

The Efficacy of Technology and Non-Technology Based Intervention for Children with Autism Spectrum Disorder: A Meta-Analysis

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Abstract:- This article aims to represent the effects of technology and non-technology based intervention methods that had been carried out on children with autism spectrum disorder (ASD). The contribution of new innovative technologies that enable the coping strategies of children with ASD and its long term effects, application of those technologies on their daily activities was covered in this study. The importance of non-technological based intervention outcomes were also reviewed in this meta-analysis to plan a better training module for children with developmental disorders especially in the case of ASD. The keywords such as autism, intervention, technology, disability were used in the journal indexing sites like Scopus, PubMed, Medline, Web of Science, Google Scholar and the resulting articles were considered for the study. The outcome of this meta-analysis is emphasizing the technology and non-technology based intervention methods for children with autism spectrum disorder.

Keywords:- Autism, Disability, Intervention, Meta-analysis, Technology, Multiple disabilities, Non-Technology.

I. INTRODUCTION

The concept of autism was introduced in the year 1911 by the German psychiatry specialist Eugen Bleuler to portray an indication of the most extreme cases of schizophrenia. As indicated by Bleuler, autism was said to be the wishes by the children to abstain from uninspiring real factors and supplant them with dreams and fantasies. (Bleuler, E 1950). But later the core feature of Autism was first described in 1943 by Leo Kanner in Baltimore, US and was independently described in 1944 by Hans Asperger in Vienna (Asperger 1944) . Both of these clinical descriptions described an overlapping core set of features (social difficulties alongside highly repetitive behaviour). In the 1950s and 1960s autism was often attributed to purely environmental factors, such as unemotional parenting (Bettelheim 1967). But this theory was over turned in the 1970s. From the 1950s to the 1980s autism was mostly considered to be categorical (either present or absent) and quite rare (four in 10,000 children) were

diagnosed with this condition in United states. In the 1970s the symptoms were described as a ‘triad of impairments’ that included social difficulties, communication difficulties and social imagination difficulties (together with strongly repetitive behaviour) (wing 1976). In the 20th century it can be diagnosed as early as 18 months from birth. Developmental screening and early psychological assessment can help to formulate appropriate intervention to identify children with Autism symptoms. Autism Spectrum Disorder refers to a range of conditions characterized by some degree of impaired social behaviour, communication and language, and a narrow range of interests and activities that are both unique to the individual and carried out repetitively. ASDs begin in childhood and tend to persist into adolescence and adulthood. In most cases the conditions are apparent during the first 5 years of life. (WHO 2018). Around 1/100 children in India under age 10 has mental ASD, and almost 1 out of 8 has neurodevelopmental related condition.

The estimates are based on the first rigorous study of its kind in India (Arora NK et al 2018). In India autism has been recognized as one of the 21 recognized disabilities under the section 2 of the National Trust Act, 1999 – The persons with the Disabilities (Equal Opportunities Protection of Rights and Full participation) Act, 1995 (PwD Act). The major difficulties faced by parents of children with autism in India is obtaining an accurate diagnosis and also there are not enough quality services are being offered to meet the needs of children with developmental delays in India.

II. CURRENT TREATMENTS AND INTERVENTIONS

Significant advancement has been made in distinguishing interventions that address the main deficiencies of ASD and improve the life quality and satisfaction for some people diagnosis with autism (Kopelman et al 2020). There are wide methods of treatment are available for ASD which range from behaviour to alternative medicine (Ospina M.B et al 2008). At present there are no medical treatment or drug that will

completely cure the ASD but however there are some drugs that help them function better in the day to day life (CDC 2019). There have been psychological techniques which is useful for supportive care and psycho educate the parents of children with ASD. (Malhotra et al 2002) and also found to be effective. Research shows that early mediation treatment can significantly improve a child's overall growth. A significant treatment approach for individuals with an ASD is called applied behaviour analysis (ABA). ABA has broadly acknowledged by the clinical psychologists and also among numerous schools and rehabilitation centers . Relationship-Based Approach (AKA "Floortime") intervention stress upon emotional and social improvement with parents or primary caretakers. It helps the child to build up the self-regulation, social relationship and emotional ideas. Occupational therapy instructs the individual to live as autonomously as could reasonably be expected. This deals with the abilities that incorporate with dressing, eating, washing, and identifying connection with other individuals. Sensory related training enables the individual to manage tactile sensation, sights, sounds, and scents. It likewise helps the children who is annoyed by specific sounds or doesn't prefer to be contacted. Language training assists with improving the individual's communication abilities. A few people can learn verbal correspondence rapidly however for other people, utilizing motions or picture sheets is more practical (CDC 2019). The Picture Exchange Communication System (PECS) utilizes picture images to show relational abilities. The individual is educated to utilize picture images to ask and answer inquiries and have a discussion (Charlop-Christy, M. H et al 2002).

