

Dr. Bayan Abdulla Alsubaie

*A systematic Review of Telehealth Articles in
Applied Behavior Analysis*

Dr. Bayan Abdulla Alsubaie

Assistant Professor in Department of Psychology, College of
Education, Princess Nourah bint Abdulrahman University. O.Box
84428, Riyadh 11671, Saudi Arabia

ABSTRACT

Applied behavior analysis (ABA) therapy is widely recognized as the most effective, evidence-based treatment for autism. ABA therapy provides many different services to teach children with autism some basic skills such as looking, listening, requesting and imitating, as well as complex skills such as reading, conversing and understanding another person's perspective. ABA also helps reduce behaviors that make it difficult for children to learn. Some children with autism receive ABA therapy at clinics, schools, and in homes directly, while others received it remotely. This manuscript reviews some articles that used telehealth to provide services to children with autism. This manuscript is focusing on, what kind of services used by most articles? Who are the most involved in the programs? What kind of interventions they used in most of the research?

Keywords: Applied behavior analysis, Telehealth, Autism, COVID-19, Direct services , Remote services.

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Introduction

The continued prominence of technology in everyday life has prompted the health sector to adapt and adopt innovative ways to provide services. This follows the increased affordability and prevalence of technology such as smart phones and high-speed internet connections. Telehealth refers to the innovative ways through which health care facilities have adopted technology in providing health services (Alnemary, Wallace, Symon & Barr, 2015). It is the utilization of both information technology and telecommunications technology to provide such services as behavioral health assessment, supervision, consultancy services, education, diagnosis, intervention, and access information across distance. The avenues used in telehealth include through telephone, online chat rooms, email, video conferencing, use of smart phones and tablets and internet-based interventions. Telehealth has a wide variety of use including, but not limited to, speech and language therapy interventions, collaboration between healthcare professionals in assessment, diagnostics, and monitoring cases of long-term conditions, and offering mental health interventions and support.

The development and use of telehealth services provides such advantages as the increased ability to get to hard-to-reach populations including those living in remote areas with rare conditions, easier scheduling and reduced travel costs and the ability to involve the participation of family in the care and interventions (Nigro-Bruzzi & Sturmey, 2010). In psychiatry, telehealth has

proved reliable and acceptable and led to reduction in costs and medical errors.

Even though the advantages and successes of telehealth in other fields are visibly recognized, it has been used lesser in the field of Applied Behavior analysis. As at 2000, 98% of psychologists admitted having used some form of telehealth (Nigro-Bruzzi & Sturmey, 2010). This could however be attributed to the disparities in the fields where general psychology deals directly with the client while behavior analytic support involves the training of others on the use of specific techniques and formal behavior consultation models. The effectiveness of the trainings and consultations enhances the usefulness of telehealth as an alternative method for providing such support.

The slower adoption of using telehealth in ABA may also be attributed to a number of barriers that arise in the use of telehealth exclusively as compared to in-person training in such aspects as observing practice, role playing skills, collecting data, fidelity and monitoring implementation (Alnemary, Wallace, Symon & Barr, 2015). Initial practice has seen the use of in-person training with telehealth being used for support.

However, in 2020 the spread of the coronavirus disease of 2019 (COVID-19) has revealed a critical need and opportunity for behavioral science to contribute to the scientific database on public health issues, including delivery of services via Telehealth. The Centers for Disease Control (CDC) issued guidelines advising people and health care providers to adopt social distancing practices, imposed emergency lockdowns, and placed strict restrictions on travel and movement within the city, which made it difficult for children with autism to continue receiving treatment and completing behavior modification sessions.

During this period, both children with autism, their therapists, and their parents faced strong challenges to address difficulties. On the one hand, the autistic children faced difficulties in adapting to the new routine, stopping treatment sessions, and

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changing many behaviors, such as washing and sterilizing hands, wearing a mask, and other behaviors that were adopted at that time.. And therapists could not provide direct assistance because they were prohibited to come in contact with their patients. As for the parents, their challenges were greater because they became completely responsible for the child throughout the day without knowing how to apply what the child learned with the therapists and how to confront the new behaviors and deal with them .

