



Evidence-based Nursing Strategies for the care of Autistic Children with Com- munication Disorder

A Systematic Review

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<p>Abstract</p> <p>Autism spectrum disorder (ASD), a neurodevelopmental health condition, accounts for significant shortfalls in social interaction and communication in many children. Over the last decade, different treatment strategies with varying levels of evidence have been recommended and applied to meet specific needs of children. Nonetheless, there has also been a growing emphasis on the identification and utilization of evidence-based treatment strategies for autistic children.</p> <p>The aim of this study was therefore to explore available scientific literature to find evidence-based strategies for the care of autistic children with communication disorder. The findings in this study was aimed at aiding nurses to better understand how evidence-based strategies can serve the specific needs of autistic children and also to highlight the nurses' role in providing quality care.</p> <p>Using a thematic analysis approach, the study engaged in a systematic review of literature involving seventeen (17) scientific papers published between 2007 and 2020. The literature for the study were collected from Cinal, Pubmed, PsychInfo, Google scholar, and Medline Ovid databases.</p> <p>Four main broad strategies were found and confirmed in the study as evidence-based strategies. These were entertainment-based therapy, early intervention, speech language pathology and computer-based interventions. While these broad interventions were not regarded as the only solution for the needs of every autistic child, it was found that their application resulted in significant improvements in the communication and social interaction of children. Continuous research on the application of these strategies was therefore necessary to ensure their effectiveness to attend to the specific needs of every child.</p>		
Keywords: Evidence-based Care, Autism Spectrum Disorder, Communication Disorder, Children		
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1 Introduction

Autism spectrum disorder (ASD) is a neurodevelopmental health condition characterized by prevalent shortfalls in social interaction and communication, in addition to the existence of rigid and/or repetitive behaviors that influences an individual's functioning and development. (American Psychiatric Association 2013). There is no known single cause of ASD, but available evidence suggests that genetic and environmental factors may play a role to impact brain development. (Brown & Elder, 2014). ASD is normally identified during the early years of childhood.

Global estimates show that it affects one out of every 160 people worldwide, resulting in about 7.6 million disability life adjusted years. (WHO 2013). In the United States, autism affects one out of every 68 children (Brown & Elder, 2014). Earlier studies have confirmed the presence of the disease in some African countries. However, reliable data on the prevalence rate in Africa including other low and middle-income countries is missing. Thus, the disease burden is underestimated (Bakare & Munir 2011). In Europe, the average prevalence rate is estimated at 12.2 per 1,000 (one in 89) for children between the ages of seven (7) and nine (9) years. (ASDEU 2018, 3).

Currently, no single treatment or cure has been identified for ASD. Nonetheless, different therapies involving multidisciplinary approaches are normally applied to meet specific needs of patients. (Gupta 2015). Given the variations in the needs of ASD patients, and the fact that health and therapeutic services must be based on practical scientific evidence of their effectiveness (Hume, et al 2021, 2), it is critical for nurses to understand this framework of practice in order to provide quality care. Along the autism spectrum, timely interventions have been judged to produce favorable outcomes. And while each part of the spectrum deserves equal scholarly attention, this study focuses mainly on communication disorder to achieve the goals of the research topic.

Against this background, the aim of this study was to explore available scientific literature to find evidence of strategies for the care of autistic children with communication disorder. The findings in this study was aimed at aiding nurses to better understand how evidence-based strategies can serve the specific needs of autistic children and also to highlight the nurses' role in providing quality care for such children. It was

also envisaged that children who had challenges with social interaction and communication could benefit from the knowledge gained by nurses from this study.

2 Neurodevelopment Disorder and Nursing Care

Neurodevelopmental disorders are health problems related largely with the operational activities of the neurological system and the human brain. According to the Diagnostic and Statistical Manual of Mental Disorders 5th edition (DSM-5), “neurodevelopmental disorders are characterized by early-onset deficits of variable severity in personal, social, academic, or occupational functioning”. The American Psychiatric Association (2013) explains that these disorders can comprise among others, intellectual deficiency, speech disorders, attention deficit/hyperactivity disorders, specific learning impairment, motor disorder, and autism spectrum disorder.

The health condition may be first diagnosed in childhood or adolescence. Although symptoms related to neurodevelopmental disorders change as children grow older, some symptoms could potentially become permanent. According to clinicians, the diagnosis and treatment of neurological development disorders can be challenging. Treatment may involve a diverse combination of professional therapy, medications, home-based programs as well as school-based programmes (American Psychiatric Association 2013).

2.1 Autism Spectrum Disorder (ASD)

As indicated in the earlier section, the American Psychiatric Association categorizes “autism spectrum disorder (ASD) as a neurodevelopment disorder that is identified by challenges with social communication and social interaction and restrictive, repetitive patterns in behaviors, interests, and activities”. (2013). The term ‘spectrum’ is used in the classification of the health condition due to the heterogeneity in the exhibition and magnitude of ASD symptoms, including the skills and level of functional effectiveness of people who are diagnosed with it. Among children, symptoms of ASD consist of an extensive variety of characteristics, ranging from minor deficits to severe deficits or complete loss of activity. (Ortiz 2020.) For the purpose of clarity, the study adopted the definition of a child from the United Nations Convention on the Rights of a Child (UNCRC) as “every human being below the age of eighteen years unless under the law applicable to the child, majority is attained earlier”.

2.2 Causes and Diagnosing ASD

According to the States Department of health and human services (2017), some degree of evidence supports the position that genetic factors play a major role in autistic conditions. Consequently, if an individual was susceptible to developing autism due to genetic factors, then certain environmental conditions could trigger ASD. Again, since the signs and behaviors of ASD are so broad and differ so much from child to child, there is no single standardized test to determine whether a child is autistic. In Finland, one of the assessment tools used is the 'Miller Function and Participation Scale'. This is a developmental assessment instrument or tool used to examine a child's overall functional performance. The assessment tool enables experts to evaluate a child for any signs and symptoms of ASD. Although symptoms of autism can appear between the ages of 15 and 18 months, the average age of diagnosis is between four to five years. ASD can be diagnosed by collecting the child's developmental history as well as direct examination of the child's behaviors. A group of experts are usually assembled to evaluate the child's symptoms and activities. (Gupta 2015).

The experts will comprise of a pediatrician, a child psychiatrist, a speech and language therapist, and a child psychologist. The child's behavior would be observed in a variety of environments, including his home and school. In Finland for instance, a report from the child's school will normally be sent directly to the experts prior to the assessment while parents of the child would be also required to complete a questionnaire to be submitted to the team on the day of the evaluation. Different habits that are common in children with ASD would be evaluated by the team to arrive at a conclusion. The prognosis for each case is made on an individual basis because the child's actions can differ significantly and even alter over time. Some individuals with autism can lead productive lives, while others may need some help throughout their lives. (Sedgewick, Hill, Yates, Pickering, & Pellicano 2016).

2.3 Communication Disorder

A communication disorder is defined as the incapacity to acquire, transmit, process, and understand concepts, be it verbal, non-verbal or graphical representations. This inability could be manifest in areas such as hearing, speech and language. (Gupta 2015,

88). Indeed, persons diagnosed with autism show one or several forms of communication disorders. It is however important to highlight that there are varying types of communication disorders that may not necessarily be connected with autism as a primary cause. Notwithstanding this, there are specific types of communication disorder that can be classified as a symptom of autism. (Lord, Elsabbagh, Baird, & Venderweele 2018).

Regarding the symptoms of communication disorder, medical experts have identified some patterns of language use and behaviours among children who are autistic. This consist of, but not limited to the use of repetitive or rigid language. It involves saying things that are meaningless or pointless on a particular engagement or conversation with them. Children could also demonstrate irregular language development or display a narrow interest and extraordinary capabilities as a symptom. (Casari, Brady, Lord , & Tager-Flusber 2013, 479-485).

