Review

POTENTIAL OF ROBOTIC TECHNOLOGY IN SOCIAL ANXIETY DISORDER*

Hamza SIĞIRCI[1], Şerife GÜZEL[2]

Abstract

Technology describes a process that often develops day by day. Technology, which attempts to sustain both individual and community health, contributes to the prevention and postponement of health issues. The newest technological stars in this process are robots. On the other hand, social robots are sophisticated robotic machines that distinguish themselves via their capacity for human interaction and technology integration. The problem of the study is how to incorporate robotic technology, which is widely used in administrative and surgical units, into the treatment process. The aim of the research is to shed light on the potential use of social robots in the therapy of people who suffer from social anxiety disorder. The research was carried out in a theoretical context. Within the parameters of the study, the technologies utilized in healthcare were broadly reviewed, robotic technologies were examined at, and by defining social robots, potential scenarios for their integration into treatment processes were created. Five potential scenarios that demonstrate the applicability of social robots in the treatment process were developed as a result of the research. The advantages and disadvantages of using robotics for treatment are also discussed.

Keywords: Social Robot, Robotic Technology, Industry 4.0, Social Anxiety Disorder

---

* The summary of this study was presented at the 7th International Health Sciences and Management Congress held between 16-19 June 2022 and was published in the congress abstract book, and its scope was expanded and rearranged after the congress.

[1] Res. Assist. Karamanoğlu Mehmetbey University, Faculty of Health Sciences, Department of Health Management, Karaman, Türkiye, hmzsgrc@gmail.com, ORCID: 0000-0001-5975-3961

[2] Corresponding Author: Assoc. Dr., Selçuk University, Faculty of Health Sciences, Department of Health Management, Konya, Türkiye, serife_eren.89@hotmail.com, ORCID: 0000-0002-4141-9110

Manuscript received: *15.09.2023*
Manuscript Accepted: *05.12.2023*

Manuscript information: Sığırcı, H., Güzel, Ş. (2024). Potential Of Robotic Technology in Social Anxiety Disorder. *Selçuk Sağlık Dergisi,* 5(2), 243 – 270.

Sosyal Anksiyete Bozukluğunda Robotik Teknolojisinin Kullanım Potansiyeli

Öz

Teknoloji her geçen gün kendi gelişimini sürdürme eğiliminde olan bir süreci ifade etmektedir. Birey ve toplum sağlığının sürdürülmesini amaçlayan teknoloji, sağlık sorunlarının meydana gelmesini önleyici ve geciktirici rol oynamaktadır. Robotik teknolojiler bu sürecin yeni yıldızlarıdır. Sosyal robotlar ise insanlarla etkileşimde bulunabilmeleri ve diğer teknolojik unsurlarla entegrasyonu nedeniyle ön plana çıkan gelişmiş robotik cihazlardır. İdari ve cerrahi birimlerde kullanımı yaygın olan robotik teknolojisinin, tedavi sürecine entegrasyonu araştırmanın problemini oluşturmaktadır. Bu bağlamda çalışmanın amacı sosyal robotların, sosyal anksiyete bozukluğu tanılı birey tedavisinde kullanılabilirliğinin muhtemel durumlarını ortaya koymaktır. Çalışma teorik çerçevede gerçekleştirilmiştir. Çalışma kapsamında sağlıkta kullanılan teknolojiler genel hatlarıyla ele alınmış, robotik teknolojiler incelenmiş ve sosyal robotlar tanımlanarak tedavi süreçlerine entegrasyonları ile ilgili muhtemel senaryolar oluşturulmuştur. Çalışma sonucunda sosyal robotların tedavi sürecinde kullanılabilirliğini ortaya koyan beş muhtemel senaryo oluşturulmuştur. Ayrıca tedavide robotik kullanımına dair avantaj ve dezavantajlar sıralanmıştır.

Anahtar Kelimeler: Sosyal Robot, Robotik Teknoloji, Endüstri 4.0, Sosyal Kaygı Bozukluğu

INTRODUCTION

Today's world is undergoing fast change. Both people and systems must adapt to this change in order to continue living. Innovations and inventions create changes. Over time, several categorizations have been used to describe how civilizations have evolved. Consider the industry. The term industry 1.0 refers to industrial machinery that is powered by steam and water. Industry 2.0 alludes to the advent of mass manufacturing and the widespread use of electricity, Industry 3.0 refers to the era of the introduction of computers and information technology into our daily lives, while Industry 4.0 is the era of the widespread use of autonomous systems, robotics and artificial intelligence (Akalın & Veranyurt, 2022). The time known as "Industry 4.0," which we are presently living in, is one in which cutting-edge technology processes penetrate our lives, products are integrated with one another, and internet services are widely used. The urge to advance technology is shared by nations that operate with the goal of creating a smart society. Research is conducted to spread innovations like big data, robots, and sensors for this reason (Silkin Ün, 2020). The main objectives are to help individuals fulfill their needs quickly, make services more accessible, and improve their quality of life (Türkeli, 2021).

Technology is more than just an idea with advantages. People are believed to become more isolated from society as a result of developing tight relationships with technology. As a result, it is possible to say that it might lead to an increase in social anxiety disorder cases in society (Turan, 2002). With the spread of technological communication networks, individuals cannot find enough time to communicate face to face. With these developments, thoughts, feelings and habits are changing (Karagülle & Çaycı, 2014). In addition, as a result of the increase in interpersonal virtual communication via social networks, individuals have less time to spare for themselves (Siyez, 2011). One of the most prevalent anxiety disorders is social anxiety disorder (SAD). Marks and Gelder's initial definition of social anxiety disorder stated that it is characterized by extreme anxiety that people experience when they are expected to be seen by others or when they are required to behave (Muhtar & Çakmak Tolan, 2021). People who have SAD have a persistent fear of social situations where they could feel embarrassed or humiliated (Ollendick & Hirshfeld-Becker, 2002). This dread is not merely a person's psychological reaction. People with SAD exhibit physiological symptoms including sweating, palpitations, flushing, and other things in addition to psychological discomfort in social situations (Muhtar

& Çakmak Tolan, 2021). In addition, the lifetime prevalence of this condition varies between 4% and 13%. However, the rate of patients complaining only of symptoms is reported to be lower than the prevalence rate (Muhtar & Çakmak Tolan, 2021). For this reason, it is expected that the proliferation of healthcare programmes created daily by technology and the introduction of new service delivery models will speed up the processes of identifying and treating disease (Köse & Kurutkan, 2021). Robotic technologies are envisioned as being at the forefront of these advances, and with the help of robotic technology, the efficiency of health care delivery will be improved.

The Turkish Language Association recognizes two definitions for the term robot. In accordance with the first definition, they are automated instruments that utilize magnetism to carry out a variety of tasks. According to the second definition, it is a person who does business under the direction of another individual and who does not have its own independent will or mind (TDK, 2022). The number of robots that fit these definitions is increasing day by day.

There were 553,052 industrial robots installed in factories all over the world. Asia accounts for 73% of newly installed robots, Europe 15% and the Americas 10%, according to the World Robotics Report. According to the president of the International Federation of Robotics (IFR), this is the second year in a row that the record of 500,000 units has been broken. It is estimated that 600,000 robot units will be installed by 2024 (Robotics, 2023). Sales of service robots also increased by 48% in 2022, with IFR recording sales of around 158,000 units (World Robotics, 2023). Robots are no longer only technological instruments that execute a limited set of tasks thanks to advancements in robotic technology; instead, they now have a social structure.

Despite the fact that social robots initially appeared at the end of the 1940s, recent advancements in artificial intelligence technology, technical expertise, hardware accessibility, and data sets have made them a popular topic (Gültekin Varkonyi, 2020). Important researchers on social robot technology Dautenhahn, Fong, and Nourbakhsh (2003) and Breazeal (2002) describe social robots as robots that can comprehend human behavior, interact socially with people, and imitate human behavior by adapting to dynamic social systems. In general, they are automatons that can comprehend people and interpret data to show social relationships. They can also naturally transmit human emotions and actions to the other person (Gültekin Varkonyi, 2020). The ability to interact with people sets social robots apart from other robotic devices (Taşbaş Ustaoğlu, 2019) The accessibility and treatment options

provided in the healthcare industry may advance favorably as a result of technological advancements and growing social robot potential. Although the employment of social robots in service delivery is now under discussion, robot technologies are already being employed in several nations to transport files, papers, perform surgeries, provide advice, and provide advisory services. This means that social robots might be employed in therapeutic procedures (Rasouli, Gupta, Nilsen, & Dautenhahn, 2022).

Finally, it should be understood that SAD is an illness that typically manifests in people at a young age and makes it challenging to engage in social activities in a healthy manner. Before the age of 25, among younger age groups or in middle adolescence, it is frequently observed (Binbay & Koyuncu, 2012). SAD is assessed using three main factors. These include self-evaluation, clinical interview, and behavioral assessment. But in this case, the clinical interview itself is frequently a factor that causes anxiety. The clinical component aspect may be moved to people's homes through the social robots that are the subject of the research (Dursun & Yılmaz, 2021). Less stress will be added to the treatment process management in this way. In addition, the relatively young age of SAD sufferers suggests that innovative treatments may be more readily accepted (Cisse & Yılmaz, 2022). This is due to the closer contact that young people have with technology. The aim of the study is to explore the potential use of social robot technology, one of the tools used in the healthcare industry, in the treatment of SAD patients.

1. SOCİAL ANXİETY DİSORDER

The fundamental characteristic of social anxiety disorder, according to the Diagnostic and Statistical Manual of Mental Disorders 5 (2013), is the sensation of worry or dread of being poorly judged by others in social circumstances. Furthermore, the individual may shiver, quiver, or flush as a result of their own actions or anxiety-related symptoms (Spence & Rapee, 2016). Although people with social anxiety may typically stay away from circumstances where they must perform in front of others, this is rarely the case for children and adolescents who suffer from this illness. As a result, different circumstances might arise, including subpar academic performance, reluctance to attend school, and disregard for the games performed by friends. Since they frequently refuse to comply with requests, people who try to stay out of stressful circumstances may be seen by their surroundings as antagonistic or incompatible

(Ollendick & Hirshfeld-Becker, 2002). The person with anxiety condition becomes increasingly socially isolated as a result of this circumstance.

Social anxiety disorder shows itself in many different ways. Public speaking and giving presentations are two of the most scrutinized of them. The Book of Lists claims that American society's worst phobia is public speaking. It has been said that this fear encompasses even the fear of dying (Dilbaz, 2000). Eating in a large group is another circumstance that frequently increases anxiety. Even though these individuals experience physiological reactions like flushing and sweating when eating, their anxieties frequently result in additional anxieties like shaky hands and dropping the food. The person feels ashamed and degraded as a result of this circumstance (Dilbaz, 2000).

Researchers present a variety of statistics when considering the incidence of SAD diagnoses. The prevalence is often said to range from 5% to 10% every year in the population, and it ranges from 10% to 15% throughout the course of a person's lifetime. In addition, yearly prevalence was reported as 7.4% by Kessler et al. (2005), 4.8% by Acartürk et al. (2008), and 4.4% by Ohayon and Schatzberg (Binbay & Koyuncu, 2012). The onset of this condition is usually reported in the mid-10s. It is also stated that it has a genetic substructure (Muhtar & Çakmak Tolan, 2021).

In conclusion, social anxiety has the potential to have a considerable impact on people's quality of life. For instance, while issues like poor academic performance may arise in adolescence and childhood, it is believed that avoiding social activities in adulthood will have a detrimental impact on people's life. Additionally, only 50% of people look for treatment options, despite the fact that people endure anxiety and related sensations for an average of 15-20 years. The cause of this is that natural occurrences resulting from normal states of shame and embarrassment and social anxiety disorder are both easily mistaken (Rasouli vd., 2022).

2. TECHNOLOGICAL INNOVATIONS AND HEALTH

Robotics is not a standalone discipline. Artificial intelligence, the internet of things, big data, and other related technologies are used to feed this technological system. These advanced technologies, which support the concept of robotics, are crucial for both understanding what robot technology is capable of and for assessing the possibility of such advancements in the

delivery of healthcare services. Because of this, these ideas, which are not unique to robotics, are briefly discussed in the articles that follow.

Virtual Reality: The idea of virtual reality was initially presented in the 1980s by Jaron Lanier. The term "virtual reality" refers to a computer simulation method that lets users use headphones to hear and feel sensations that correlate to a picture (Kaya & Karaman Özlü, 2022). Virtual reality is a way of distraction that enables the user to engage with the virtual world through sensory stimulation (Doğan Merih, Ertürk, Yemenici, & Satman, 2021). Through the use of tools like glasses and headphones, people may direct their attention from the actual world to virtual representations. Because of this, giving the user a sense of realism is one of the most fundamental characteristics of the virtual reality application (Doğan Merih vd., 2021). Additionally, the idea of virtual reality is the initial development of this technology. The ideas of augmented reality and mixed reality were later presented as a result of numerous advances. For instance, augmented reality works by fusing the virtual and the real worlds together, whereas users of virtual reality are immersed entirely in a virtual setting. In other words, augmented reality enables users to view and contact with the actual environment. The video game Pokemon Go is a wonderful example of this. On the other side, mixed reality merges the real and the virtual while also enabling user interaction with things. A more obvious way to put it is that it makes the actual world useable in the virtual one and gives the virtual world greater realism (Doğan, Erol, & Mendi, 2021). Technologies for virtual reality are an intervention that may be utilized in healthcare systems since they are often affordable, have no negative side effects, are not invasive, and have an active social-psychological function (Kaya & Karaman Özlü, 2022). The Microsoft company's Hololens product is another tangible illustration of how this project is supported. With the aid of the Hololens, mixed reality is implemented, giving medical students a more lifelike instruction (Doğan vd., 2021). It is clear that boosting the quality of education offered contributes significantly to health care service.

Telemedicine: A system known as telemedicine allows for various trainings, consultations, and treatment planning while also allowing for remote monitoring of health service providers using telecommunication technology (telephone, internet, etc.). Particularly at home, in hospitals, and in jails. Applications such telephone triage, remote monitoring, and home health care services are included (Karakul, 2021). As the idea of telemedicine has a very broad conceptual integrity, it encompasses concepts such as telerehabilitation, telepsychiatry,

telecardiology and others of a similar nature. Though conceptions are seen to vary, on a fundamental level, all concepts work in the same ways. This idea refers to the supply of healthcare that can be accomplished even when patients and healthcare professionals are separated physically (Aybek Kalkanlı, 2021). The development of telemedicine is intended to give health consulting services by connecting those who cannot access healthcare with healthcare providers. Community health services are offered in this way (Aybek Kalkanlı, 2021).

Digitalization: In its broadest definition, digitization is the conversion of acquired data from analog to digital (Yılmaz & Yılmaz, 2022). This data will be digitally preserved so that it may be processed and stored in an electronic context. Digitalization, however, refers to more than just data transformation. Beyond transformation, it is a notion that encompasses technological production, process, and implementation (Silkin Ün, 2020). Digitization also enables the transfer of digitized data sets and information to a variety of communication platforms (Yılmaz & Yılmaz, 2022). Healthcare institutions and organizations now have access to several advantages of digitization, including the ability to see data sets from a single location, create electronic archives, and operate more systematically.

Internet of Things (IoT): The ecosystem known as the Internet of Things consists of network-capable smart devices and sensors that can communicate with one another. IoT is a notion that operates irrespective of time and place. It is a term for services with limitless advantages that have arisen for people to use at every moment of their life. It is important to enabling data transmission through different apps in the internet of things ecosystem to make the mentioned advantage accessible (Köse & Kurutkan, 2021). More specifically, it is a technology that enables devices to converse with one another and carry out certain activities in this direction by transmitting the data gathered by one device to another (Doğan Merih vd., 2021). Undoubtedly, a wide range of industries employ this technology, but the health industry is one of the most prevalent. Utilizing this technology in the health industry will allow for the remote processing and receipt of patient data as well as smart device connectivity (Köse & Kurutkan, 2021). It is utilized in a wide range of medical conditions, including chronic illnesses, Parkinson's disease, sleep problems, obesity, orthopedics, and anxiety (Doğan Merih vd., 2021).

Mobile Health: When the term "mobile health" is used, the typical image that comes to mind is using mobile phones, smart tablets, and other similar portable communication devices to receive access to health-related apps (Cisse & Yılmaz, 2022). The utilization of wireless and portable technology to accomplish health goals is the fundamental component of the mobile health idea (Değerli, 2021). Today, this technology is frequently utilized by both service providers and consumers. Examples of apps we utilize as a result of mobile technology include drug reminders, daily exercise reminders, and blood pressure, pulse, temperature, and blood glucose measures. Additionally, the collected data may be logged and delivered at any moment to the central server (Cisse & Yılmaz, 2022). In particular, the monitoring and management of chronic illnesses benefit greatly from mobile health. Additionally, it is reported that 20% of various applications, including medication adherence, illness management, and behavior change, are utilized in clinical studies as a result of study (Değerli, 2021).

Wearable Technologies: Wearable technologies, in contrast to the majority of technical equipment, provide information access even when people are moving. For long-term data gathering, wearable technologies are wireless electronic monitoring devices that may be synchronized with a smart phone or computer (Dursun & Yılmaz, 2021). These technologies were acknowledged as personal healthcare equipment by Leonhardt (2006), who described them as intelligent, wearable instruments that help ill people in their own environments (Aydan & Aydan, 2016). Wearable technology enables measurement and monitoring of any physiological reaction from the user of the equipment. The person must wear and utilize this device on a limb, such as the arm, trunk, or head, in order for it to perform its function. By using a variety of sensors, the device may produce individualized data sets this way and give personalized feedback (Doğan Merih vd., 2021). These technologies make it easier to deliver health services by collecting a range of personal data (such as step count, heart rate, anxiety level, blood pressure, etc.) from the user. People are made aware of the aspects that represent a danger to their health by using the data collected by wearable technology in the delivery of health services. Potential losses are believed to be averted in this way (Dursun & Yılmaz, 2021).

Big-Data: Big data is a term that describes the processing of data sets that are produced in the digital world but aren't used in a beneficial way, as well as the conversion of data sets into ones that are helpful. Even while a single piece of data might not make sense on its own, the

gathering and categorization of several data points may reveal something valuable (Doğan Merih vd., 2021). Data can be gathered through sources including social media, blogs, pictures, videos, and other comparable materials in addition to using programs for mobile devices, sensors, and telemedicine (Aydan & Aydan, 2016; Doğan Merih vd., 2021). The health care services is expected to become more effective and efficient as a result of the diversity of the data collected in a multidisciplinary sector with so many complex challenges, like health.

Artificial Intelligence: According to McCarty, artificial intelligence is the engineering of creating intelligent devices and computer systems. This is the first definition of artificial intelligence that has been presented (Akalın & Veranyurt, 2022). There are two widely accepted definitions of artificial intelligence when the literature is examined. The first of them comes in the shape of systems that are capable of reaching a goal by rationally resolving difficult issues and acting in line with actual world circumstances. The other definition of artificial intelligence describes it as a computer system that demonstrates actions that call for intelligence (Demir, 2017). The goal of artificial intelligence techniques is to duplicate human thought processes through computers and to some extent provide computers with the capacity for learning (Doğan Merih vd., 2021). In this way, structures that possess similar cognitive abilities to humans will develop. The assessment and evaluation of several factors at the decision stage will take on a more effective form if this aim is accomplished.

3. THE USE OF ROBOTICS IN HEALTHCARE

Robotics has its roots in the early Chinese Dynasty and Ancient Greece. There are autonomous and semi-autonomous robots, which can take on a variety of shapes. Heavy labor was formerly a typical practice in factories, but with the advancement of technology, they are now tools utilized in a variety of industries. They can be used, for instance, in the household, the military, and several fields of health and entertainment (Demir, 2017). The term "robot" is derived from the Czech word "robota," which meaning "worker," "slave," or "forced labor." (Hockstein et al., 2007). When the literature is examined, it becomes clear that there are several definitions of robots. One definition of a robot is a device created to carry out duties, or to carry out tasks more quickly. Another definition describes them as reprogrammable manipulators whose components, limbs, and tools can move and carry out the tasks required by this functionality (Considine & Considine, 1986). They are systems that are physically and psychologically

organized but not physiologically living, according to another definition (Richards & Smart, 2016). The significance of rapidly evolving robotic technology in daily life is growing. With the increased acceptance of the technology oriented lifestyle, it is expected that we will see more robotic technologies in the future (Taşbaş Ustaoğlu, 2019).

The development of robotic technology has an impact on the medical field as well (Blumenthal, 2017). Social robots based on artificial intelligence are also employed in the production and distribution of medical supplies needed in the delivery of healthcare services. In this way, the health sector's production achieves productivity gains, and operations within medical facilities are handled in a quicker, simpler, and more dependable manner (Doğan Merih vd., 2021). Naturally, excellent technical work and a holistic integration of other fields, such as biology and psychology, are both necessary for robots to become completely functioning (Taşbaş Ustaoğlu, 2019). The reason behind this is the idea that humans, who are biopsychosocial organisms, cannot be fully satisfied mechanically by robots that assist people in their daily tasks. When the relevant literature is read, there are several variables that determine whether a machine qualifies as a robot. These aspects include intelligence, energy, movement, and perception. Programming a computer to complete a given task is referred to as intelligence (Humbe et al., 2014). Energy indicates that a power source is required for the device. A machine's surroundings may produce sound, heat, odors, or pressure that may be detected. This is referred to as perception. The capacity to move the entire machine or specific components is referred to as movement (Humbe et al., 2014). For instance, the Canadarm is a robotic arm designed to gather samples from space that can only move its limbs (Glenn Cook, 2015).

The existence of a wide variety of robotic technologies, although being relatively uncommon, stands out when the most current innovations are examined. Because of this, organizations that provide healthcare services are anticipated to utilize robotic technology more frequently in both service and treatment operations in the next years. It's possible that in the near future only robots would do cleaning services, in addition to tasks like transporting products, drugs, laundry, and meals (Daum, 2017). Furthermore, owing to their sensors, service robots equipped with imaging technology can scan hospital corridors, identify patients who have fallen to the ground, and watch them (Silkin Ün, 2020). How sophisticated robotic technologies are in the medical field is fairly simple to observe. For instance, the da Vinci

Surgical Robot may help a surgeon during surgery. TUG, on the other hand, has the capacity to move drugs, linens, or any other hospital material and deliver it to the relevant department (ST Engineering, 2015). Additionally, strong robotic technologies like Robear may be used to lift patients into wheelchairs or transfer them somewhere, while Dinsow can be utilized to carry out simple tasks like a personal assistant, observation, exercise reminder, or drug reminder (Baloğlu, Kaplancalı, & Kılıç, 2019). It is evident from simply looking at the instances in question that robotic technology will improve both the usability of numerous jobs and the quality of services to be performed.

Japan intends to use robots in hospitals, nursing homes, and care facilities in response to the aging of the population in the nation. In order to assist older people in need of more mobility, it already utilizes specialized robots with artificial intelligence (Schulte et al., 2018). Thanks to the sensors on the Hybrid Assistive Limb (HAL) suit created by the Cyberdyne company, the wearer may mechanically assist their motions when they desire to stand up and walk. Another version of the HAL that may be worn on the upper body has been developed by the company's founder, Prof. Yoshiyuki Sankai, to make it simpler for caregivers to raise elderly patients (Sankai, 2007). Paro is another robot that helps elderly people. Since its introduction in Japan and Europe in 2003, Paro is one of the first robots designed specifically for dementia-stricken elderly people. Paro, which resembles a young seal, has ten cpus, eight motors, and more than one hundred sensors. Additionally, it has five various kinds of sensors. These sensors are capable of detecting position, touch, temperature, sound, and light. Faux furs are used to provide the illusion of realism (Broekens et al., 2009; Elsy, 2020). According to Dr. Sandra Petersen's study, Paro lessens stress, depression, and worry while also reducing drug use by a third (Mulligan, 2017). The vast majority of people who utilized the robots at Shinton Nursing Home said they were happy with the services they got (Elsy, 2020). Pepper, which is utilized in Belgium, allows people to adjust to the hospital by welcoming visitors, accompanying patients to their destinations, and answering questions (Eşkin Bacaksız vd., 2020). There are institutions using Pepper in our country (Ulukan, 2018).

4. SOCIAL ROBOTS IN HEALTHCARE DELIVERY

In terms of the concept of a social robot, there are two significant institutions. The International Robotics Federation and the International Standards Institute are these organizations. Robots

are divided into two categories by the International Robotics Federation (IFR): service and industrial. Service robots are robots that execute service offers like support service and entertainment service, which are generally designed for personal services, as opposed to industrial robots, which are robots for heavy-duty jobs when human strength is insufficient (International Federation of Robotics (IFR) 2017, IFR 2019). Any robot deployed outside of industry is considered a service robot by the International Standards Organization (ISO). However, they believed it was reasonable to refer to the robots that offer personal assistance as personal service robots (International Organization for Standardization (ISO) 8373 2021). On the other hand, social robots correspond to the concept of IFR in terms of offering services. It also fulfills the requirements of ISO since it may offer individualized service.

Social robots known as robotic individuals can identify one another, engage in social contact, evaluate their surroundings based on their perceptions, engage in direct communication, and both learn from and teach other interacting entities (Dautenhahn & Billard, 1999). Social robots are created to function in human situations and communicate with people in language that are relevant to people (Kanda et al., 2001). Established systems of communication take into account social relations, behavioral expectations, emotional responses, and behavioral standards. There are two types of social robots: humanoids and non-humanoids. Humanoids resemble people in appearance, but non-humanoids resemble more animals, cartoon characters, or are only functional (Rasouli vd., 2022). There are claims that differing robot appearances cause varied reactions in individuals. Because of this, it is claimed that social robots may alter societal norms about physical appearance and form (Fong et al., 2002).

When the implementation examples for social robots are examined at, it is known that a semi-social robot was utilized to help medical staff and patients in a hospital in Lombardy, Italy, during the recent pandemic (Lo Scalzo, 2020). There are also therapeutic robots with sophisticated interaction skills that were created for use in healthcare facilities during clinical interventions and treatments. Nadine, a robot with sensory intelligence, is one of the better examples that can be used to illustrate this concept. It is a robot that stands out thanks to its capacity to identify the faces of individuals it interacts with and to remember the established communication. It was created specifically to make friendships with dementia and autism patients (Baka et al., 2019).

On the other side, Pearl was created by Carnegie Mellon University as a tool for everyday functioning tasks and as protection for the elderly from the adverse effects of the environment. Pearl is an useful helper for daily activities like eating, taking drugs, and taking a shower (Pollack et al., 2002). It has a friendly interface and may be utilized for events like doctor's visits, social events, or simply walking (Yasemin, 2016). The social robot iRobiQ, which can view films, move its limbs, and make gestures, is the last robot on the list. It has technologies that enable functions like conversation and the ability to view videos (Hyun et al., 2012). It was created by a South Korean robot company in order to lessen the stress and anxiety associated with dental procedures. Scientific study has shown that social robots used in dental procedures can lessen the pain and worry that young patients feel (Yasemin, 2016).

4.1. Potential Applications For Social Robots

Social and communication situations can be learned more easily with the employment of social robots in therapeutic techniques. People with social anxiety disorder will be able to practice the problems they might face in real life and develop reflexes before these circumstances arise, thanks to the robots that will be used. Additionally, people will feel more relaxed and at comfortable because to the social robots' friendly and nonthreatening features (Rasouli vd., 2022). Applications for remote psychological help have also been seen in the past. However, it was executed using more primitive techniques. For instance, it is well known that Freud and Adler corresponded through letter with their privileged or distant patients (Acar, 2022). Today, it is believed that social robots rather than letter communication can be used to give psychological assistance. In the following sub-titles, various possibilities of how social robots could assist in therapy are offered.

It is crucial that the therapist first establishes a trusting relationship between the patient and the social robot before presenting the potential applications of social robots. The patient with SAD should also be made aware of another crucial fact: the social robot can help with anxiety. It is believed that this circumstance will make the person more aware. Additionally, requests and other ideas that the robot and the therapist may have for the individual will be given a better footing. The individual will not perceive the robot as an outsider if these conditions are completed. Patients will be able to act naturally and feel confident while interacting with the

robot in this way. In this approach, the communication that will be formed will be more reliable and effective (Horvath & Luborsky, 1993).

4.1.1. Scenario 1: Post-Treatment Follow-Up

The range of the scenario includes childhood, adolescence, and adulthood. It is useful anywhere. Psychological therapies often include procedures that must be worked through over an extended period of time. Most of the time, therapies that result in the disease being lessened or completely eradicated do not assure patients that the condition won't recur. A little occurrence or recalling earlier traumas might cause people to relapse into their old psychological issues (Karatay & Günderci, 2023). Social robots may be used to accompany patients who got psychological care throughout the post-treatment follow-up phase.

Complex creatures, social robots are capable of integrating with a wide range of technical devices. Even with its unique operating principles, it has the capacity to collect a variety of essential patient data. Many post-treatment data may be gathered thanks to these hardware and software capabilities by following the patient's sleep, measuring the ambient noise level, observing the person's daily motions, or logging the phrases they use most often while speaking (Palestra et al., 2016). There will be opportunities for the therapist to look into the data gathered by social robots and to manage the patient's psychological condition post therapy. The therapist can then contact the client if he feels it essential in this way. Remote monitoring is another option for keeping an eye on the patient's health outside.

4.1.2. Scenario 2: Mentoring the Individual

The range of the scenario includes adolescence, and adulthood. It is useful anywhere. Another applicability for robotic technology is mentoring people utilizing social robots (Trinh et al., 2017). Within the context of this scenario, the social robot tries to identify the SAD patient first. For this reason, a line of communication on general characteristics and behavioral patterns is formed with the person. The objective of this exercise is to learn the personality traits and behavioral traits. Robotic learning can be done by analyzing certain personality type measures or by providing answers to open-ended questions. The social robot has now completed this stage and is aware that it is speaking with a person who has SAD and what their character traits are.

The social robot will present workout routines, relaxation methods, and breathing exercises suitable for the individual, in line with the personality of the individual, as a consequence of the information gathered. The person will have no difficulty executing these activities because the workouts and approaches are laid out in line with the traits. The robot may also send out daily reminders about the foods, routines, and behavioral patterns that the therapist has specified should be avoided. There will also be a lower chance that things will happen that might harm people's psychological states.

4.1.3. Scenario 3: Ensuring System Integration

The range of the scenario includes childhood, and adolescence. It is useful anywhere. Social robots can be used to observe young people's and children's daily activities in particular. Even while experienced observers can make some assumptions about the people they observe from a distance, it is possible to learn more details about individuals. Information about people is provided in great detail via the use of computers, games, and phone usage hours etc.

The social robot must first be integrated with the electronic devices that the subject of the observation uses. This makes it possible to gather information on social media usage, time spent online, interests, exposure to adverts, and many other things. In addition to these issues, the social robot may initiate conversation and ask open-ended inquiries about the platforms that the person uses. For instance, what do you watch on YouTube, how do you feel after playing a game, what do you do on Instagram, how does it make you feel, etc (De Graaf et al., 2015). As a result of the conversation, it is clear how the person ’s attitude is impacted. The information gathered will allow for the improvement of the treatment's efficacy.

4.1.4. Scenario 4: Developing Reflexes in Social Situations

The range of the scenario includes adolescence, and adulthood. It is useful anywhere. Social robots may generate a variety of scenarios that people they speak with would be afraid to encounter in real life. People are tasked with simulating created virtual scenarios as happenings from their daily lives. Then, by observing how the person feels in this circumstance, advice may be given to the person on how to handle it (Hung et al., 2019).

For instance, a scenario may be created for a person who is frightened speaking in front of a group of people. The person who visualizes himself making a presentation in front of a huge

audience provides feedback by expressing his or her emotions. Then, by teaching the user the relaxation techniques (such as breathing techniques) that he or she may use in this circumstance, the social robot can help to develop reflexes in advance of possible situations that may arise in real life.

4.1.5. Scenario 5: Supporting the Individual

The range of the scenario includes childhood, adolescence, and adulthood. It is useful anywhere. The social robot can occasionally say positive thoughts or offer specific suggestions to the person who has SAD. It is believed that this situation will encourage individuals. These technologies also enable circumstances that are unconsciously coded as "can't do" to be recoded as "can do." (De Graaf et al., 2015).

There are individuals who eat with great pleasure on a daily. On the other hand, SAD sufferers might avoid participating in these activities while others are around. They ask about things like "do I spill when eating," "are I being observed while eating," and "do I look odd." By adopting positive thoughts, these anxiety-provoking questions may be removed. There are two ways to make suggestions: consciously and unconsciously. Consciousness-based suggestions have directness. Contrarily, subconscious suggestion is the unnoticed imposition of a variety of positive thoughts on the person (Harris et al., 2007). Positive affirmations, for instance, can be spoken out in a low tone while the person is listening to their favorite music. The basis for this condition is how positive ideas are processed by the person's subconscious. People may unconsciously change their way of thinking after going through this procedure in a beneficial direction. These statements can be arranged in any direction, depending on the person's needs and social context. Additionally, the fact that the statement must be said in one's own voice might make this strategy much more effective. After then, the therapist has access to data like how long people have been exposed to suggestions. This allows conclusions to be drawn regarding notions like the patient's compliance with therapy (Öztürk, 2015).

4.2. Advantages Of Robotic Technology

- Communication is the basis of consulting services. However, factors like having a different mother language and living in a different country make therapy complicated. The installation of specialized native language functions and the realization of service

delivery are made possible by social robots. It is possible to overcome communication barriers in this way.

- Hooman Samani's Lovotiks notion centers on the relationship between humans and robots. In order to create emotional transitions in Lovotiks robots, human-specific synthetic hormones are used (Samani, 2011). Additionally, several researchers and companies have integrated sign language capabilities to robotic arms or limbs (Aksoy, Ghazal, Şenol, & Ersoy, 2020). In summary, future robotic technology might have more advanced features.
- Individuals getting home care will have less access difficulties thanks to the use of social robots.
- People may feel stigma-related anxiety in face-to-face therapy. Social robots, on the other hand, are technical innovations that can also do activities in people's homes. As a result, several issues can be resolved, including the social stigma anxiety.
- Social robots will make it possible to observe patient progress after psychological treatment has been given. Patient follow-up will be simpler in this method.
- Calo, emphasizes the bond between human and robot, reporting that soldiers risked their lives to save the robotic member of the team (Calo, 2016). In this context, it is expected that social robots, which can speak with humans and seem humanoid, would be capable of creating strong emotional connections with people. Robots will also be able to get more trustworthy data in this manner.
- Direct patient data sets acquired by social robots will be sent to electronic medical records. Therapists can observe remotely thanks to this function.
- Social robots will enable it to regularly and completely collect patient data.
- Resources for a variety of research projects may be made available by arranging and analyzing the gathered data.
- By using social robots as an alternative to drug therapy delivery (for instance, using robotics to reduce anxiety instead of pharmaceuticals), potential negative effects can be avoided.

4.3.Disadvantages Of Robotic Technology

- Social robots' ability to interact with people will determine how effective they are. The level of communication will be significantly influenced by people's desire to converse with social robots, their willingness to express their thoughts and feelings, and their inclusion in their everyday life. Humans and social robots need to form a link of trust and integrity in order for it to perform well (Okay & Canel-Çınarbaş, 2021).
- Advanced data analysis techniques are required in order to get meaningful conclusions from the obtained life data.
- People who are aware that social robots are used to collect a lot of data may behave differently than they would normally (Sedgwick & Greenwood, 2015).
- Providers of healthcare should be receptive to novel therapeutic approaches. Otherwise, social robots will be ignored and their potential won't be realized.
- Social robots will be able to interact with people and will have a variety of information about the components in their surroundings. This circumstance raises several risks related to data security, confidentiality, and other related concerns. For instance, sharing information with third parties without their consent or stealing it (Chatterjee et al., 2021).
- Laws are necessary in interactions between people and robots, just as they are in every other discipline. It is important to depend on legal grounds when a potentially unfavorable situation arises. However, it is clear that in the modern world, robot law is not given enough importance. Because of this, it is unclear how to tackle any unfavorable outcomes that may follow from interactions between humans and robots. For instance, who should be made responsible if a robot causes injury to a patient—the person who used the robot, the manufacturer, or the therapist who advised using it (Lutz & Tamò, 2015)?
- Costs rise as a result of the restricted output of robotic technology. The use and acceptance of robotics will be harmed as a result. Additionally, expenditures associated with robot repair and maintenance as well as educational expenses for people who will utilize and present the technology should be taken into consideration.

CONCLUSION

The health industry, like many other sectors, has undergone changes as a result of technological advancement. The structure of medical institutions and the way that health services are delivered are only two examples of the numerous aspects that have changed. Among the most fundamental human rights is the one to get high-quality medical care. It is necessary to act in accordance with the age's requirements in order to fulfill this rights. One of the needs of our age is being able to understand and use technology efficiently (Eşkin Bacaksız vd., 2020). Robots are machines with intelligence, no feelings, and the ability to carry out intricate everyday tasks thanks to their mechanical design and computer algorithms (Demir, 2017). Observing the environments where robots perform reveals that human-robot communication is increasing day by day. In this condition, it's possible to find robots performing office tasks, therapy work, and occasionally even cleaning (Hung et al., 2019). However, there are many levels of interaction between humans and robots in every activity. Developers will need to prioritize the creation of socially intelligent robots in this aspect (Şabanoviç & Yannier, 2003). One of the most prevalent anxiety disorders in modern society is social anxiety disorder (Kessler et al., 2005). SAD is a diagnosis given to persons who worry about being judged by others and exposed to ridicule as a result (DSM-V 2013). Other symptoms include being worried about running into other people, feeling like others are watching you, avoiding uncomfortable situations, and being anxious about the socializing process in general (Dilbaz, 2000). In terms of capabilities like active learning and social engagement, social robots are different from other technical instruments (Gültekin Varkonyi, 2020). It is expected that social robots will progress further in the next years and ease human life in a variety of contexts, including entertainment, education, and health (Şabanoviç & Yannier, 2003). One of the potential advancements in this regard is the use of social robots in the therapy of people with SAD. Of course, the utilization of social robots benefits from user volunteerism. For instance, it doesn't appear like Pepper will be able to convince someone who has never participated in activities to do so (Türkeli, 2021).

Finally, it is believed that all of this robotic activity should be conducted in accordance with the laws outlined by famous science fiction author Isaac Asimov. Asimov presented three robot laws that robots must abide by in his book, which was published in 1947. These laws are listed below (Barthelmess & Furbach, 2014);

- A robot cannot harm people or, by doing nothing, allow someone to be hurt. It is known as the zeroth law and was later included to the rules.
- Unless it violates the zeroth law, a robot cannot cause harm to people in any way or enable harm to occur by being inactive.
- Robots must comply and obey the orders issued by humans as long as they do not violate with the zeroth and first laws.
- As long as it does not violate the zeroth, first, or second laws, a robot has a duty to defend its own existence.

Acting in accordance with these standards, which are based on the principle of doing no harm, is considered to be the best way to make efficient use of social robots. Even if they are not utilized alone in therapies in the early years, it is anticipated that social robots would eventually perform a variety of duties on their own. The study was carried out on a theoretical basis and was revealed as a consequence of literature reviews. The study's limitation is the absence of a real implementation on which it is based. Additionally, because the field of study is multidisciplinary (including psychology, engineering, management science, etc.), the topic has only been covered to a limited extent.

RECOMMENDATIONS

The study's subject matter is multidisciplinary in nature. The collaboration of researchers from various fields is crucial for future research that will be inspired by our study. Furthermore, it has been shown that the literature lacks significant practical studies of robotic technology used in health. Therefore, another recommendation is to carry out research on the use and development of tangible robotic technology.

Supporting Organization

There is no person/organization that financially supports the study.

Conflict of Interest

The authors have no conflict of interest.

REFERENCES

Acar H (2022) Web tabanlı psikolojik destek uygulamaları üzerine minör bir değerlendirme: Avantajlar-sınırlılıklar. Uluslararası Anadolu Sosyal Bilimler Dergisi, 6:414–423.

Acarturk C, de Graaf R, van Straten A, Have MT, Cuijpers P (2008) Social phobia and number of social fears, and their association with comorbidity, health-related quality of life and help seeking: A population-based study. Soc Psychiatry Psychiatr Epidemiol, 43:273-279. https://doi.org/10.1007/s00127-008-0309-1

Akalın B, Veranyurt Ü (2022) Sağlık 4.0 ve Sağlıkta Yapay Zekâ. Sağlık Profesyonelleri Araştırma Dergisi, 4:57–64.

Aksoy B, Ghazal Z, Şenol R, Ersoy M (2020) Ses ve metin olarak girilen işaret dili hareketlerinin robot kol tarafından gerçekleştirilmesi. Düzce Üniversitesi Bilim ve Teknoloji Dergisi, 8:220–232.

American Psychiatric Association (2013) Diagnostic and statistical manual of mental disorders, DSM-5TM. Washington and London: American psychiatric publishing.

Aybek Kalkanlı A (2021) Pandemi ve telesağlık hizmetleri. Sağlık Bilimleri ve Yaşam Dergisi, 5:19–25.

Aydan S, Aydan M (2016) Sağlık hizmetlerinde bireysel ölçüm ve giyilebilir teknoloji: olası katkıları, güncel durum ve öneriler. Hacettepe Sağlık İdaresi Dergisi, 19:325–342.

Baka E, Vishwanath A, Mishra N, Vleioras G, Thalmann NM (2019) "Am i talking to a human or a robot?": a preliminary study of human's perception in human-humanoid interaction and its effects in cognitive and emotional states. In Advances in Computer Graphics: 36th Computer Graphics International Conference, CGI 2019, Calgary, AB, Canada, June 17–20, 2019, Proceedings 36 (pp. 240-252). Springer International Publishing.

Baloğlu KA, Kaplancalı UT, Kılıç S (2019) Bakıma ihtiyaç duyan yaşlılar için yardımcı sosyal robot araştırması ve analizi. European Journal of Science and Technology, 1–8. https://doi.org/10.31590/ejosat.626045

Barthelmess U, Furbach U (2014) Do we need Asimov's Laws?. arXiv preprint arXiv:1405.0961.

Binbay Z, Koyuncu A (2012) Sosyal anksiyete bozukluğu ve duygudurum bozuklukları birlikteliği. Psikiyatride Guncel Yaklasimlar - Current Approaches in Psychiatry, 4:1–13. https://doi.org/10.5455/cap.20120401

Blumenthal D (2017) Data withholding in the age of digital health. The Milbank Quarterly, 95:15-18. https://doi.org/10.1111/1468-0009.12239

Broekens J, Heerink M, Rosendal H (2009) Assistive social robots in elderly care: A review. Gerontechnology, 8:94–103.

Calo R (2016) Robots in American law. University of Washington School of Law Research Paper, (2016-04), 1-45.

Chatterjee S, Chaudhuri R, Vrontis D (2021) Usage intention of social robots for domestic purpose: From security, privacy, and legal perspectives. Information Systems Frontiers, 1-16.

Cisse IT, Yılmaz Ö (2022) Yaşlıları günlük yaşamlarında destekleyici mobil sağlık uygulaması geliştirilmesi. European Journal of Science and Technology, 34:601–609. https://doi.org/10.31590/ejosat.1083647

Considine DM, Considine, G.D. (1986) Robot Technology Fundamentals. In: Considine, D.M., Considine, G.D. (eds) Standard Handbook of Industrial Automation. Chapman and Hall Advanced Industrial Technology Series. Springer, Boston, MA. https://doi.org/10.1007/978-1-4613-1963-4_17

Daum M (2017) Digitalisierung und technisierung der pflege in Deutschland. Aktuelle trends und ihre folgewirkungen auf arbeitsorganisation, beschäfti- gung und qualifizierung. Hamburg: DAAStiftung Bildung und Beruf.

Dautenhahn K, Billard A (1999) Bringing up robots or the psychology of socially intelligent robots: From theory to implementation. In Proceedings of the third annual conference on Autonomous Agents, 366-367.

De Graaf MM, Allouch SB, Klamer T (2015) Sharing a life with Harvey: Exploring the acceptance of and relationship-building with a social robot. Computers in human behavior, 43:1-14.

Değerli M (2021) Mobil sağlık uygulamalarına genel bir bakış ve özgün bir mobil sağlık uygulaması geliştirilmesi. EMO Bilimsel Dergi, 11:59–69.

Demir E (2017) Robot hukuku. İstanbul Bilgi Üniversitesi.

Dilbaz N (2000) Sosyal anksiyete bozukluğu: tanı, epidemiyoloji, etiyoloji, klinik ve ayırıcı tanı. Klinik Psikiyatri Dergisi, 3:3–21.

Dinsaw Elderly Companion (2016) "Dinsow" Elderly care robot in japan. Retrieved from the address on 05.04.2023. https://www.youtube.com/watch?v=3csjRY8tGoI

Doğan D, Erol T, Mendi AF (2021) Sağlık alanında karma gerçeklik. European Journal of Science and Technology, 29:11–18. https://doi.org/10.31590/ejosat.1009810

Doğan Merih Y, Ertürk N, Yemenici M, Satman İ (2021) Evde sağlık hizmetlerinde teknoloji kullanımı. Türkiye Sağlık Enstitüleri Başkanlığı Dergisi, 4:76–89.

Dursun N, Yılmaz E (2021) Cerrahi hemşireliği alanında giyilebilir teknoloji kullanımı. İstanbul Gelişim Üniversitesi Sağlık Bilimleri Dergisi, 15:646–656. https://doi.org/10.38079/igusabder.948675

Elsy P (2020) Elderly care in the society 5.0 and kaigorishoku in Japanese hyper-ageing society. Jurnal Studi Komunikasi, 4. https://doi.org/10.25139/jsk.v4i2.2448

Eşkin Bacaksız F, Yılmaz M, Ezizi K, Alan H (2020) Sağlık hizmetlerinde robotları yönetmek. Sağlık ve Hemşirelik Yönetimi Dergisi, 7:458–465. https://doi.org/10.5222/shyd.2020.59455

Fong T, Nourbakhsh I, Dautenhahn K (2002) A survey of socially ınteractive robots: concepts, design, and applications. CMU-RI-TR-02-29, Technical Report from the Robotics Institute, CarnegieMellon University.

Glenn Cook D (2015) The Canadian Designed and Built SPAR/MDA Canadarms: Canada's Contribution to Space Exploration, https://documents.techno-science.ca/documents/CASM-Aircrafthistories-SparMDACanadarms.pdf

Gültekin Varkonyi G (2020) Avrupa birliği genel veri koruma tüzüğü kapsamında gerçek kişilerin kişisel sosyal robot kullanımından doğabilecek sorumlulukları. Kişisel Verileri Koruma Dergisi, 2:47–63.

Harris PR, Mayle K, Mabbott L, Napper L (2007) Self-affirmation reduces smokers' defensiveness to graphic on-pack cigarette warning labels. Health Psychol, 26:437-446.

Hockstein NG, Gourin CG, Faust RA, Terris DJ (2007) A history of robots: from science fiction to surgical robotics. J Robot Surg, 1:113-118.

Horvath AO, Luborsky L (1993) The role of the therapeutic alliance in psychotherapy. Journal of consulting and clinical psychology, 61:561.

Humbe AB, Deshmukh PA, Kadam MS (2014) The review of articulated r12 robot and ıts ındustrial applications. International Journal of Research in Engineering & Technology, 2:113-118.

Hung L, Liu C, Woldum E, Au-Yeung A, Berndt A, Wallsworth C et al. (2019) The benefits of and barriers to using a social robot PARO in care settings: a scoping review. BMC geriatrics, 19:1-10.

Hyun E, Lee H, Yeon H (2012) Young children's perception of IrobiQ, the teacher assistive robot, with reference to speech register. In 2012 8th International Conference on Computing Technology and Information Management (NCM and ICNIT), (1), 366-369).

International Federation of Robotics. (2017) Executive summary world robotics 2017 ındustrial robots, Retrieved from the address on 02.04.2023. https://ifr.org/downloads/press/Executive_Summary_WR_2017_Industrial_Robots.pdf

International Federation of Robotics. (2019) Executive Summary World Robotics 2019: Service Robots. Retrieved from the address on 02.04.2023.

https://ifr.org/downloads/press2018/Executive_Summary_WR_Service_Robots_2019.pdf

ISO 8373:2021(en). Robotics-Vocabulary.

Kanda T, Ishiguro H, Ishida T (2001) Psychological analysis on human-robot interaction. In Proceedings 2001 ICRA. IEEE International Conference on Robotics and Automation (Cat. No. 01CH37164), (4), 4166- 4173.

Karagülle AE, Çaycı B (2014) Ağ toplumunda sosyalleşme ve yabancılaşma. Turkish Online Journal of Design Art and Communication, 4:1-9.

Karakul A (2021) Çocuk hastalarda telerehabilitasyon ve pediatri hemşiresinin sorumlulukları. Artuklu International Journal of Health Sciences, 1:20–23.

Karatay G, Günderci A (2023) tarihsel/toplumsal travmaların kuşaklararası psikososyal etkileri: dersim 38 örneğinde bir olgu sunumu. Uluslararası Anadolu Sosyal Bilimler Dergisi, 7:282-291 . https://doi.org/10.47525/ulasbid.1232387

Kaya M, Karaman Özlü Z (2022) Yanık nedeniyle tedavi gören hastalarda yenilikçi teknoloji: Sanal gerçeklik. Arşiv Kaynak Tarama Dergisi, 31:46–51. https://doi.org/10.17827/aktd.992689

Kessler RC, Berglund P, Demler O, Jin R, Merikangas KR, Walters EE, (2005) Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. Arch Gen Psychiatry, 62:593-768.https://doi.org/10.1001/archpsyc.62.6.593

Kessler RC, Berglund P, Demler O, Jin R, Walters EE (2005) Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the national comorbidity survey replication. Archives of General Psychiatry, 62:593–602.

Köse G, Kurutkan MN (2021) Sağlık hizmetlerinde nesnelerin interneti uygulamalarının bibliyometrik analizi. European Journal of Science and Technology, 27:412–432. https://doi.org/10.31590/ejosat.868000

Lo Scalzo F (2020) Tommy the robot nurse helps keep Italy doctors safe from coronavirus, Reuters Technology News. Retrieved from the address on 03.04.2023. https://www.reuters.com/article/us-health-coronavirus-italy-robots/tommy-the-robot-nurse-helps-keep-italy-doctors-safe-from-coronavirus-idUSKBN21J67Y

Lo SY, Huang HP (2016) Realization of sign language motion using a dual-arm/hand humanoid robot. Intelligent Service Robotics, 9:333-345.

Lutz C, Tamò A (2015) RoboCode-Ethicists: Privacy-friendly robots, an ethical responsibility of engineers? In Proceedings of the ACM Web Science Conference, 1-12.

Morrison J (2019) DSM-5® Made Easy The Clinician's Guide to Diagnosis, (M. Şahin, çev. ed.), Ankara: Nobel Akademik Yayıncılık.

Muhtar G, Çakmak Tolan Ö (2021) Sosyal anksiyete bozukluğu olan yetişkinlerde bilinçli farkındalık temelli müdahalelerin etkililiği: Sistematik bir gözden geçirme. In Psikoloji Çalışmaları / Studies in Psychology, 41. https://doi.org/10.26650/sp2020-847371

Mulligan G (3.19.2017) Robotlar yaşlıların bakımını üstlenebilir mi? Retrieved from the address on 02.04.2023. https://www.bbc.com/turkce/haberler-39303920

Müller, Christopher; Kraus, Werner, Graf, Birgit; Bregler, Kevin (Eds.): World Robotics 2023 – Service Robots, IFR Statistical Department, VDMA Services GmbH, Frankfurt am Main, Germany, 2023.

Ohayon MM, Schatzberg AF, (2010) Social phobia and depression: Prevalence and comorbidity. J Psychosom Res., 68:235–243. https://doi.org/10.1016/j.jpsychores.2009.07.018

Okay D, Canel-Çınarbaş D (2021) Kendilik Psikolojisi Yaklaşımı üzerinden bir çekingen kişilik olgusunun incelenmesi. Nesne, 9:204-220. https://doi.org/10.7816/nesne-09-19-15

Ollendick TH, Hirshfeld-Becker DR (2002) The developmental psychopathology of social anxiety disorder. Biological Psychiatry, 51:44–58. https://doi.org/10.1016/S0006-3223(01)01305-1

Öztürk D (2015) Türkiye'de yeniçağ ruhaniliği ve pratikleri: evren tasarımı, birey ve olumlama. Yüksek Lisans Tezi.

Palestra G, Varni G, Chetouani M, Esposito F (2016) A multimodal and multilevel system for robotics treatment of autism in children. In Proceedings of the International Workshop on Social Learning and Multimodal Interaction for Designing Artificial Agents, 1-6.

Pollack ME, Brown L, Colbry D, Orosz C, Peintner B, Ramakrishnan S et al. (2002) Pearl: A mobile robotic assistant for the elderly. In AAAI workshop on automation as eldercare, 85-91.

Rasouli S, Gupta G, Nilsen E, Dautenhahn K (2022) Potential applications of social robots in robot-assisted ınterventions for social anxiety. International Journal of Social Robotics, 1. https://doi.org/10.1007/s12369-021-00851-0

Richards NM, Smart WD (2016) How should the law think about robots? In Robot law. Edward Elgar Publishing, 3-22.

Robotics, I. I. F. of. (26.09.2023). World Robotics 2023 Report: Asia ahead of Europe and the Americas. Retrieved from the address on 05.11.2023. https://ifr.org/ifr-press-releases/news/world-robotics-2023-report-asia-ahead-of-europe-and-the-americas

Samani H Agraebramhimi (2011) Lovotics: Love+ Robotics, Sentimental Robot With Affective Artificial Intelligence. PhD thesis.

Sankai Y (2007) HAL: Hybrid assistive limb based on cybernics. Advanced Robotics. Springer. https://doi.org/10.1007/978-3-642- 14743-2_3

Schulte M, Reinhardt M, Böllhoff C, Ehrentraut O (2018) Gesellschaft 5.0 Implikationen der Digitalisierung für ausgewählte Lebensfelder. Access address: https://www.prognos.com/en/project/society-50

Sedgwick P, Greenwood N (2015) Understanding the hawthorne effect. Bmj, 351.

Silkin Ün S (2020) Toplum 5.0"da bilgi ve iletişim teknolojileri ile yaşlı bakımı. Hak İş Uluslararası Emek ve Toplum Dergisi, 9:313–330. https://doi.org/10.31199/hakisderg.685831

Siyez D (2011) Kişilerarası ilişkiler ve etkili iletişim (A. Kaya, ed.). Ankara: Pagem A Yayınevi.

Spence SH, Rapee RM (2016) The etiology of social anxiety disorder: An evidence-based model. Behaviour Research and Therapy, 86:50–67. https://doi.org/10.1016/j.brat.2016.06.007

ST Engineering Aethon (2015) Aethon TUG Robot. Retrieved from the address on 02.04.2023. https://www.youtube.com/watch?v=kCDJObCNufg

Şabanoviç A, Yannier S (2003) Robotlar: sosyal etkileşimli makineler. TÜBİTAK Bilim Teknik Dergisi, 1–9.

Taşbaş Ustaoğlu E (2019) İnsan robot etkileşimi konusunu kelime bulutu analizi ile kavramsallaştırma. International Academic Journal, 3:221–239.

Trinh H, Asadi R, Edge D, Bickmore T (2017) Robocop: A robotic coach for oral presentations. Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies, 1:1-24.

Turan S (2002) Teknolojinin okul yönetiminde etkin kullanımında eğitim yöneticisinin rolü. Kuram ve Uygulamalarda Eğitim Yönetimi, 30:271-81.

Türkeli E (2021) Toplum 5.0 döneminde yaşlı bakım yönetimi. In Endüstri 5.0 Digital Toplum (Issue Mayıs). EKİN Basım Yayın Dağıtım.

Ulukan G (15.11.2018) Webrazzi Developer 2018'de Türkiye İş Bankası Genel Müdür Yardımcısı Hakan Aran'la konuştuk, Retrieved from the address on 03.04.2023. https://webrazzi.com/2018/11/15/webrazzi-developer-2018de-turkiye-is-bankasi-genel-mudur-yardimcisi-hakan-aranla-konustuk/

Yasemin M (2016) Reductıon of dental anxıety and stress ın chıldren usıng a socıal robotıc companıon. İstanbul Teknik Üniversitesi.

Yılmaz H, Yılmaz N (2022) Dünyada ve Türkiye'de dijital sağlık turizmi uygulamaları. Sağlık Akademisyenleri Dergisi, 9:64–72. https://doi.org/10.52880/sagakaderg.900867