In order to avoid the continuation of these problems and the further aggravation of the damage, the CDC recommended that health care facilities and health care providers should provide clinical services through virtual means such as telehealth. Also, the Editor of the Journal of Applied Behavior Analysis (JABA) invited authors to submit manuscripts for a special series on Public Health and Telehealth in Applied Behavior Analysis that address behavioral repertoires and interventions related to disease prevention, particularly with respect to infectious diseases, and design, delivery, effects, and recommendations for delivery of behavior analytic services via Telehealth.

The manuscript seeks to carry out a review of the articles that studied the use of telehealth in providing services to children with autism. The major focus will be based on 3 major aspects: (1) the type of services delivered; (2) the methodology and participants involved in the research including clients, teachers and parents; (3) the effectiveness of the administered interventions. The manuscript will also study how the provision of remote care services increased substantially at the onset of the COVID pandemic.

Literature review

The literature review is meant to analyze and define the previous research carried out due to a recent emergence of articles covering the use of telehealth in training of persons in ABA. Such an analysis is timely and crucial in identifying the effectiveness indicators, the breadth and scope that can be covered by telehealth

especially in dealing with autism and any difficulties or limitations that could arise from the use of telehealth for these functions (Barretto, Wacker, Harding, Lee & Berg, 2006). This analysis will define the general terms of literature that has been researched and published. Further analysis of these documents will be based on the three major aspects including types of services that are delivered, the participants involved in the research including clients, teachers and parents and the interventions that were administered.

Types of services delivered

For the past 30 years, researchers have been increasingly focused on developing effective, evidence-based training strategies to teach staff or parents a variety of behavioral technologies. Some therapists faced geographic barriers resulting in training complications due to increased travel time and physical distance. Furthermore, service providers, and sometimes families, must provide compensation for a behavior analyst's travel, which can quickly accumulate costs. Despite its expansive use and effectiveness, telehealth services providing a significant concern in rural areas, where behavior analysts may not be readily available to provide such training (Barretto et al., 2006; Boisvert, Lang, Andrianopoulos, & Boscardin, 2010; Frieder, Peterson, Woodward, Crane, & Garner, 2009; Machalicek et al., 2009; Wacker et al., 2013).

In some cases, parents or teachers would like to get some appropriate counseling from a person who is competent in this area for their child's situation. There has been evidence to suggest that telehealth can effectively be used to guide parental interventions and general parent training. As such, a comparison of results obtained from general parenting done by Reese shows comparable results for both children and parents in the cases when telehealth and in-person delivery was used. Functional behavior assessment has been considered by some experts as having the limitation of the need for

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extensive training and clinical experience necessary to perform (Alnema, Wallace, Symon & Barr, 2015).

Apart from Reese, other articles that were analyzed point to the fact that most of the services delivered using telehealth were behavioral and psychological therapy studies and research. Apart from functional behavior analysis, it was also discovered that the researchers relied on such things as exposure therapy, cognitive behavioral therapy and behavioral activation therapy. All these services, based on telehealth, provide a wide variety in terms of the scope of the study. The analysis of many articles providing all these services also gives a clear picture of the state of telehealth and the services and eliminates any bias that may have occurred in the use of lesser researches.

The analyzed articles also point to the fact that the most commonly used training that utilizes telehealth was based on either live coaching of the participants or behavioral skills training. Other researches and trainings also utilized training packages meant for individual participants as opposed to the group training carried out in the case of functional behavior analysis. The individual training in most cases was made up of instructional model with lecture-based training implemented in other cases. Moreover, other research articles also utilized telehealth for the purpose of delivering consultation services such as with the guardians and parents over their children's behavior for the cases of challenging behavior. It was also utilized in finding out the mental and physical health of both the patients and their families. Telehealth was used in the form of video conferencing for most of these cases with variations in their purpose and intent. The major services delivered in this case included support to patients and their families.