Numerous biomedical interventions recommend the adjustments in diet Such changes incorporate expelling particular sorts of nourishments from a child's eating routine and utilizing nutrient or mineral enhancements. Dietary treatments depend on the possibility that nourishment hypersensitivities or lack of nutrients and minerals cause indications of ASD.

For young people and adults with ASD, vocational training and tailor-made interventions will be carried out to improve social and conduct change to work independently. Despite the fact that credentials have been made between ASD administrations that are "habilitative" (constructing new aptitudes) or "rehabilitative" (reestablishing lost abilities), legalized choices have scrutinized the utilization of these differentiations. Current reasoning backings the requirement for preventive, clinical, and therapeutic administrations when these mediations have been prescribed by a medicinal services expert for the decrease of a physical or mental inability and for guaranteeing the most ideal degree of functioning. (Seaman, R. L., & Cannella-Malone, H. I. 2016).

People with ASD tend to enjoy themselves in the interactive programs of computers. A systematic review by (Valencia K et al 2019) which compress of 94 studies shows the development of several skills of individual with ASD by using the technology based aids. There are studies

exclusively emphasis the emotional recognition of children and adolescents with ASD (Lee CSC et al 2017) through technology based models.

Cognitive – Behavioral intervention programs are intensively focus on the overt behaviour and social reciprocity of the individual with ASD which is widely used in non-technology based and helps to treat Anxiety and social deficits (White, S. W. et al 2010). Most ASD interventions are continuous and ongoing process with individualized plan with set of goal and strategy.

III. METHODOLOGY

This study was carried out with the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA).

➤ *Materials :*

The article and information gathered for this investigation was finished by utilizing research journals and databases such as PubMed, Medline, Web of science, Google Scholar. The inspected articles were distributed from 2000 to the current time frame (2020) was chosen. During the investigating procedure, the accompanying key expressions were utilized: autism, autism spectrum disorder, ASD, technology, intervention. Approximately 8153 journals are identified with intervention methods for autism.

➤ *Inclusion Criteria :*

- Published in peer-reviewed journals
- Technology & non Technology based intervention on ASD
- Original research article, Review paper
- Open access articles are included

➤ *Exclusion Criteria :*

- Conference papers / Abstracts
- Unpublished data, grey literature
- Non – English Language papers

➤ *Selection of Studies :*

The researcher performed the literature search and the duplicate studies were excluded from the analysis. As per the figure 1 the literature review was done in step by step method.

➤ *Quality assessment :*

To assess the characteristic of the study quality, The Standard Quality Assessment Criteria for Evaluating Primary Research Papers tool for quantitative studies developed by Kmet, Lee, and Cook (2004) was used. An over view of 14 criteria such as, (i) objective of the study, (ii) study design, (iii) Method of study, (iv) subject characteristics, (v) Intervention description, (vi) Intervention from investigators view, (vii) Intervention from subject's view, (viii) outcome of the study, (ix) sample size, (x) Analytic method, (xi) Estimation of variance, (xii) Controlling of confounding variables, (xiii)

result, and (xiv) Conclusion followed. In the 14 criteria only applicable were taken into consideration for the final analysis.

IV. TECHNOLOGY BASED INTERVENTIONS ON AUTISM

A growing number of studies have investigated technology based interventions (Computer, smartphone, tablet, mobile apps) for supporting individual with ASD preferably in the structured classroom or therapy room

(Mazon et al 2019) provide effective outcome through intervention. Technology based interventions are used as temporary instructional aid and assistive devices. Devices which provide tactile and auditory prompting, Computer – aided instruction, video – based instruction and feedback, etc. There have been many methods used in the form of desktop computer, interactive DVD, shared active surface, and virtual reality (Grynszpan O et al 2014), smart glasses (Vahabzadeh et al 2018), technology based games (Valencia et al 2019).

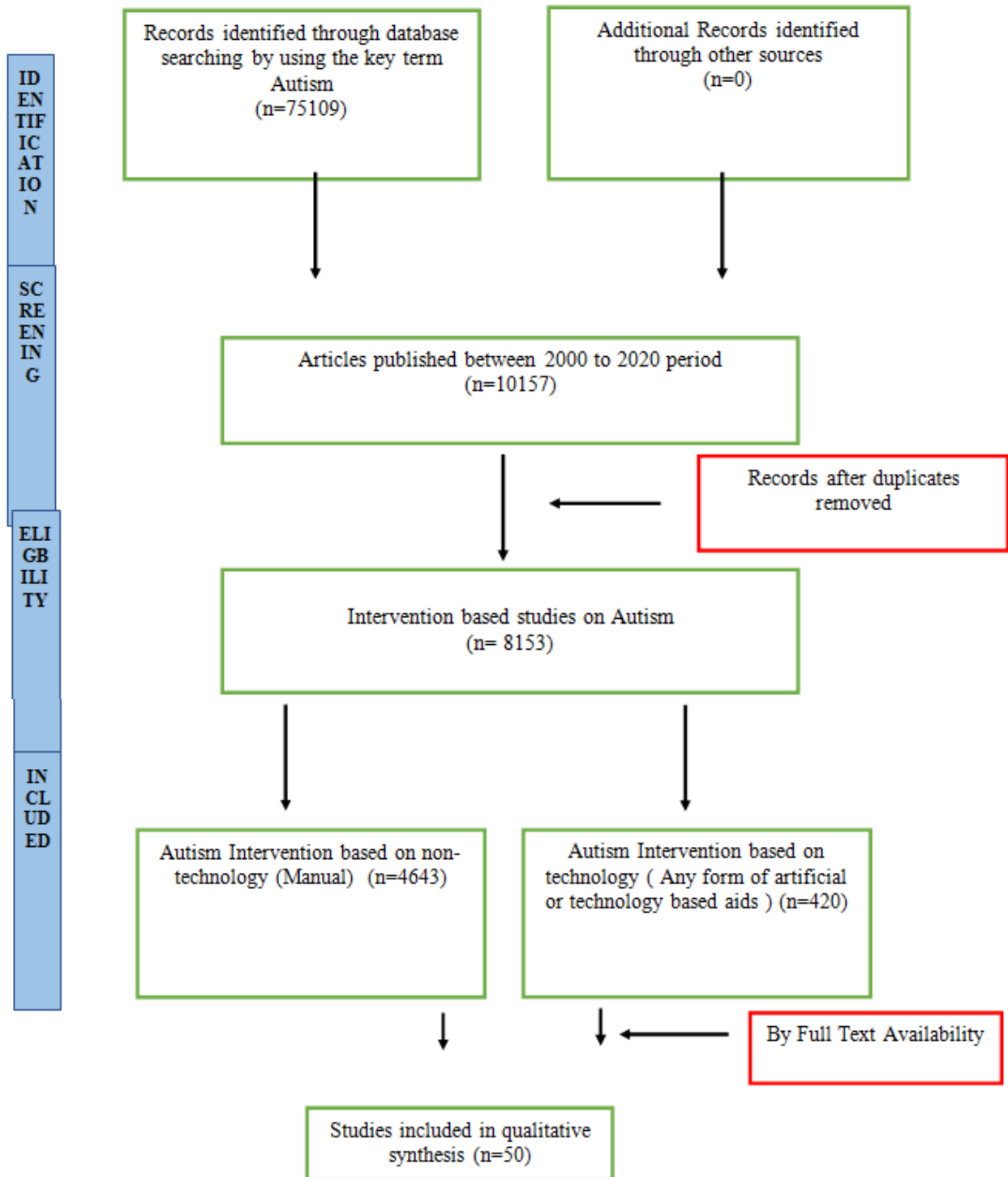


Fig 1:- Shows the systematic analysis of the literature

The core benefit of moving towards technological aid is that individual who are having communication deficits can more seamlessly interact and communicate through their mainstream peers. It was studied by using the objects (Pacman – Video game ; Walkman – Audio device) by Gaylord-Ross, R. J., et al 1984). Technology devices, such as smart phones and tablets, can be used for these form of intervention and produce same effect in the 21st century as well (Kaur & Pany 2017).

Vocal Modeling (Stevenson et al 2000) and video modeling (Qi, C. H., & Lin, Y.-L. 2012) are found to be very effective for children with ASD. At the point when the child can utilize plans adequately, prompts can be gradually diminished. Subsequently, photographic movement strategies (Morrison R S et al 2002) can be used to enhance the independent activities ad assimilate inclusion program for children with developmental disabilities.

Innovative technology may likewise be profoundly remunerating for children with ASD and may rouse them to follow plans more reliably. Research found that (Shane and Albert 2008 ; Carden and Azuma 2012) children with ASD visual attention are tend to be longer in the video modeling based interventions.

Children with ASD may have comorbid fine locomotive ability issues. This deficits may influence a person's capacity to take an interest in exercises, for example, writing and drawing.

Technology based instruments such as tablet, iPad might be used to improve the fine motor functioning. Additional and quality researches are needed in the near future with evidence based practice to apply the intervention strategies in day today functioning of individual with ASD. Continued research in this area will insure the technological advances will positively applicable for the intervention module for children with ASD.

V. NON – TECHNOLOGY BASED INTERVENTIONS ON AUTISM

There are many non-technological based interventions are available and widely accepted for treating ASD. They range from standard healthcare such as occupational therapy, physiotherapy, speech and language therapy (Smith, V. K., & Dillenbeck, A 2006), behavioral interventions, Medical, Combined, and other alternative interventions (Smith, T., & Iadarola, S. (2015). Children with ASD have a hard time in applying what they have learned in one setting to others because most of the interventions were carried out in the highly structured schedule and closed environment but designing a effective applied behaviour, social reciprocity strategies and intervention modules will produce significant treatment outcomes (Linstead, E., et al 2017). The interventions that target early childhood will produce favorable outcomes for individuals with ASD (Su Maw, S., & Haga, C. 2018). Children are capable of engaging in non-technology based interventions in the early childhood because their cognitive

and behavioral functions are more adapted to the natural objects.

Community based behavioral intervention conducted on 726 children with applied behaviour analysis (ABA) produced greater progress in their learning outcomes (Linstead, E. et al 2016). Ultimate aim for caring people with ASD ought to incorporate with of everyday life (adaptive) activities. Advancement of important and practical skills across school, work, home, and network settings which is attainable by the help of psychiatrists, psychologists, behavioral therapists, occupational therapists and speech language pathologist (Politte, L. C et al 2015) and they all make tailored method of intervention considering individual capacity of learning. In ethical and legal aspect all these manual based intervention can only give by the trained certified professional which will benefit the children and the family as comprehensive approach

Based on the results of various technology and non – technology based Intervention studies on Autism, Technology based Intervention is a current growing and promising intervention based on various studies and it has been found to be effective. But, it was concluded that many devices and the software required for technology based interventions were found to expensive. Similarly, various non – technology based Interventions were found to effective and cost – effective. It can be concluded that both the interventions areas equally effective for Children with Autism Spectrum Disorder.

VI. CONCLUSION

ASD is almost identified in 1 in 110 children worldwide (Medavarapu et al 2019) and 1 in 500 is likely to have ASD or developmental disability in India (Krishnarathi, A et al 2018). It continuous to be a difficult condition for children and their families; nonetheless, huge advances have been made with respect to diagnosis and treatment. Also it is important to realize the recent trends and technique for the quality treatment for individuals with ASD. From this review it can be concluded that both the interventions are equally effective for Children with ASD but non technology based interventions can have prolonged effect as it does not rely much on helping aids. It is highly essential for medical professionals to be educated about evidence based interventions accessible in the form technology and non-technology, so the families having child with ASD can acquire the best and successful treatment for their children.

➤ *Limitations and Future Directions :*

Only the research that related to technology and non-technology were quoted in this study for differentiating the quality of intervention method. This review article cannot be taken in to consideration as comprehensive notes for ASD

➤ *Implication :*

The studies quoted in this work will be useful for health care professional to have an overall opinion about developing the effective treatment plan and also emphasize the importance and development of modern technological aid that will enhance the quality of life of children with ASD and their family.

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