Short title: Telehealth services for rural areas

Keywords: Telehealth, intervention, Saudi Arabia, Autism spectrum disorders

Conflict of interest: No conflict of interest

Funding: No

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Word count: 3748
Abstract
Autism spectrum disorders [ASD] are the most prevalent neurodevelopmental disorders nowadays. However, each child diagnosed with ASD presents a unique range of behavioral, communication problems, and issues with social skills. Many studies underline the importance of early interventions in helping both children with ASD to improve their skills and to provide their families with the necessary support. Despite this research, however, in Saudi Arabia, the earliest intervention that a child with ASD receives, in the major cities, is at the age of four due to limited services and a lack of awareness of the importance and benefits of early interventions. Families who live in rural areas of SA arguably have an even greater need for these services, as currently, they have to travel to cities, such as Riyadh, if they wish to seek help. Using telehealth services has been suggested as a particularly effective ASD intervention method for children who live in rural areas since it uses technology to provide consultations, interventions, diagnosis, training, and education. In fact, research indicates that telehealth services are as valuable as traditional face-to-face treatment, allowing families to obtain support from their homes and helping them to improve their quality of life. This review will discuss the application of telehealth services to support families in rural areas of SA in dealing with issues surrounding ASD, taking into account the cultural and religious context. Finally, it will examine ways that technology could be employed that would be suitable for SA’s culture and needs.

Keywords: Telehealth; intervention; Saudi Arabia; Autism spectrum disorders
Introduction

ASD is the most widespread of all developmental disabilities; global figures had experienced a dramatic increase since the 1980s when they were estimated at a rate of 1 in 10,000. Last year, in 2016, the figure was 1 in 68 [1]. In Saudi Arabia [SA], however, there is no data about the number of cases of ASD; although it is estimated to be over 167,000 in a population of over 28 million [2]. Yet, currently, the services available for children with ASD in the cities do not meet the demand, and as a result, some families are forced to travel to neighboring countries [e.g., Jordan] and/or overseas [e.g., United States of America] for services [2]. While the rest of the world are continually developing ways to improve intervention methods to ensure better lives for children with ASD and their families [6], SA is still lagging significantly behind [3]. This is because methods developed in the west are not always culturally suitable for SA, particularly in relation to their prescribed gender roles [1]. However, one method that might be effective is to use telehealth services.

Telehealth services for children with Autism Spectrum Disorders

Using a Family-Centred approach to educate and support parents face-to-face encounters many barriers, such as the scarcity of trained therapists, limited resources and services, the low socioeconomic status of many families, lengthy waiting lists, and practical issues arising from the fact that these limited services are only available in major cities [4]. It is vital, therefore, to investigate how parents can be helped to transition and adapt to new ways in which interventions for ASD can be provided [4]. Due to the significant increase in the use of the computer and internet in everyday life, telehealth services, which use technology to provide services from a distance to families with a child with ASD, could be an alternative and effective method of providing support [4]. This method
presents a number of advantages. Firstly, the possible advantage is that the family can interact directly via a video with an instructor, which means that they potentially have access to a greater range of expert therapists. Secondly, telehealth technology providing parents with an opportunity to take an even more active role in their child’s development would empower them and accelerate the diagnostic process [4; 5].

Telehealth consists of a range of computerized software applications, such as video conferencing, DVDs, 3D interactive programmes, phone applications, and telephone and web-based tutorials [7]. Studies of telehealth-based parent training document that the parents found the training programmes to be convenient, practical, appropriate and helpful in increasing their knowledge about evidence-based intervention methods [8; 9; 10].

**Barriers and challenges in adopting Saudi telehealth services for ASD children**

In SA, families of children with ASD, particularly those living in rural areas, currently encounter many difficulties when seeking support [3]. As mentioned earlier, the number of children with ASD is rising, but services are only available in major cities, and due to limited resources, waiting times for appointments or FCA sessions can take between 8 and 12 weeks [11]. In addition, both the costs of travel and the service itself and the need to juggle receiving support for their child while keeping jobs and meeting other responsibilities, all put a significant strain on families living in rural areas of SA [2; 11; 12]. For such families, telehealth would seem to address many of these issues and provide additional support to existing services. Telehealth services could be used as a tool for teaching strategies to improve the outcomes of children with ASD and their families [11]. However, the cultural context and the beliefs, educational levels and socioeconomic status of the SA population need to be considered when selecting appropriate methods of intervention [12]. Besides, because this method employs technology in a new way, research is necessary to
identify reliable, valid of an evidence-based telehealth framework and intervention programme for delivering services at a distance in Saudi culture.