Integrating telehealth training across different continents and cultures by using telehealth further shows that after one group-format training and a subsequent individualized feedback session,

all individuals can acquire some basic skills that lead to mastery and they also can acquire mastery for conducting functional analysis (Frieder, Peterson & Woodward, 2010). Video conferencing is effective in providing training and supervision for research-based strategies. As such the types of services that can be delivered by using telehealth are limitless and it can comfortably be applied to a wide variety of scenarios.

Though there is need for more research on how to forge these working partnerships between behavior analysts and clients, and development of components of effective collaboration and analyses of function-based treatments, the new technologies currently available provide a promise for future consultations over a great range of issues that were difficult due to cost, and distance constrains (Barretto, Wacker, Harding, Lee & Berg, 2006).

Participants involved

ABA therapy is provided under the direction of a Board-Certified Behavior Analyst (BCBA) or a Board-Certified Assistant Behavior Analyst (BCaBA). Therapists work closely with families and education professionals and apply the principles of ABA to teach language, social, self-help, academic, daily living, and life skills. However, in some cases a BCBA needs to provide some services to another location to help other people who need ABA services, but they have some geographic barriers.

Previous studies have shown that teleconsultation can be a cost-effective service-delivery method for overcoming the barriers to training individuals who do not live close to universities or other training facilities (Barreto et al., 2006; Frieder et al., 2009; Gibson, Pennington, Stenhoff, & Hopper, 2010; Machalicek et al., 2009; Machalicek et al., 2010; Wacker et al., 2013). Researchers have used teleconsultation to deliver a variety of services such as functional communication training (Suess et al., 2014; Wacker et

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al., 2013) and functional analyses (Frieder et al., 2009; Machalicek et al., 2009; Machalicek et al., 2010; Wacker et al., 2013). In recent studies, researchers have begun to use teleconsultation to train staff to conduct functional analyses (Alnemary et al., 2015).

The participants involved in most of the research and assessments included those from different mental states, backgrounds, and functions. Most of the articles carried out wholesome research that involved different participants carrying out different roles in order to generate consistency and reduce the presence of bias. Most of the studies done on the use of video conferencing for functional analysis incorporated participants from different background including a student with autism that displayed challenging behaviors, parents, teachers of special education and some different staff members- depending on the child's needs-.

Intervention Administer:

Telehealth services have been used to train a variety of different skills, such as discrete trial teaching, preference assessments, token economies, the picture exchange communication system, incidental teaching, and many more (Fetherston & Sturmey, 2014; Homlitas et al., 2014; Petscher & Bailey, 2006). Also, it has also been effective in training staff to conduct functional behavior assessments (Alnemary, Wallace, Symon, & Barry, 2015; Machalicek et al., 2009). Analyses on the research completed for the different interventions pointed out to the fact that most of the research conducted was based on a variety of interventions such naturalistic and functional communication training and behavior support.

Moreover, it was also discovered that some of the treatment packages included interventions for self-management and counselling. Other more comprehensive interventions used a variety of techniques in their implementation including metacognitive strategies and motivational interviewing.

Method

For articles published from 2005 through 2023 in telehealth, I created an Excel[®] database containing articles lists. Online electronic searches were conducted on PubMed, ERIC, Web of Science, ProQuest, and Scopus databases and Google Scholar. The search terms included ‘telehealth or telemedicine or teleconferencing for autism, Asperger's syndrome in Applied Behavior Analysis field’, as well as filters for the type of publication and the language of the publication was in English. I entered article information into a spreadsheet, including year, type of service delivery, participants, interventions delivered via telehealth and title. This procedure yielded 186 articles in telehealth. Then, I constructed pivot tables to count the number of articles that talked about the same: type of service delivery, participants, or interventions, to get the total number of each area.

Results and discussion

Figures 1 and 2 show the yearly number and cumulative of research articles of telehealth in ABA by using different Applied Behavior Analysis’s services. Between 2005 and 2023, articles searched in telehealth were 185, some increases in the number of telehealth articles in ABA between 2005 to 2008, with a steadily increasing trend across the past 14 years – between 2009 to 2023. The graphs are a clear indication of the continued research and interest that has developed in the use of telehealth services for behavioral assessment, especially between 2014 and 2018. This is due to the successes that preliminary research carried out has had and the existing potential in redefining and increasing the scope of application of these interventions and analysis over a wider group of clients and related participants.

The increased interest is also due to the continued desire for technological applications in different aspects of our lives since it has become central for our existence. The ability to offer telehealth services therefore solves the problem of both time, distance, cost, and convenience among others. It could prove to be the best

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available tool in the field of behavioral analysis as it eliminates all the stereotypes and allows more freedom of engagement with the participants. The included patients also cut across the different aspects in terms of roles; such as parents, caregivers, teachers, and patients. The ability to be applied for different clientele and allowing for different interventions gives it more edge beyond the conventional methods that are quite cumbersome in dealing with a mixed group of participants. Telehealth applications such as video conferencing in this case allows the behaviorist to fine tune their analysis to a set group of people without compromising effectiveness. The increase and diversity are therefore attributed to both the success of previous research and the continuous advancements in technology that calls for the different fields to keep up with the trends and allow for increased convenience and effectiveness.

During the years 2020 - 2021, and this is the period of the spread of the COVID-19 , the efforts of behavior analysts in providing remote care increased significantly to avoid all the previously mentioned problems ,in addition to completing the treatment, and providing assistance to parents and children remotely without the need to stop or treat in person only. This marked shift in practice patterns has implications for rapid response efforts in how to quickly adapt to emergency conditions, find rapid solutions to deal with ongoing changes, and delve into telehealth policy and regulatory waivers to increase access to acute, chronic, primary, and specialty care during and after the pandemic.

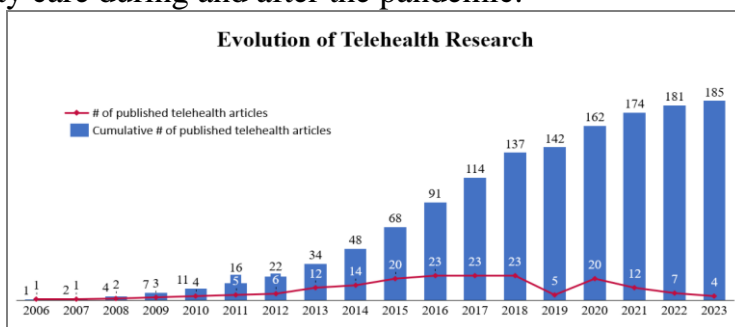


Figure 1. Yearly and cumulative number of published telehealth articles in ABA.

Year	# Of Articles
2005	0
2006	1
2007	2
2008	2
2009	3
2010	4
2011	5
2012	6
2013	12
2014	14
2015	20
2016	23
2017	23
2018	23
2019	5
2020	20
2021	12
2022	7
2023	4

Figure 2. The number of total articles of telehealth articles in ABA.

Type of Service Delivery:

Behavioral and/or psychological therapy was included in 28% (N=35) of the studies. Some of the common treatment packages that were evaluated included cognitive behavioral therapy (Dunstan & Tooth, 2012; Ertelt, Crosby, Marino, Mitchell, & Lancaster, 2011; Frueh et al., 2007; Holmqvist, Vincent, & Walsh, 2014; Lichstein et al., 2013; Martínez et al., 2014; Stubbings, Rees, Roberts, & Kane, 2013; Ziemba et al., 2014), behavioral activation therapy (Egede et al., 2015; Lazzari, Egan, & Rees, 2011; Price & Gros, 2014; Strachan, Gros, Ruggiero, & Acierno, 2012), and exposure therapy (Gray et al., 2015; Gros, Yoder, Tuerk, Lozano, & Acierno, 2011; Tuerk, Yoder, Ruggiero, Gros, & Acierno, 2010; Yuen et al., 2013). Additional treatment packages included self-management interventions (Anderson, Godwin, Petersen, Willson,