In relation to the former, children may be able to gain some speech and language abilities but this may not be at the level to be deemed as normal or adequate for their age. In the latter symptom, children are observed to be able to carry out a theme that is of interest to them but may not necessarily be able to do so as a two-way enagement about the same topic. Last but not least is poor non-verbal communication skills. Here, children will lack the ability to use gestures to make meaning and also generally avoid eye contact. (Casari, Brady, Lord , & Tager-Flusberg 2013, 479-485). As mentioned earlier, diagnosis and treatment of communication disorder are carried out by a group of experts who work together to evaluate a child's functional performace to arrive at a conclusion. Based on the assessment results, appropriate interventions are recommended for the child as a form of treatment.

2.4 The Concept of Care in Nursing

The term 'care' or 'caring' appears regularly in nursing. Despite the fact that 'care' is a common concept, there is no single recognized definition of it. Caring has been articulated by many nursing theories. In the attempt to arrive at a definition for the concept, Newman et al realized that the fundamental aim of nursing science was linked to how nurses could support and promote the health of people. (Cook 2017, 13). Granting this central aim of nursing, an important aspect that was sought to be understood

was how nurses and their patients could connect in a ‘transforming way’. Thus, Newman et al suggested that caring is a moral obligation that gives nursing a purpose. (Cook 2017, 14).

Jean Watson on the other hand admonished nurses to assume social obligations that maintained human dignity. Watson’s theory defined caring as “a significant humanitarian, ethical, philosophical, and epistemic endeavor and cultivated practice that contributes to the preservation of humanity.” (Cook 2017, 14-15). Watson further proposed ten carative factors in the science of nursing. Out of the proposed factors, three of them are underscored as forming the “philosophical foundations” for the science of caring. These factors are (a) “forming humanistic-altruistic value systems”, (b) “instilling faith”, and (c) “cultivating sensitivity to self and others”. (Gonzalo 2021).

Perhaps, these definitions and conceptualization of ‘care’ suggests it may be unreasonable to think that the concentration of a profession that is so diverse in practice and context can be confined to one single definition. Nevertheless, a critical look at the suggested ideas by these authors give an indication of some consistent themes. The general themes of caring in nursing that appears to cut across the literature are protecting humanity, giving hope, easing suffering, and promoting health and well-being. Indeed, any nurse irrespective of their area of specialization identifies with these themes. This enables nurses to appreciate the process of understanding a patient’s needs in order to attend to those needs in a meaningful way such that the patient is able to attain their health goals.

2.5 Evidence-based Care

Nursing, and healthcare in general, has undergone incredible changes since the 1990s. One of such tremendous changes in the profession concerning patient care has been the move to evidence-based nursing care. Sometimes referred to as Evidence-based practice (EBP), this approach is a deliberate approach to nursing practice that makes use of the best evidence available in modern research to inform clinical decisions about improving a patient’s health and safety. (Black , et al 2015, 15-17). This technique in nursing care combines best practices with clinical experience whilst keeping in mind the values, personal needs and choices of the patient being cared for. Unfortunately, there are no strict methods prescribed that nurses everywhere must take into account when considering factors that should inform a clinical decision. However, it is

a reality that nurses already adhere to a number of medical procedures that originally have their roots in evidence-based practice. Through years of medical application and reinforced by scientific studies, these nursing protocols have become established as providing more satisfactory results in improving the health of patients.



Figure 1. Evidence-based Practice. (Missouri Autism Guidelines 2012, 6).

As depicted in Figure 1, the diagram depicts a pictorial perspective in the application of evidence-based frameworks for decision-making in healthcare. The outcome of such a decision-making approach is the application of nursing interventions that will provide the best-possible health outcomes in improving patient's health and addressing a patient's needs.

3 Aim, Purpose and Research Question

The aim of this study was to explore existing scientific literature in order to identify evidence-based strategies for the care of autistic children diagnosed with communication disorder. The purpose is to aid nurses to better understand how these evidence-based strategies can serve the specific needs of autistic children. The research would also highlight the nurses' role in providing quality care for autistic children with communication disorder. Finally, autistic children who have challenges with social interaction and communication could also benefit from the knowledge gained by nurses from this study. To achieve this goal, the central research question for this study is *“what are the evidence-based nursing strategies for the care of autistic children diagnosed with communication disorder”?*

4 Research Methodology

4.1 Qualitative Research

The study adopts a qualitative research approach to explore scientific publications to identify evidence-based strategies for the care of autistic children diagnosed with communication disorder. Qualitative research is a scientific research method used to study subjective human experience by employing non-statistical methods of enquiry (Borbasi, Jackson, & East, 2019). Academics connect it with the naturalistic approaches since it explores the intricate experience of human beings (Grove, Burns, & Gray, 2013). It has, in the past decade, been used as a preferred method in nursing research due to its human-focused and holistic approach. This approach is indeed consistent with the philosophical foundations of the nursing profession.

4.1 Literature Review as a Research Methodology

A literature review can generally be defined as a structured way of gathering and harmonizing previous scientific studies. Developing a study based on existing scientific knowledge is the foundation of all academic enquiry, regardless of the academic discipline (Snyder, 2019). Thus, executing this correctly should be of utmost importance to all academics. While this is desirable, this has become increasingly complex over time consequently making literature review as a research method very important in today's research than ever.

A rigorous and successful literature review as a research method generates a strong foundation for advancing knowledge through the integration of several research findings in a manner that no single study would ever achieve (Ham-Baloyi & Jordan, 2016). Indeed, guidelines suggested by scholars for the conduct of literature reviews indicate that there are different types of literature reviews. These are integrative reviews, systematic reviews and meta-analysis (Snyder, 2019). Although each of these approaches present their unique strengths and weaknesses in the conduct of any academic enquiry, this thesis adopts the systematic review approach to generate findings on the research topic.

In the words of Gough et al. (2012), systematic reviews make use of clear, rigorous, and accountable methods to answer research questions. The task of reviewing literature systematically involves three defined processes: identifying and describing relevant scientific research that have been published, engaging in a critical analysis of the relevant literature, and organizing the combined research findings into a synthesis of research conclusions. Due to its systematic approach, systematic reviews are touted as more rigorous as compared to mainstream literature reviews. (Ham-Baloyi & Jordan, 2016).

In formulating the research question for this thesis, the research is guided by the Cochrane framework. This framework is a structured approach that enables research questions in nursing and other medical studies to be framed in manner that incorporates four variables; population of interest (P), intervention (I), comparative interventions (I), and outcomes of interest (O), popularly known as PICO format (Baloyi-Ham & Jordan 2016).

Against this background, the population in this thesis are children; the intervention is nursing care; the comparative interventions are previously published research on nursing interventions or care for autistic children; and the outcomes of interest are the evidence-based practices that are found from the synthesized literature in the systematic review.

4.2 Search Strategy

To achieve the objective of this of this review, a literature search was conducted in the following databases: PubMed, the Cumulative Index to Nursing and Allied Health Literature (CINAHL), PsychInfo, Google Scholar, and Medline. The search for articles was limited to research published from 2007 to 2020. With the goal of achieving relevant search results, an inclusion/exclusion criterion was applied to select articles that were relevant to the purpose of this thesis. Inclusion and exclusion criteria are recommended to guide a researcher to select or exclude articles for a study. This is a necessary element of the research process as it helps focus the study. (Aveyard 2014).

4.3 Inclusion and Exclusion Criteria

To be included in this literature review, the outlined inclusion criteria was applied: All articles should have been published in English language in the last twelve years

(2007-2020). This included both quantitative and qualitative research papers. The articles should be about children (who by definition of this paper were to be under 18 years of age). Excluded papers included articles not published in English language as well as those published before 2007. Articles that were about patients older than 18 years were also excluded in the research. The steps used for the search strategy were guided by the PRISMA guidelines as suggested by Moher, et al (2009). This involved a four-staged process namely Identification, screening, eligibility and included articles.