The first issue to take into account is that in SA culture women assume the role of homemaker and carer while the men provide for and protect the family, leaving the mothers with almost the complete responsibility for taking care of the children [13]. In addition, SA culture dictates that males and females be always separated [e.g., education, banking, and health], that females are required to cover their faces in front of males, and some of them are not allowed to have their picture taken [13]. This all makes communication between genders a sensitive issue [14]. In fact, face-to-face contact between men and women is prohibited by law and culture, and this includes online communication [14]. Therefore, as Alqahtani [2012] [15] reports, this means that some cases interventions or interviews with mothers of children with ASD are not allowed to be conducted by men without her relatives being present. This apparently reduces the opportunities for teleconference or video conferencing sessions that are based on face-to-face sessions between the therapist and the mother, which this type of method can help the therapist to provide recommendations answering questions and giving an intervention strategy while observing the child through the camera in their own home. [16].

A second obstacle to using technology to provide assistance to families affected by ASD is the prerequisite that they: [a] have a computer, [b] have a high-speed internet connection, and [c] are IT literate [17]. However, 40% of SA families living in rural areas are living below the breadline, which means that they cannot meet their basic needs in terms of healthcare, let alone have sufficient technological equipment [18].

Using telehealth programmes to assist families with a child with ASD would require training [17] and SA has poor educational levels [12]. In fact, many mothers of children with ASD do not have a degree and have often not attended high school, some of them are even illiterate, which
apparently makes using technology extremely difficult [2; 19; 12]. In addition, the Saudi government does not provide much education on how to use technology and as a result institution, such as public schools in the rural area, are often not aware of the latest advances in technology [18].

A third problem with implementing a telehealth service in SA is the need for Saudi mothers, as the principal carers, to talk to female rather than male therapists [20]. However, despite the fact that the health system is one area in which allows a mix of genders is SA because this is a male-dominated field, the number of Saudi females working in it is low. [21; 13]. This means that the majority of female professionals in the SA healthcare system are foreign workers, which often results in problems with the delivery of information because a translator, who is more often than not a non-expert, is needed [21; 13]. In addition, many online applications are non-Arabic, and therefore a team is required to translate the applications into Arabic. Yet, as mentioned above, Saudi expertise in technology is limited [21].

Finally, using telehealth services requires the parents to be their child’s ASD therapists, taking on board new strategies for care, and using different technological methods of intervention from the professionals [4]. However, Saudi families [especially mothers] have historically placed a profound trust on healthcare professionals which might result in them not wanting to take on such an influential role in their child’s intervention without a healthcare team [21].

To sum up, introducing technology to support families living with ASD in rural areas clearly has many advantages, not least of which is its flexibility. However, SA is a traditional country where Islamic teachings and Arabic cultural values are strictly followed which means that such telehealth services need to be selected and implemented carefully. Cultural factors such as the need to hire both male and female Arabic-speaking educators, gender roles, and educational levels all need to be taken into consideration.

**Summary of the Recommendations for Best Practice**
Using telehealth services is new in SA, and many of the barriers mentioned above could prove detrimental to the success of this service. However, there is a clear need to help families with children with ASD living in rural areas [3]. Nowadays, the world revolves around technology, and because it enhances social interaction through its convenience, facilitates knowledge-sharing among not only health professionals and those living with ASD but also the broader community, and will lead to positive change in the health sector [an increase in demand for more up-to-date technology, a reduction in mistakes made due to human error, and improved treatment plans] [22]. Given the up to date evidence the government and the health now need to implement and explore assisting families affected by ASD through the use of technology, engaging both genders in the use of computers and up-to-date software. Furthermore, increasing socialization between genders and explaining that this change might benefit children with ASD could positively impact on the development of the child and the families through the improved access to quality medical and behavioral services in the healthcare system [3].

First, Many Saudi parents reported to Alqahtani [2012] [15] that their children were diagnosed with autism at the age of seven because the hospitals in their area were not trained sufficiently to diagnosis autism. They had to refer the children to significant cities for diagnosis, which then took months because of the limited number of professionals who could diagnose the disorder. Delay in diagnosis can cause to delay in early intervention services despite the importance of early year intervention that has been shown to improve child outcomes [23]. Therefore, that ASD is diagnosed early, as it could improve the child's and the family's quality of life, through providing the opportunity for intervention, and thus an improvement in the child's social skills and communication [24].