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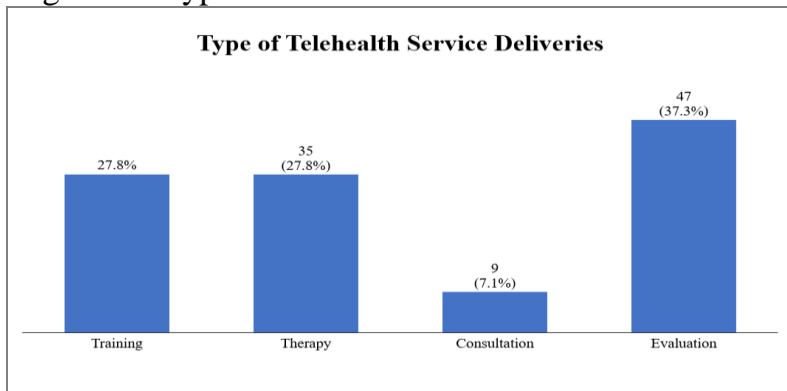
& Kent, 2013), counseling (Fox, Connor, McCullers, & Waters, 2008), and other comprehensive psychological therapies that included a combination of various techniques (e.g., motivational interviewing, metacognitive strategies, etc.).

In 28% of studies (N=35), authors delivered training via telehealth. The most common type of training consisted of behavioral skills training (Alnemary, Wallace, Symon, & Barry, 2015; Gibson, Pennington, Stenhoff, & Hopper, 2010; Hay-Hansson & Eldevik, 2013) and live coaching (Barretto, Wacker, Harding, Lee, & Berg, 2006; Fisher et al., 2014; Heitzman-Powell, Buzhardt, Rusinko, & Miller, 2013; Machalicek et al., 2009; McDuffie et al., 2013; Suess et al., 2014; Vismara, McCormick, Young, Nadhan, & Monlux, 2013; Wacker et al., 2013; Wacker et al., 2013). The rest of the studies delivered individualized training packages that consisted of lecture-based and other forms of instruction.

In 7% of studies (N=9) utilized telehealth for consultation services. The services included consultation with families on their children's problem behavior (Buono & Citta, 2007; Davis, Sampilo, Gallagher, Landrum, & Malone, 2013) and with patients and their families on their mental and/or physical health (Haddad, Grant, & Eswaran, 2015; Hilt et al., 2015; Keeping-Burke et al., 2013; McCord et al., 2011; O'Connell et al., 2014; Shore, Goranson, Ward, & Lu, 2014). Consultation services consisted of video conference meetings with families and patients in their homes. The meetings varied across studies but typically included support for the families and patients in the form of answering questions, interviews, and giving them information on resources available to them.

Finally, the remaining studies discussed the evaluation and analysis of telehealth services. In 37% (N=47) the authors discussed some of the barriers and difficulties faced telehealth delivery in the field of applied behavior analysis. In addition to Evaluating and providing some preliminary practice recommendations for ABA telehealth services with children with autism.(Jenny Ferguson, Katerina Dounavi & Emma A. Craig,

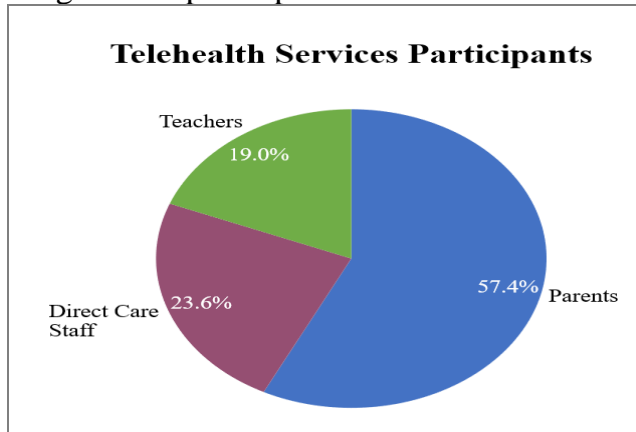
2022; Sho Araiba & Marija Čolić, 2022; Gerow, S., Kirkpatrick, M., McGinnis, K., Sulak, T. N., Davis, T. N., & Fritz, S. ,2023; Dueñas, A. D., & D'Agostino, S. R. ,2022; Leslie Neely, Hannah MacNaul, Emily Gregori & Katherine Cantrell,2021; Mara K. Oblak, 2021; Maithri Sivaraman & Tara A. Fahmie, 2020; Ferguson, J., Craig, E. A., & Dounavi, K. ,2019).Fieger 3 shows the percentage of the type of services.



Fieger 3. The percentage of types of telehealth services delivery.

Participants:

After reviewing the articles used telehealth for providing ABA services, it was discovered that a large percentage of participants were parents. Direct care staff and teachers formed a lesser percentage of the participants involved as shown in figure 4.



Fieger 4. Distribution of telehealth services participants.

Interventions Delivered via Telehealth:

Figure 5 depicts the percentage of studies completing research in each intervention category. The highest percentage of studies were focused in functional analysis and functional communication training and also in naturalistic. The lowest percentage of studies were in behavior support, comprehensive, preference assessment.

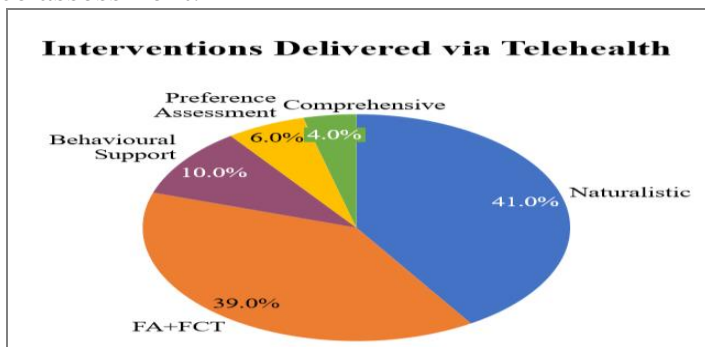


Figure 5. Proportion of studies completing research in each intervention category.

Conclusion

The continued advances in technology require all aspects and fields to keep up with the times. As such, telehealth is a very important aspect in behavior assessment especially owing to the massive advancements in terms of video conferencing and high-speed internet connections. The use of telehealth in ABA helps ensure convenience and universal care for patients and training for caregivers despite any challenges such as distance telehealth has the advantage of increased ability to access hard to reach areas including very remote places, reduced traveling, easier scheduling, and the ability to incorporate family members in the care and interventions. In psychiatry, telehealth has proved reliable and acceptable and led to reduction in costs and medical errors.

Even though the advantages and successes of telehealth in other fields are visibly recognized, it has been used less in the field of Applied Behavior analysis. As of 2000, 98% of psychologists admitted having used some form of telehealth. The slower adoption of using telehealth in ABA may also be attributed to several barriers

that arise in the use of telehealth exclusively as compared to in-person training in such aspects as observing practice, role playing skills, collecting data, fidelity, and monitoring implementation. Initial practice has seen the use of in-person training with telehealth being used for support.

However, there has been an increase in the interest generated by telehealth in the field of ABA not only due to its success in other fields such as psychiatry, but also following its success in preliminary studies. The growing interest has caused the number of research and articles to grow and increase over the years. This has proven to be a continued success with the ability of various activities to be carried out via telehealth and a diverse number of interventions being made possible.

It is expected that after relying on the provision of telehealth after the onset of the Covid-19 pandemic and the successes that it has resulted in achieved so far, the development in the field of telehealth will continue for behavioral scientists, with more effort being made from a professional standpoint to appreciate its role as a therapeutic service that solves many problems that patient, parents, or therapists may face. Also, telehealth applications comply with the telehealth-specific ethical codes and guidelines of the American Psychological Association, the American Academy of Pediatrics, and the National Association of Social Workers, along with the related ABA literature. It is an exciting field to see, and some are excited that it is becoming central to applied behavior analysis.

Declarations

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Conflict of Interests:

None reported .

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