4.4 Screening and Selection

The search in the databases resulted in the identification of seven hundred and thirty-four (734) studies (Figure 1.) for screening and for their potential relevance to this study. Fourteen (14) additional publications were identified for inclusion through reference list searching, as recommended by Polit and Beck (2013) and Whitemore and Knafl (2005).

As duplicated articles were expunged, the total number of potentially relevant publications were reduced to forty-six (46). Following the application of the inclusion and exclusion criteria and a reading of the titles and abstracts, twenty-five (25) articles were excluded from the list. The remaining twenty-one (21) articles were thus assessed using the eligibility criteria. Following an assessment of the twenty-one (21) articles, eleven (11) articles were initially selected for the review. However, an additional six (6) articles were included due to their relevance and in order to achieve depth in the research outcome. A total of seventeen (17) articles were therefore included in the review. The summary of the reviewed articles is presented in Appendix 1.

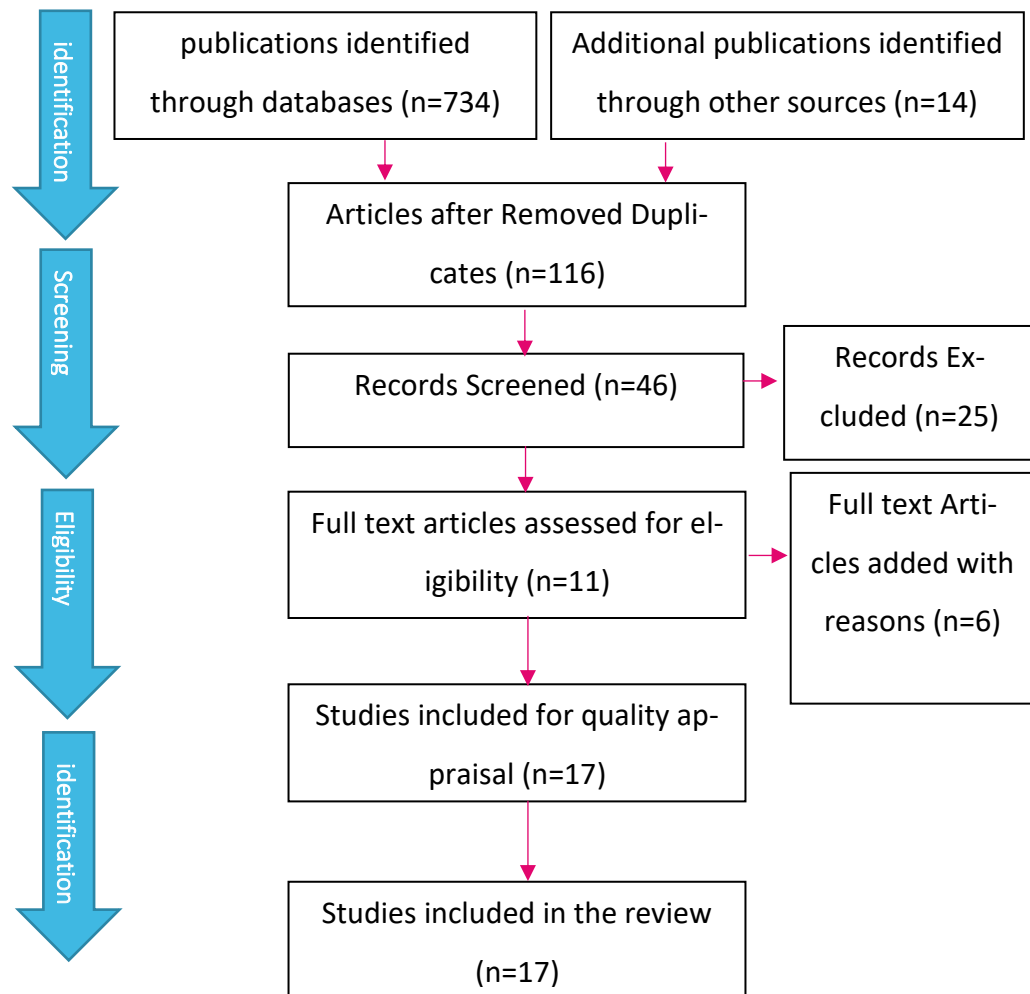


Figure 2. PRISMA Flow Diagram. (adapted from Moher et al 2009, 3).

4.5 Data Analysis

The aim of the analysis was to examine existing scientific literature to find evidence-based interventions for autistic children diagnosed with communication disorder.

Given the diverse nature of the research methods used by the literature included in this thesis, neither a meta-analysis or meta-synthesis was feasible. For this reason, this study used a descriptive narrative approach to report the findings. In doing this, the study engaged in a thematic analysis of the reviewed literature.

Thematic analysis has been labelled as “adaptable and straightforward” (McLeod 2011, 146). It enables an in-depth interpretation of important aspects of a research question across various literature as well as highlighting similarities and differences. (Braun & Clarke 2006, 85). That notwithstanding, this method of analysis is known to

be prone to the researcher's bias. This can happen where the researcher consciously or unconsciously selects specific themes across the literature to establish a viewpoint.

To minimize such research bias, academics have recommended the application of a six-phased thematic analysis framework for this type of study. This is carried out by recognizing themes and patterns through a rigorous procedure of acquainting one's self with the data, whilst coding, theming, revising and filtering it until a thematic map of the data is achieved. (Braun & Clarke 2006). In this study, the application of the six-phased thematic framework is supported by the use of Nvivo 12 qualitative software to arrange, analyze and visualize the data to discover patterns and emerging themes. The recommended step-by-step thematic analysis approach is explained below.

In the first phase, this comprises the immersion of the researcher in the data to attain a clear sense of the content and context of the study. Braun & and Clarke (2006) recommend the re-reading of the whole dataset (that is the literature) for at least once prior to the analytical process. This should be followed by a reading of the literature in a more active way and at the same time taking note of ideas and making codes that will be useful in the final stages of the analysis (87).

In phase two, the researcher generates initial codes (also called nodes in Nvivo 12). According to Braun & Clarke, coding involves the process whereby the researcher recognizes and categorizes aspect of the dataset that connects with the research question of the study. (2006, 96). Those aspects of the study which include words, phrases, quotations and concepts are summarized into meaningful and interconnected categories. The researcher then established a relationship between these categorizations to provide a coherent account of the observed phenomenon. (Allen 2017).

Phase three is characterized by the search for themes and therefore marks the stage where a goal-driven interpretation of the data starts. It entails analyzing the codes that have been generated in phase two. In doing so, the codes are systematized into themes using the patterns and similarities that emerged from the coding. The aim at this point is to find a set of themes and sub-themes that constitute the coded data extracts.

The fourth stage (phase 4) entails a review of the generated themes. The task at this point is to re-examine and perfect the candidate themes generated in the third stage of the review process. This is done whilst keeping in mind that the researcher must ensure there is coherence in the coded data extracts at the primary level. Secondly, the researcher in this phase also ensures that he or she validates the individual themes against the original text in the published literature or the data utilized.

In the fifth phase, Braun and Clarke (2006) suggest that in detailing and christening themes, the researcher reviews the final themes taking into account the sub-themes. This according to them ensures that the core themes generated precisely represent the thoughts outlined in the sub-themes and vice versa. At this stage, it is further recommended that researchers fine-tune the working titles that have already been ascribed to the themes and determine what caption or headline they will assign to the themes in the final text that will be compiled.

Finally, compiling the research findings and delivering a report on the study constitutes the final step in the six-phase process of data analysis. Braun and Clarke describe this as knitting the themes together using illustrative data extracts to build a compelling argument that will be reflective of the validity of the study.

The use of Nvivo 12 qualitative software together with the application of the rigorous steps as recommended by Braun and Clarke (2006) furnished the researcher with the necessary tools to answer the research question. In doing this, the research delimits its focus to only the data that addresses the themes appropriate for answering the research question. Even though the stages in the framework was central to arriving at the research findings, other concepts from the theoretical basis of the study are used in the discussion section of the study to explain and make sense of the findings in relation to the context of the research.

In applying the step-by-step process outlined above, all the seventeen (17) articles were organized and imported unto the NviVo12 platform prior to the analysis. Each article was then read individually and multiple times to familiarize with the dataset. Specific attention was given to the research abstracts, introduction, methods, research findings and conclusions of the articles. This helped identify data that was relevant to the research question as well as highlighting and taking note of areas to be coded and

analyzed in the final stages (Braun & Clarke 2006, 87). In stage two of the analysis process, initial codes (such as improving language in social settings, assisted AAC approaches, unassisted AAC approaches, etc.) were created in the Nvivo12 platform. The relevant texts in the articles were then selected, dragged and dropped in the appropriate codes. (Allen 2007).

In stage three (3). The study makes use of the ‘query tool’ in Nvivo12, where word/phrase patterns and frequency checks was conducted in the coded data to check for codes that could be combined as well as to create broader themes out of the codes for the data analysis (Braun & Clarke 2006). For instance, the codes/nodes for the use of *sound, visuals and social tales* were merged into one broad theme and named as ‘entertainment-based therapy’. This further contained the sub-themes *video therapy, music therapy, and story-based therapy*. Further, the generated themes and sub-themes were reviewed and validated against the original text in the data whilst keeping in mind the research question to be answered. This was to ensure internal consistency with the data as recommended by scholars (Braun & Clarke 2006). In the final stage, these thematic areas were analyzed and reported descriptively based on the results generated. (McLeod 2011; Braun & Clarke 2006). The process of data analysis process is depicted in Table 1 below.

Table 1. Data Analysis Implementation

Themes	Sub-themes	Codes	Main Findings
Entertainment-based Therapy	Music therapy Story-based therapy Video therapy	The use of Sound The use of Social Tales The use of Visuals	Music therapy had a huge impact on alleviating language, behaviour and social skill deficits. Story-based interventions have been declared as an ‘established form of intervention’ affirmed as an evidence-based intervention technique. Video modeling has been found to be an efficient method used to teach people expected behaviour in specific situations.

Themes	Sub-themes	Codes	Main Findings
Early Intervention	<ul style="list-style-type: none"> -Applied Behavioral Analysis (ABA) -Developmental Approaches 	<ul style="list-style-type: none"> -Therapy for children under 5 years -The Antecedent Behaviour Consequence (ABC) -Family-centred -Peer-mediated/child-led 	<p>-The ABA practice was used to teach children communication skills. Discrete trial teaching (DTT) procedure was employed to tutor children on open communication, oral reproduction, play, and combined attention.</p> <p>-Developmental behavioral approaches were applicable as a component of speech-language treatment.</p>
Speech-Language Pathology (SLP)	<ul style="list-style-type: none"> Environmental Arrangements Augmentative & Alternative Communication Systems (AAC) 	<ul style="list-style-type: none"> -Improving language in social settings of a child -Assisted AAC Approaches -Unassisted AAC Approaches 	<p>Parents, teachers and family members involved in the everyday life of children are encouraged to be trained to implement the strategies recommended by the SLP in the child's environment to model suitable use of language. These modelling strategies are also referred to as "established interventions"</p> <p>AAC systems are labelled as "emerging interventions". AAC systems enhance language development</p>
Computer-based Intervention	Software Applications	<ul style="list-style-type: none"> Synthesized speech using computers/Tablets/ -Animated talking heads vs Voice -Software (enabled and disabled speech features) 	<p>Research confirmed that CBIs improved communication in children. A comparative assessment of CBIs and person-implemented directives revealed that the use of CBI resulted in a more profound improvement in voice imitation percentages.</p>

5 Research Findings

Four main themes namely entertainment-based therapy, early intervention, speech language pathology and computer-based interventions were derived from the literature. An additional nine sub-themes were further generated. The four categories and nine sub-themes are depicted below. This is followed by a detailed presentation of the findings.

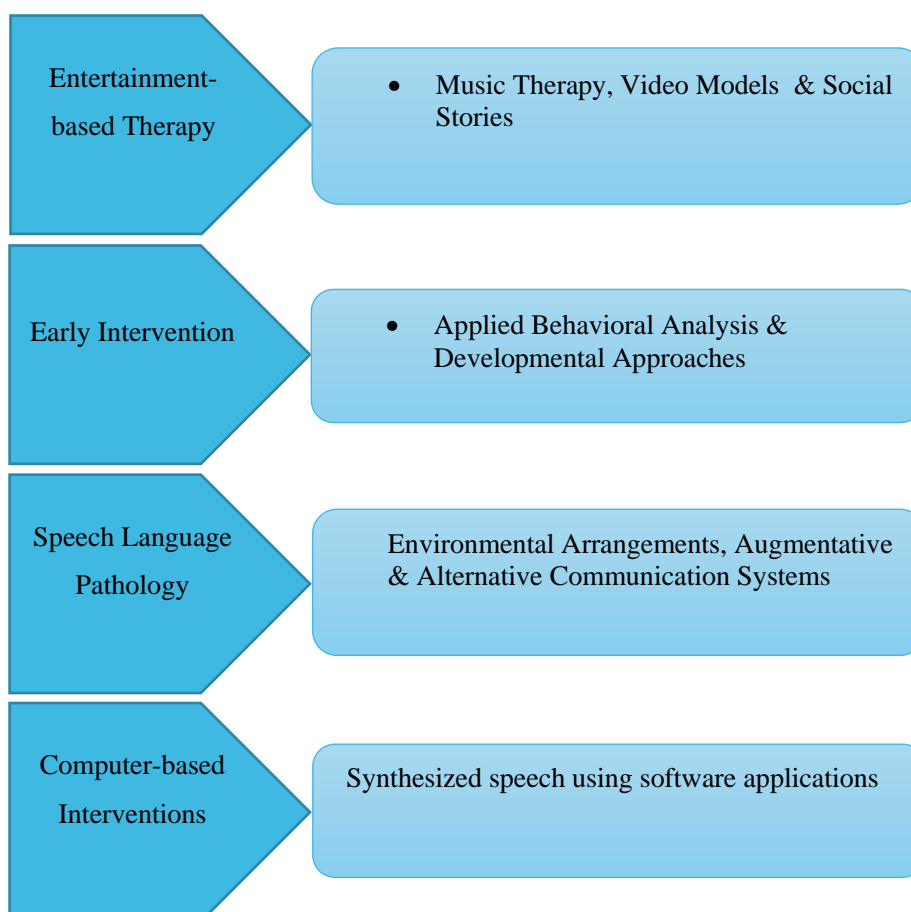


Figure 3. Themes and sub-themes of evidence-based interventions

5.1 Entertainment-based Therapy

Music therapy has been used as an intervention technique in the treatment and management of autism for decades. In the review about the application of music therapy in the management of communication disorder, the findings show evidence for reasonable to huge effects of music therapy as compared to standard care. The impact of music therapy was found to be profound in alleviating symptoms that are core to ASD

such as deficits in social interaction, non-verbal communicative skills, initiating behaviour and social emotional reciprocity. (Radecki, Sand-Loud, O'Connor , Sharp, & Olson 2011.)

Further evidence also indicated that music therapy could also be helpful in revamping verbal communication skills as compared to other types of interventions on language, emotions, behaviour and social skills. (Bethell , Reland, Schor, Abrahms, & Halfon 201). Although the confidence in the propositions made for music therapy were high, the strength or quality of the available evidence have been classified as moderate to low. This was mainly because of the limited number of research participants, scope and issues related to the research methods used in arriving at the conclusions for music therapy.

Story-based interventions are social tales written by healthcare practitioners. It integrates scripted or visual representations of particular situations under which some behaviour are expected to happen. The subject matter of the story depends largely on the cognitive capacity of the learner or child. They are aimed at improving a learner's ability to understand or perceive situations from an alternative point of view. Story-based interventions have not only been declared as an 'established form of intervention' (Will, et al 2018), but also have been affirmed as an evidence-based intervention technique. (Wong , et al. 2015.) Notwithstanding this, other scientific studies do not adduce evidence in support for the practice of applying story-based interventions for the care of autistic persons. Scientific reviews about this care approach have produced mixed results regarding the effectiveness of method of intervention. (Wang & Spillane 2009). On this basis, further research may be needed to illuminate the effectiveness of social narratives.

Modeling is an intervention or practice whereby a health professional, acting as a teacher, displays an acceptable behavior for a given situation for a learner to emulate and ultimately acquire. Essentially, it encompasses watching a film of one's own self or someone displaying a socially acceptable behaviour for a targeted situation. (Reichow & Volkmar 2010.)

According to available research, modeling has been found to be an efficient method used to teach people expected behaviour in specific situations. Whereas most people diagnosed with ASD might show shortfalls in imitating skills, studies have established

that both live and pre-recorded video modeling (displaying social expectations in a given setting) are effective approaches in teaching individuals with deficits in social communication skills. (Will, et al 2018).

In fact, the literature included in this study confirm that video modeling was one of the highly effective evidence-based strategies for children. The research suggested that it was particularly advantageous due to its capacity to stimulate the visual learning awareness of children diagnosed with ASD. (Reichow & Volkmar 2010.)

5.2 Early Intervention (EI)

Available evidence indicates that the commencement of early intervention at the earliest stage of a child's development was critical to the enhancement of the long-term outcomes of the intervention. (Zwaigenbaum, et al 2015.) This intervention was said to be possible only when ASD diagnosis has also been carried out early and efficiently during the window of a child's development which is deemed as the most critical stage (Zwaigenbaum, et al 2015).

Applied Behaviour Analysis Approaches. Again, there is solid evidence to show that the Applied Behaviour Analysis (ABA) method of early intervention programs produces desirable outcomes for children. (Howard , et al 2014). The ABA practice is one of the methods used to teach children communication skills. One of the significant elements of the ABA approach is the discrete trial teaching (DTT) procedure which is employed to tutor children on open communication, oral reproduction, play, and combined attention. (Lafasakis & Sturmey 2007). Although it is possible for children to attain communication skills with the help of DTT, a strong critique of this methodology is its inability to be generalized in varying environments. (Schreibman 2013).

Scientific research in the past decade argue that the type of intervention and its success depends largely on the severity of the autistic disorder and the child's cognitive abilities. Nonetheless, behavioural interventions were found to be more beneficial to autistic children who had severe symptoms for instance in the case of classic autism including children who showed signs and symptoms of poor cognitive abilities. (Zalaquette, Schonstedt , Angeli , Herrera, & Moyano 2015).

To enhance the diffusion of skills, there is an increasing movement towards the practice of applying developmental behavioral approaches in the context of normal life as

a component of speech-language treatment. These methods are child-led and places emphasis on actions and routines that are conversant and highly inspiring for the child to emulate and improve in a number of social-communication skills shortfalls. (Carter , et al 2011).

5.3 Speech-Language Pathology

Environmental Arrangements or communication temptations. Environmental arrangement or “communicative temptations” encompasses putting together a set of arrangements in a child’s environment so that he or she is able to start a communication bid such as a sign, word or phrase to achieve a desired result. This environmental set up may comprise of strategies such as a restrained access to highly desired items, or more broadly, constructing a treatment space to offer visual clarity in relation to the actions that transpires within the created space. These environmental strategies align with behavioural antecedent methods, which are deemed to be ‘established’ interventions. (Will, et al 2018).

Timetables and written scripts are also classified as “established” intervention strategies. (Will, et al 2018). The timetables or schedules are used to positively encourage engagement and the appreciation of task execution for children with ASD extending from being marginally verbal to strongly verbal. The schedules might include words, photos or a combination of the two. These words and/or photos could be incorporated into tasks which will be designed to be completed daily by the child. Conversely, these set of activities can also be designed to be executed outright in a one-time activity at school or at home. (Will, et al 2018, 244).

In the use of written scripts to promote communicative exchanges, children may be given cue cards with texts and encouraged to read the specific texts from the cards. These texts will usually be aligned with the child’s interest. As the child progresses in the recognition of texts or words, the cue cards are progressively removed to achieve a more independent engagement with the child. Experts have maintained that these visual cues are classified as “emerging interventions” used to help autistic children in making choices. (Will, et al 2018). They may also be used to help social initiation among autistic children such as being able to make a request or play with peers.

Augmentative and Alternative communication systems. Since a substantial minority of persons diagnosed with ASD fail to obtain an adequate level in the use of communicative language, SLPs may deliver an evaluation and recommend treatment that will make use of augmentative and alternative communication (AAC) systems, presently classified as an “Emerging”. (Will, et al 2018). A number of AAC methods can be used to enhance the social-communication abilities of children with ASD. Unassisted AAC approaches consist of the use of gestures, facial expressions, and sign language.

Assisted AAC approaches may include the use of images, graphic signs, scripted cues, speech producing machines, or mobile technologies enabled with AAC-specific applications. The Picture Exchange Communication Systems makes use of both behavioural philosophies as well as assisted AAC to teach autistic children to initiate requests for things that they like. The use of this approach could have a positive impact on the behaviour of children including better social engagement and receptive and communicative language. (Warren , et al 2011).

Other studies indicate that AAC strategies do not obstruct the progress of communicative language but actually facilitates its development. (Schlosser & Wendt 2008). This evidence contradicts earlier assumptions that suggested that AAC methods obstructed the production of speech. Nonetheless, other publications revealed that it cannot be ruled out entirely that AAC methods inhibit speech production since such studies are usually not given any priority for publishing in peer-reviewed journals. (Balandin 2007). Despite its advantages, current research does not yet prescribe particular types of AAC that may be suitable for autistic patients. (Ganz 2013.)

Clinicians are however advised that decisions concerning the use of unassisted and assisted AAC techniques should be made whilst taking into account the uniqueness of each individual case. Attention must be paid every patient or persons learning abilities (both strengths and weaknesses) as well as the individual’s social communication skills, vision and motor skills. More importantly, the context (whether at home, school or hospital) within which the AAC takes place should not be relegated to the background since it is the foremost consideration before AAC is implemented. (Will, et al 2018).

5.4 Computer-based Interventions (CBI)

This study found that in relation to the use of CBIs as a strategy to teach autistic children communication skills, the evidence shows that CBIs actually improved the communication of children who were between the ages of three (3) and fourteen (14) years. (Ramdoss, et al 2011). In reality, a comparative assessment of CBIs and person-implemented directives suggested that the use of CBIs resulted in a more profound improvement in voice imitation percentages.

Similarly, a comparison of the impact of software that was comprised of an animated talking head and another voice synthesized by the same computer software program gave interesting insights. The evidence available showed that the total accurate receptive responses in children were very high in relation to the animated talking head. Again, the effect a software program that had a speech feature was juxtaposed with the impact of the same software where the speech feature was turned off. This study found that there was a high increase in the number of spoken words of children when the speech feature was turned on as compared to the situation where the speech feature of the software was turned off. (Ramdoss, et al 2011).

On the basis of the articles included the review, the degree of certainty of the evidence adduced were estimated to be either conclusive, preponderant or suggestive. Findings from two of the reviewed research were found to be conclusive and another two were found to be preponderant in the degree of certainty. For the outstanding six studies, the degree of confidence in relation to the intervention effects were found to be suggestive. The classification of the findings as suggestive were specifically due to the use of methods that were observed to be non-experimental or rather, the absence of experimental control in relation to the improvement in the communication-skill dependent variable. (Ramdoss, et al 2011). In view of this, future research on this topic will have to address methodological issues to provide results that will be reliable scientifically.

6 Discussion

The study conducted a review of seventeen (17) articles (from 2007-2020) to find scientific evidence of strategies for the care of autistic children with communication disorder. The research findings show that the use of augmentative and alternative communicative (AAC) tools were beneficial in improving the speech capabilities of autistic children. However, in relation other existing literature, scholars have recommended that practitioners should provide parents or guardians with realistic expectations about the effectiveness of AAC interventions. (White et al 2021, 8). When combined with other evidence-based practices, AAC is expected to be effective and indeed the findings in this review does not report that AAC approaches have resulted in a decrease in the speech of autistic children. However, caution has been given to any conclusion or statement that seeks to suggest categorically that AAC will increase speech production. This is because there is not enough high-quality research that has been delivered to support such conclusions. (White et al 2021).

From the time that Schlosser and Wendt submitted their review on the effects of AAC in 2008, academics have continued to question the application of AAC approaches for children with ASD as well as the impact that it has on the communication of children. Recent studies on AAC approaches continue to show mixed results whereby some participants experience increased communication, some recorded zero improvements whilst others remained at baseline levels. (Bishop et al 2019; Cagliani et al 2017; Gevartner & Horan 2019).

On this basis, future research in the use of AAC could enquire further into the individual characteristics of research participants when targeted interventions are rolled out to tackle communication disorder in autistic children. While it is possible that one approach will not apply to all children, there may also be stages in a participant's development where AAC may or may not be beneficial to the production of language. It seeks to suggest that researchers should be able to determine at what point it may be necessary to completely phase out AAC if the child or participant attains a certain level of speech improvement. This does not also mean that AAC is inadequate. However, for some persons and at a certain point of applying AAC, the methodical phasing out of AAC could result in the production of speech. (White et al 2021).

To make use of AAC tools, nurses must take a central role in applying these methods by learning how to use these skills (for instance the use of hand gestures, facial expressions, language, images and technologies enabled with AAC applications to help children). This will definitely require some form of further training for nurses (Finke , Light , & Kitko 2008). Additionally, professional cooperation between a nurse and a speech language pathologist (SLP) is vital in the valuation and care of children with ASD. Nursing observations and opinions are very important in fully appreciating all these dimensions of an autistic child's condition.

Computer Based Intervention (CBI) is also documented as an evidence-based approach for the care of autistic children. The main difference between this approach and AAC is the use of computer software in the application of CBI. Despite the mixed results produced by CBIs as seen in the research findings, this approach is known to have been used for persons with disabilities since the 1960's. (Ramdoss, et al 2011). A number of computer-based programs have been developed over the period that are adapted to persons with ASD. To date, several scientific publications have indicated that CBIs can be applied to improve and support many aspects of a person's life including language and communication. (Hetzroni & Tannuous 2004).

A few years ago, when there was media hype about a communication application on the iPad that could potentially help children overcome their communication difficulties, there was a mad rush for the iPad because people were convinced that the device was the panacea to every autistic child with communication problems. Without knowledge of how the iPad could be used help children with ASD, the devices ended up being used for entertainment. (Lofland 2016). This incident gave the strongest indication about the role of nurses in educating the guardians of children and families about the use of emerging technologies in the care of autistic children.

None of the findings in literature included in this research reported any adverse effects of music therapy on autistic children. Based on these results, music therapy can be deemed as safe and a commonly accepted method of strategy to alleviate the symptoms of communication disorder in pediatric healthcare. This conclusion aligns with the findings of other studies where music therapy scored highest as part of accepted modalities in complementary and alternative medicine. (Trifa , et al 2018, 470).

In the case of story-based interventions, the study results are consistent with previous reviews, which have found that considerable variations exist between the results pertaining to the efficacy of story-based interventions. (Reynhout & Carter 2011). It could be that the strategy was effective under certain conditions than others or the individual differences among autistic children could have accounted for the variations. Whereas this may be accurate, others studies affirm this position stating that story-based interventions appear to be effective specifically in combination with other treatment forms and within a multidisciplinary intervention approach. (Teti, Cheak-Zamora , Lolli, & Maurer-Batje 2016). That said, caution is still given to practitioners that there are no clear-cut suggested combinations that can serve as the single ‘magic bullet’ that will work for every child at any time. (Teti, Cheak-Zamora , Lolli, & Maurer-Batje 2016).

Similarly, the findings that relates to modeling resonates with earlier studies which suggest that this form of intervention has delivered promising results both in teaching children who have deficits in communication skills as well as improving behaviour. Studies by Bellini and Akullian (2007) have emphasized the effectiveness of the modeling approach whilst Buggey (2005) is credited with using video modeling to improve verbal responses in an autistic patient. Aside from this, other studies suggest that video modeling is a time-consuming approach. However, this weakness may not necessarily negate the gains that can be achieved by using this strategy. With the appropriate support and resources for this intervention, modeling has the potential to be applied in a variety of settings to help children with communication disorder.

The evidence available further shows that there is a growing body of literature that emphasizes the gains that can be achieved in the application of **early intervention methods** to improve communication and social functioning in children. (Zalaquette, Schonstedt , Angeli , Herrera, & Moyano 2015). Indeed, early intervention techniques comes at the back of research which suggest that ASD can be detected accurately in children before they attain the age of 2. For this reason, interventions that seek to tackle communication disorder in ASD as early as possible in a child’s development has never been greater. Early recognition of communication problems in children is important to enable the activation of early intervention. In this sense, the findings in this thesis are consistent with existing literature. For this reason, nurses who are involved in the care and monitoring of a child’s development have a fundamental duty

in the identification of early symptoms that will consequently call for an early referral of the child for specialized treatment.

Summary. The results of the review showed a growing convergence between developmental and behavioral approaches and particularly the emphasis on non-pharmacological evidence-based strategies to improve communication deficits in autistic children. Across the scope of the evidence-based strategies, the literature indicates the importance of early intervention which is aimed at improving on skills considered critical such as a child's ability to imitate and communicate. The non-pharmacological approaches found can be placed in a range that spans from a highly structured evidence-based intervention involving healthcare professionals in a natural or non-natural environment, approaches (developmental) that are tailored to the interest of a child in a natural environment and the use of software applications that stimulate speech in autistic children.

6.1 Critical Appraisal, Ethics and Study Limitations

In conducting this study, an assessment of the selected publications was undertaken to arrive at their reliability. This was carried out in accordance with the three steps suggested by Hawker et al (2002). The three steps include an evaluation of relevance, data extraction and the scoring of methodological robustness. In the first step, the scientific publications are selected based on their relevance to their research question, the source of data, type of scientific study and the context of the research material used for the study. In the next step (data extraction), the researcher makes use of an assessment template where the full details of the selected publications are entered with a particular focus on the research question. The third and final stage involves the scoring of the research methodology applied by the selected publications. The publications are then assigned scores based on the reliability of the study results. (Hawker et al 2002).

The appraisal tool recommended by Hawker et al (2002) conducts an assessment of scientific publications focusing on nine areas. The areas of focus are; research title and abstract, introduction, aims, research methods, data, sampling, analysis of data, research ethics and biases, findings, research generalizability, and finally implications of the research for practice and policy. The scoring criteria for the quality of each article ranges from 1 to 4. The figures are interpreted as; 4= Good, 3=Fair, 2=Poor, 1=Very

Poor. The maximum score for any article is 36 whereas the minimum is 9. It is important to emphasize that scientific publications that attained the score of 30 and above were the only ones considered for use in this thesis. The process of this selection process was presented in appendix 2.

Ethical Considerations. This study analyzed published research that is available in the public domain. Therefore, ethical approval was not required since it was not obligatory for the use of previously published research presented in this thesis. Regarding respect for intellectual property, due diligence was ensured through the use of appropriate citations and references to acknowledge the ideas of authorities and/or authors whose work this thesis depended on. (Botma , Greeff, Mulauzi, & Wright, 2010, 277)

Study Limitations. In any research that uses a systematic review approach, the procedure for selecting specific scientific publications and the criteria for inclusion and exclusion of papers has the potential of research bias which can affect the study results. Indeed, the focus on specific databases (PubMed, CINAHL, PsychInfo, Google Scholar, and Medline Ovid) for articles caused the study to unintentionally exclude articles from other relevant sources. Also, the exclusion of non-english articles meant that all other relevant scientific articles in other languages were also missed. This potentially affected the study results. In this thesis, the researcher attempted to reduce this bias by applying recommended scientific approaches in the selection of papers for further analysis. Again, the quality of evidence found in the scientific papers reviewed had limitations. This was also due to the risk of bias in the research methods used by the authors of the papers. Against this background, this thesis was unable to make decisive conclusions based on the papers reviewed.

6.2 Conclusion and recommendations for future research

There is a diverse body of scientific knowledge that documents strategies at different levels that are used in the care of autistic children with communication and social interaction challenges. As captured in the literature, ASD is a pervasive condition that impacts many areas of functioning in a child's development. It is therefore important that nurses and other health professionals involved in the care of these children to be knowledgeable about the most efficient and evidence-based strategies across disciplines. Knowledge about these multidisciplinary approaches will enable nurses

and other health practitioners to be able to provide quality care that produces the most favourable results to the benefit of the autistic child.

Indeed, the treatment strategies and interventions outlined in this study are interdisciplinary. It is therefore recommended that practitioners endeavour to make use of multi-disciplinary methods that can address the personal needs of autistic children. As we mentioned earlier in the study, none of these strategies serve as a ‘magic bullet’ for every child with communication deficits in different settings. However, a methodical approach using these interdisciplinary methods, combined with the professional experience and training of nurses can make a difference in the lives of these children. While this could be a challenging endeavour, the professional nurse must focus on only evidence-based interventions as the gold standard for delivering the best care for the autistic child.

As the study concludes, it closes by making indicating some areas for research. Future studies should consider conducting or replicating controlled trials of these strategies in different contexts to test the applicability and quality of existing evidence. Results from these replicated studies could be a good source of information or reference point for nurses and academia. It could also pave the way for further research when contextual factors appear to challenge existing and accepted approaches.

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Appendices

Appendix 1. Summary of Reviewed Articles

No.	Author and Year	Purpose of study	Research Methods	Key Findings	Critical Appraisal (Hawker et al 2002)
1	Balandin S. (2007)	To establish the impact of augmentative and alternative communication (AAC) intervention on speech production in children with autism or pervasive developmental disorder-not otherwise specified.	The study engaged in a systematic review of scientific studies on treatment published between 1975 and 2007. A systematic review was adopted to curtail the extent of research bias in searching, selecting, coding and synthesizing the literature.	The findings from the study showed that AAC interventions do not obstruct speech production. Indeed, many of the literature reported an improvement in speech production. However, the improvements that were recorded were determined to be rather modest outcomes.	34
2	Bethell C, Reuland C, Schor E, et al (2011)	To evaluate the national and state incidence of standardized, parent-completed developmental screening (DS-PC) in the past 12 months and assess the linkage between screening and application of an early-intervention plan or mental health services for children who are at higher risk.	The study made use of data from the 2007 National Survey of Children's Health. Nested <i>t</i> tests were utilized to juxtapose each state to national incidence rate. Logistic and multilevel regression models assessed variations and associations with DS-PC.	Results showed twofold variations among high-risk children in the United States in their probability of obtaining early intervention or required mental health services according to whether they had received a DS-PC.	32

No.	Author and Year	Purpose of study	Research Methods	Key Findings	Critical Appraisal (Hawker et al 2002)
3	Carter AS, Messinger DS, Stone WL (2011)	This study used a randomized controlled trial to compare Hanen's 'More than Words' (HMTW), a parent-implemented intervention, to a 'business as usual' control group.	Sixty-two children (involving 51 boys and 11 girls; Mean age = 20 months; SD = 2.6) together with their parents participated in the research. The HMTW intervention was given over a period 3 and a half months. There were 3 measurement phases: prior to randomization (Time 1) and at 5 and 9 months post enrollment (Times 2 and 3). Children's communication and parental responsivity were measured at each time point. Children's object interest, a putative moderator, was measured at Time 1.	The HMTW intervention indicated a differential impact on child communication based on a baseline child factor. HMTW enhanced communication in children with lower levels of Time 1 object interest. Parents of children who evidence higher object interest may require greater support to implement the HMTW strategies, or may require different strategies than those provided by the HMTW curriculum.	34
4	Ganz JB (2013)	The purposes of this article was (a) to summarize and synthesize the last few decades of research on the use of AAC with persons with ASD; (b) to show implications of this	A meta analysis of (a) effective modes of AAC, (b) designs for AAC systems that reduce learning demands and maximize performance, (c) choice and preference in AAC interventions, (d)	The implementation of AAC in natural environments may be as impactful with individuals with ASD as implementation in didactic, highly structured environments, which is	36

No.	Author and Year	Purpose of study	Research Methods	Key Findings	Critical Appraisal (Hawker et al 2002)
		study for stakeholders such as persons with ASD, their families, and educators with whom they work; and (c) to define some priorities for future research to enhance communication and other outcomes for people with ASD and their loved ones	the impact of AAC on particular communication skills and functions, (e) generalization of AAC skills across communicative partners and contexts, and (f) unsubstantiated AAC treatments.	critical to increasing generalization of communication skills.	
5	Howard JS, Stanislaw H, Green G, et al (2014)	The aim of the study was to find out the impact of intensive behavior analytic intervention after thirty-six months of its application.	The evaluation was conducted after 1 to 3 years of treatment. This involved 61 children in the final evaluation.	About one-third of the children who participated in the research and who received AP or GP interventions obtained final scores on tests of cognitive or adaptive skills that were at least 15 points higher than their intake scores. These results meant that those interventions may be beneficial for some children with autism.	36
6	Lafasakis Lafasakis, M., & Sturmey, P. (2007).	The study assessed whether behavioral skills training was impactful in teaching discrete-	A multiple baseline design was for all parents who participated in the study. The researcher trained the parents to	Parents learned to use and apply discrete-trial training, their skills were generalized to new programs, and the children's	33

No.	Author and Year	Purpose of study	Research Methods	Key Findings	Critical Appraisal (Hawker et al 2002)
		trial teaching to parents of children with developmental disabilities	use discrete-trial teaching only during gross motor imitation (GMI). To evaluate the generalization, data was also obtained during vocal imitation (VIM).	accuracy in response improved, indicating that behavioral skills training is an effective and efficient method of teaching discrete-trial teaching to parents	
7	Radecki L, Sand-Loud N, O'Connor KG, et al (2011)	The aim of the research was to do a comparative analysis of how paediatricians used standardized screening tools between 2002 and 2009.	A national, random sample of nonretired US AAP members were mailed Periodic Surveys (2002: $N = 1617$, response rate: 55%; 2009: $N = 1620$, response rate: 57%). χ^2 analyses were used to examine responses across survey years; a multivariate logistic regression model was developed to compare differences in using ≥ 1 formal screening tools across survey years while controlling for various individual and practice characteristics	Pediatricians' use of standardized screening tools increased significantly between 2002 and 2009. The percentage of those who self-reported always/almost always using ≥ 1 screening tools increased over time (23.0%–47.7%), as did use of specific instruments	33
8	Ramdoss et al (2011)	The aim of the study was to deliver a systematic review of scientific publications about the use	This adopts a systematic assesses the results on interventions, evaluates the precision of evidence,	The findings of the study indicated that CBI should not yet be regarded as a researched-based strategy	33

No.	Author and Year	Purpose of study	Research Methods	Key Findings	Critical Appraisal (Hawker et al 2002)
		of computer-based interventions (CBI) to teach communication skills to children with autism spectrum disorders (ASD). The results was intended to inform and guide practioners interested in the use of this strategy and to guide future research with the focus of improving the efficacy of CBIs.	and outlines software and system requirements for all the research included in the study.	to teach communication skills for persons with ASD. Nonetheless, CBI does appear to be a promising practice that calls for future research.	
9	Reichow , B., & Volkmar, F. (2010)	The study compiles the best available evidence of strategies that can be used to improve social behaviour among persons diagnosed with autism.	The study synthesized literature which comprised 66 studies published between 2001 and 2008 and involving 513 research participants. The findings are presented according to the age of participants and the delivery agent. .	The results indicated that there is enough empirical evidence that supports video modeling to part of the classifications of established EBP and promising EBP, respectively.	33
10	Schlosser RW, Wendt O (2008)	A aim of the study was to establish the impact of augmentative and alternative communication (AAC)	This involved a multifaceted search for studies written between 1975 and May 2007 using various bibliographic	The findings from the study showed that AAC interventions do not obstruct speech production. Indeed, many	31

No.	Author and Year	Purpose of study	Research Methods	Key Findings	Critical Appraisal (Hawker et al 2002)
		intervention on speech production in children with autism or pervasive developmental disorder.	databases, dissertation databases, hand searches of selected journals and published compilations of AAC theses and dissertations, and ancestry searches.	of the literature reported an improvement in speech production. However, the improvements that were recorded were determined to be rather modest outcomes.	
11	Schreibman L, Dawson G, Stahmer AC, et al. (2013)	The study described the development of Naturalistic Developmental Behavioral Interventions (NDBIs), their theoretical foundations, empirical support, essential and common characteristics, and suggest directions for future research. The results will improve understanding for informed choices among families, service providers and referring agencies.	The paper adopts a historical approach by analyzing the context within which naturalistic developmental behavioural strategies have been developed to arrive their common characteristics and essential features..	NDBIs are a fusion of ABA and developmental science and they do not only facilitate an immense and increased child-learning process, but they are also specifically appropriate for autistic children.	33
12	Wang P., Spillane A (2009)	The aim of this research was to deliver a synthesis of research studies published in the last ten years on strategies to enhance social skills for	A systematic review of 38 studies out of which 36 were single subject research and 2 were group experimental research.	Whereas social stories, Peer-Mediated, and Video-Modeling all met the criteria for evidence-based strategies, other results suggested that	35

No.	Author and Year	Purpose of study	Research Methods	Key Findings	Critical Appraisal (Hawker et al 2002)
		children and adolescents with ASD, evaluate the results of these studies and determine whether a given strategy meets the criteria to be called evidence-based practice.		only Video-Modeling met the criteria for being evidence-based and also demonstrating high effectiveness as an intervention strategy.	
13	Warren Z., Veenstra-VanderWeele J., Stone W., et al (2011)	The aim was to review evidence on therapies for children ages 2 to 12 with autism spectrum disorders (ASDs). This was to determine treatment strategies that provided the most favorable outcomes in children ages 0 to 2 who were at high risk of developing autism.	A systematic review of scientific publications between 2000 and 2010.	The evidence available supported early intensive behavioral and developmental intervention, including the University of California, Los Angeles (UCLA)/Lovaas model and Early Start Denver Model (ESDM) for improving cognitive performance, language skills, and adaptive behavior in children under age 2.	36
14	Will, M., Currans , K., Smith, J., Weber , S., Duncan , A., Burton , et al (2018)	The study sought to establish evidence-based strategies across disciplines for the treatment of autism spectrum disorder.	A review and summary of existing literature was conducted by professionals in an interdisciplinary autism center.	The study results suggest that modeling, story-based interventions and naturalistic teaching strategies as established; AAC interventions as emerging; and animal-	33

No.	Author and Year	Purpose of study	Research Methods	Key Findings	Critical Appraisal (Hawker et al 2002)
				based therapy as unestablished	
15	Wong C, Odom SL, Hume KA, et al. (2015)	The purpose of this study was to identify evidenced-based, focused intervention practices for children and youth with autism spectrum disorder.	A systematic review of 456 studies	The results provided evidence that supported foundational applied behavioral approaches, Antecedent-based intervention, differential reinforcement, and video modeling efficient evidence-based strategies.	33
16	Zalaquette, D., Schonstedt , M., Angeli , M., Herrera, C., & Moyano, A. (2015).	The aim of this study was to update concepts regarding the current available evidence on the importance of early intervention.	A literature review to update the existing that supported the importance of early intervention in ASD	The study results confirmed the importance of early intervention strategies for children with ASD including the role of pediatricians and other healthcare professionals in the early detection of ASD	35
17	Zwaigenbaum L, Bauman ML, Choueiri R, et al (2015)	To review current evidence on the treatment of Autism Spectrum Disorder to identify comprehensive and targeted treatment models with evidence of clear benefits	The paper provides a systematic review of scientific literature in the last decade (up to 2013) that reports evidence-based interventions for children under 3 years of age.	Integrating teaching that focuses on joint attention, play, and imitation are reported as evidence-based approaches for early intervention. However, due to the diverse nature of ASD, it was important to take into account the individual	35

No.	Author and Year	Purpose of study	Research Methods	Key Findings	Critical Appraisal (Hawker et al 2002)
				needs of children to determine how strategies could be tailored to meet those needs.	

Appendix 2. Critical Appraisal of Articles

No.	Author	Abstract and Title	Introduction and Aims	Methods and Data	Sampling	Data Analysis	Ethics and Bias	Findings	Generalizability	Implications for Practice and Policy	Total	Comments
1	Balandi S. (2007)	4	4	4	3	4	3	4	4	4	34	No Comments
2	Bethell C, Reuland C, Schor E, et al (2011)	3	4	4	4	4	1	4	4	4	32	
3	Carter AS, Messinger DS, Stone WL (2011)	3	3	4	4	4	4	4	4	4	34	
4	Ganz JB (2015)	4	4	4	4	4	4	4	4	4	36	
5	Howard JS, Stanislaw H, Green G, et al (2014)	4	4	4	4	4	4	4	4	4	36	
6	Lafasaki & Sturmev (2007)	3	4	4	4	4	4	4	3	3	33	
7	Radecki L, Sand-Loud N, O'Connor KG, et al (2011)	4	4	4	4	3	4	4	4	3	33	
8	Ramdoss et al (2011)	4	4	4	3	4	3	4	4	3	33	

9	Reichow & Volkmar (2010)	3	4	4	4	4	3	4	4	3	33	
10	Schlosser RW, Wendt O (2008)	4	4	4	4	4	1	4	3	3	31	
11	Schreibman L, Dawson G, Stahmer AC, et al. (2015)	3	4	4	4	4	4	4	3	3	33	
12	Wang P., Spillane A (2009)	4	4	4	4	3	4	4	4	4	35	
13	Warren Z., Veenstra-VanderWeele J., Stone W., et al (2011)	4	4	4	4	4	4	4	4	4	36	
14	Will, M., Currans , K., Smith, J., Weber , S., Duncan , A., Burton , et al (2018)	3	4	4	4	4	2	4	4	4	33	
15	Wong C, Odom SL, Hume KA, et al. (2015)	3	4	4	4	4	4	4	3	3	33	
16	Zalaquette, D., Schonstedt , M., Angeli , M., Herrera, C., & Moyano, A. (2015).	4	4	4	3	3	4	4	4	4	35	
17	Zwaigenbaum L, Bauman ML, Choueiri R, et al (2015)	4	4	4	4	4	4	4	3	4	35	