In this regard, NODA SmartCapture, a mobile phone-based application for parents to record several video evidence of their child’s behavior in his natural environment [e.g., the home]; and supports diagnosticians in finalizing the diagnostic assessment of ASD [5]. This method presents with advantages. Firstly, the fact that families do not
need to purchase relatively inexpensive equipment and no longer pay travel expenses makes it cost-effective and, therefore, a much more attractive option [4; 5]. In addition, for a family with an ASD child who may dislike change to their routine and social context, no longer having to travel to vast, anonymous cities is clearly a significant benefit regarding the reduction in stress [4]. According to Smith et al.2017 [25] study, they reported similar results to clinician assessment in a prospective study of 50 families [88.2% correlation]. Furthermore, 95% [42 out of 44] parents reported that NODA SmartCapture easy to use and were able to record videos in their homes [26] successfully. Finally, NODA SmartCapture has possible to improve the efficiency of the diagnostic process for ASD in SA. Alternative point to mention is the use of telephone services in diagnosis [27]. The telephone would be an effective tool for aiding the diagnosis of ASD [28]. Professionals could administer the Autism Diagnostic Interview-Revised [ADI-R] via the telephone [28]. The ADI-R is the gold standard for diagnosing ASD, and the results of research carried out into diagnoses made by ADI-R showed that there is no significant difference between face-to-face interviews and those undertaken over the phone [28].

Secondly, web-based learning is a method that could be of immense help to the families of children with ASD after diagnosis and could potentially contain video tutorials which highlight specific ASD behaviors and advise parents of how to use intervention strategies correctly [29]. In SA using web-based learning is, in theory, both extremely valuable and flexible in that it can be adapted to suit the cultural context of families of children with ASD [29]. In SA these could be uploaded onto a website by male therapists, and for Saudi mothers who cannot read or understand medical terms, such videos would be immensely useful. The website could also have a forum either using or similar to, email so that parents can send and receive messages either by voice message or text to their therapist, who could then provide relatively instantaneous advice and support [6]. Since Saudi culture is strict about communication between genders, anonymous usernames could facilitate the communication between parents using these sites [6].
Another method would be to develop a website that provides parents, and the general public, with resources, such as information on autism symptoms, educational brochures, early interventions programmes, strategies for dealing with issues at home, community activities, and local events [6]. Besides, it should allow the parents to post conversational topics, tips, and progress updates about their child—or any other information they want to share [6]. In SA such a method could help in solving the separation issue between the genders, helping them to support each other and increase their awareness of other local families of children with ASD, keeping them up-to-date on new interventions for ASD.

A further point to mention is the benefit that telehealth services could also bring to health professionals. Alqahtani [2012][15] stated that many ASD therapists in SA are not trained in the latest intervention strategies, and therefore, web-based learning could help them stay up-to-date on the latest research and intervention techniques [27]. For example, a study by Vismara et al. [2009] [30] explained that training therapists via telehealth to use the Early Start Denver Mode for ASD was particularly effective. Also, raising public awareness of ASD symptoms and treatment in rural areas is essential, as is the need for all members of society to develop their IT skills [15; 3]. Zylstra’s [2013] [27]study found that online courses or workshops for families of children with ASD were equally as effective as face-to-face workshops. Therefore, a good starting point would be to develop and launch online courses informing interested parties about autism and life with such disorders in SA.

Conclusion

Autism is becoming increasingly recognized as a disorder in SA, yet there are limited services in rural areas. Increased public awareness about the disorder is needed to meet the demand for adequate services, support, and research suitable for the Saudi cultural context. While services and support can be found in major cities, this is not
representative of the whole country. Finding alternative methods for assisting families dealing with ASD can potentially be found through technology. Clearly, however, the use of technology faces many obstacles due to SA's culture and religion; but by adapting it accordingly, it could make a significant difference to the lives of those families with ASD children. Also, not only could healthcare professionals in SA interact with rural areas, providing consultations, behavioral interventions, and other support, using such methods may also lead to more acceptance of the use of technology in society in general. However, for this progressive, yet effective method of support to gain momentum in SA, evidence-based research about its implementation needs to be undertaken as a matter of priority.

Reference:


