental level and individual characteristics of the individual with ASD and what kind of social skills he/she needs [12].

When the literature on technology-based research in individuals with ASD was examined, it was seen that many skill areas were applied using computer-based instruction, smartphones and tablets. According to the reports of NAC and NPDC, technology-based interventions are scientifically based practices that are effectively used in the field of special education [33]. With the rapid development of technology and the increase in studies, it will be a guide for researchers and practitioners to examine the technology-based studies descriptively and interpret the results of the current studies on individuals with ASD. For this reason, it was decided to conduct this research. It is important in terms of revealing the studies conducted in the last years on individuals with ASD.

At the end of this research, autism and technology-based approaches were examined. Their distribution among countries, distribution between years, distribution between departments, distribution by place of publication and distribution according to published languages were also examined.

1.1 The purpose and importance of the study

The aim of this study is to systematically analyse the articles accessed through the search made in the Scopus database by examining them according to the selected themes and discussing them with other relevant basic concepts. Through research, researches on technology-based research conducted with the autism disability group were evaluated and contributions were made to studies in relevant subject areas.

Limitations

- This research was limited to the selected and reviewed documents in the Scopus database.
- The research was limited to the documents published between the years 2008 and 2020.
- The content analysis of the documents was limited to the five themes specified above.

2 Method

This study was carried out using a qualitative research methodology, document analysis and related content analysis. The basic process in content analysis is to compile similar data within the framework of specified concepts and themes and to interpret organisations in a way that readers can understand. Content analysis is a scientific framework that enables a systematic analysis of written, oral and other sources. The research topics, the quality and quantity of the studies, the methods and the techniques used were evaluated by the content analysis method. Thus, it was seen that the trend in a certain area was likely determined. It is thought that the data obtained will make important contributions to the development of publishing policies of educational research, as well as directing educational research [19].

2.1 Data collection and analysis

Within the scope of the research of technology-based designs and teaching in individuals with autism, a research was conducted using the keywords 'autism and technology-based' in the Scopus database between 2008 and 2020, and 95 documents presented in the research were obtained. The documents obtained from the Scopus database were analysed, linked with each other and integrated, and the data were analysed by content analysis (Figure 1).
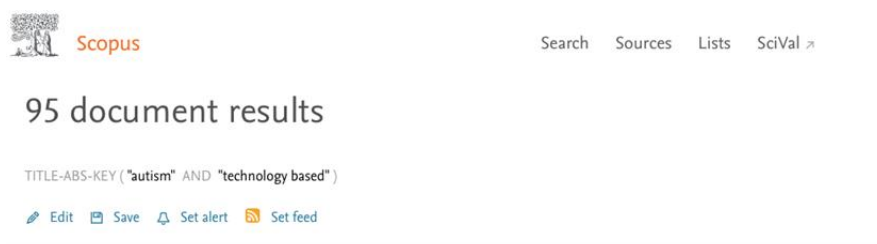

Fig. 1. The documents accessed on Scopus database through keywords 'autism and technology-based'

3 Findings

3.1 Distribution of documents by years

At this stage of the research, the distribution of documents between the years 2008 and 2020 was examined. In this context, 95 studies were accessed through the Scopus database, and their distribution was presented in Table 1.

Table 1. Distribution of documents by years

Years	Frequency
2020	10
2019	22
2018	11
2017	8
2016	17
2015	8
2014	3
2013	6
2012	2
2011	4
2010	1
2009	2
2008	1

When we looked at autism and technology-supported studies, it was seen that the first study was conducted in 2008 from the distribution of studies by years. It was also found that most of the studies were conducted in 2019 (22) and in 2016 (17) and the least was conducted in 2008 (1) and 2010 (1).

3.2 Distribution of documents by subject areas

Table 2. Distribution of documents by subject areas

Subject area	f
Computer Science	37
Psychology	35
Social Sciences	25
Medicine	24
Mathematics	10
Arts and Humanities	8
Engineering	8
Health professions	7
Neuroscience	4
Biochemistry, Genetics and Molecular Biology	2
Agricultural and Biological Sciences	1
Chemical Engineering	1

Energy	1
Multidisciplinary	1
Pharmacology, Toxicology and Pharmaceutics	1
Physics and Astronomy	1

When we looked at autism and technology-based studies, it was seen that most of the studies were conducted in the field of Computer Science (37). It was seen that autism and technology-based studies focus on Psychology (35), Social Sciences (25) and Medicine (24).

3.3 Distribution of documents by document types

Table 3. Distribution of documents by document types

Document types	f
Article	48
Conference paper	24
Review	14
Book chapter	3
Conference review	2
Erratum	2
Book	1
Letter	1

When the document types of autism and technology-based studies were examined, it was seen that 48 studies were articles. It was found that 24 studies were presented as conference papers. However, there is one study each in Letter and Book document types.

3.4 Distribution of documents by the countries of authors

Table 4. Distribution of documents by the countries of authors

Country	f
United States	42
United Kingdom	14
United States	8
Australia	7
China	6
France	4
India	4
Spain	3
Belgium	3
Israel	3
Malaysia	2
Brazil	2
Canada	2

Germany	2
Hungary	2
Italy	2
Netherlands	2
Norway	2
Romania	2

When the countries of the authors of the studies on autism with technology-based teaching were examined, it was revealed that the majority of the studies were conducted in the United States (42), followed by United Kingdom (14), Australia (8) and China (7).

There is one study each in Chile, Colombia, Finland, Hong Kong, Ireland, Pakistan, Portugal and Sweden. The countries of the authors of three studies are unknown.

3.5 Distribution of documents by language

Table 5. Distribution of documents by language

Language	f
English	93
French	2

When the studies published, by using the keywords technology-based teaching and autism, were examined, almost all of the studies were in English. Only two of them were published in French. There are no published studies in other languages.

4 Conclusion and Discussion

In the Scopus database, 5 topics were identified and 95 documents were reached, and the themes were determined as a content analysis initiated by the search with the keywords 'autism and technology-based'.

Technology-based teaching and designs are rapidly increasing. Technology-based studies are of great importance when considering the effectiveness of the studies. With the rapid development of technology, many studies have been conducted on technology-based teaching on individuals with disabilities. In this study, autism and technology-based studies were investigated. Autism is a type of disability that has social problems and problems in terms of attachment, trust and communication skills. For this reason, autism and technology effectiveness are very important. In this context, with this study, the results of autism and technology-based teaching and designs indicate what the deficiencies are and what can be done. Autism and technology-based studies need to be increased. When we look at the autism and technology-supported studies conducted on individuals with autism, it was seen that the first study was conducted in 2008 from the distribution of studies by years. When we looked at the year 2008, when technology entered our lives, it was seen that the studies started late. It was determined that most of the studies were conducted in 2019 (22) and 2016 (17). It was concluded

that the least studies were conducted in 2008 (1) and 2010 (1). Technological developments have encouraged the creation of more informatics-based tools and software for individuals with developmental disabilities [20,21]. Cognitive loading does not occur for individuals with ASD, but they can use these tools with an intuitive and exploratory approach. Another feature of these tools is that the communication allows not only touch-based communication but also the opportunity to present it to users with different approaches that enrich the content. It is the ability to increase functionality by communicating with the user (. For this reason, it can be said that studies on OIZ and technology-based teaching have increased in recent years.

By examining the autism and technology-based studies published in the Scopus database, it can be seen that most of the work was conducted in the field of Computer Science (37). Studies have also been conducted in the fields of Psychology (35), Social Sciences (25) and Medicine (24). In line with these results, the effects of technology-based teaching and designs on individuals with autism can be investigated in special education and other fields. In the past literature reviews of individuals with ASD, where technology-based intervention methods were provided, it can be seen that the literature generally focused on a specific skill area [13,28]. It can be seen that the literature focuses more on two areas. These areas are computer science and psychology. The reason why technology is related to computer science can be said to be related to the field of psychology as the psychological effects of the development of autism are intense. It can be said that it will be useful to expand the literature in different fields.

When autism and technology-based studies published in the Scopus database were examined, it was revealed that most of the studies were conducted in the United States of America (42), followed by the United Kingdom (14), Australia (8) and China (7). There are studies in Chile, Colombia, Finland, Hong Kong, Ireland, Pakistan, Portugal and Sweden. The countries of the three study authors are unknown. This result is not surprising when looking at the ranking of developed countries. Along with the technological developments used in developed countries, there are many studies in the field of autism. It can be suggested that research should be conducted on autism and technology-based studies in other countries. It can be said that autism and technology-based studies should be increased in Russia.

When the studies published in the Scopus database by searching the concepts of technology-based autism were examined, almost all of the studies were in English. Only two of them were published in French. There are no published studies in other languages. Studies can be published in terms of universality in other languages. Since English is the universal language in the world, it is not surprising that the languages of the articles published are in English. It may be suggested to publish studies in other languages.

5 References

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