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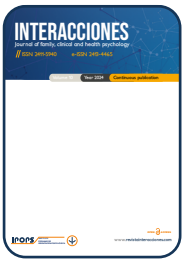

ORIGINAL ARTICLE

Effectiveness of functional communication training in the regulation of self-injurious behavior in children and adolescents diagnosed with autism spectrum disorder: an empty systematic review

Efectividad del entrenamiento en comunicación funcional en la regulación de la conducta autolesiva en niños y adolescentes diagnosticados de trastorno del espectro autista: una revisión sistemática vacía

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ABSTRACT

Background: Self-injurious behaviors are highly prevalent in individuals with autism spectrum disorder (ASD), occurring frequently in those with associated intellectual disabilities as well as in those without intellectual impairment. Single-case studies have found that functional communication training helps regulate self-injurious behaviors and repetitive behaviors, particularly in children with ASD. However, no review identifies whether there is experimental evidence to support the use of this treatment. **Objective:** Our review aims to determine the efficacy of functional communication training for regulating self-injurious behavior in children and adolescents diagnosed with ASD. **Methods:** A systematic review was conducted.PubMed, Scopus, Web of Science, and Embase were searched for single-case experimental studies and randomized clinical trials. **Results:** A total of 67 studies were initially identified, of which 16 remained eligible after duplicate elimination and selection based on title and abstract. However, a thorough review of each text revealed that some needed to meet the inclusion criteria or had exclusionary elements. Therefore, they did not qualify for the next stage of the process. As a result, no publications were found that provided robust evidence to support the efficacy of functional communication training in regulating self-injurious behaviors in children and adolescents diagnosed with ASD. However, four publications met the secondary objective of identifying relationships between the proposed variables and presenting variations of the proposed intervention prototype. The quality of these publications was assessed and discussed according to the transparency recommendations of the Cochrane Effective Practice and Organization of Care guideline for reporting reviews without eligible or empty studies and the PRISMA 2020 guidelines. **Conclusions:** There is an urgent need for more research in this area, given the harmfulness and self-injurious behaviors, in addition to their high incidence in individuals diagnosed with ASD. This study's results help identify existing knowledge gaps and suggest new directions for research in this area.

Keywords: autism spectrum disorder; self-injurious behaviors; functional communication training; children; girls; adolescents; systematic review.

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RESUMEN

Introducción: Las conductas autolesivas son altamente prevalentes en individuos con trastorno del espectro autista (TEA), ocurriendo con frecuencia tanto en aquellos con discapacidad intelectual asociada como en aquellos sin discapacidad intelectual. Los estudios de casos individuales han encontrado que el entrenamiento en comunicación funcional ayuda a regular las conductas autolesivas y las conductas repetitivas, particularmente en niños con TEA. Sin embargo, no hay ninguna revisión que identifique si existen pruebas experimentales que apoyen el uso de este tratamiento. **Objetivo:** Nuestra revisión busca determinar la eficacia del entrenamiento en comunicación funcional para la regulación de la conducta autolesiva en niños, niñas y adolescentes diagnosticados con TEA. **Método:** Se realizó una revisión sistemática. Se realizó la búsqueda de estudios experimentales de caso único y ensayos clínicos aleatorizados en PubMed, Scopus, Web of Science y Embase. **Resultados:** Inicialmente, se encontraron un total de 67 investigaciones, de las cuales, tras la eliminación de duplicados y la selección basada en el título y el resumen, quedaron 16 artículos elegibles. Sin embargo, durante la revisión exhaustiva de cada texto, se descubrió que algunos no cumplían con los criterios de inclusión o presentaban elementos excluyentes, por lo que no calificaron para la siguiente etapa del proceso. En consecuencia, no se encontraron publicaciones que brinden evidencia robusta para comprobar la eficacia del entrenamiento en comunicación funcional para regular las conductas autolesivas en niños, niñas y adolescentes diagnosticados con TEA. No obstante, cuatro publicaciones lograron cumplir el objetivo secundario de identificar relaciones entre las variables propuestas y presentar variaciones al prototipo de intervención planificada. Estas publicaciones fueron evaluadas en calidad y discutidas siguiendo las recomendaciones de transparencia de la guía de Cochrane Effective Practice and Organisation of Care para informar revisiones sin estudios elegibles o vacías y los lineamientos de PRISMA 2020. **Conclusiones:** Existe una necesidad imperante de más investigación en este campo dada la nocividad y facilidad de cronificación de las conductas autolesivas, además de su alta incidencia en personas diagnosticadas con TEA. Los hallazgos de este estudio ayudan a identificar las brechas de conocimiento existentes y sugiere nuevas direcciones para la investigación en este campo.

Palabras claves: trastorno del espectro autista; conductas autolesivas; entrenamiento en comunicación funcional; niños; niñas; adolescentes; revisión sistemática.

Self-injurious behaviors represent highly harmful clinical phenomena, with the potential for chronicity and a significant negative impact on individuals' health and well-being. In the context of neurodevelopmental disorders, self-injurious behavior is defined as behavior in which an individual unintentionally causes harm to themselves, excluding suicidal intent (Iwata et al., 1994). Like others with an operant component, these behaviors are governed by environmental consequences that increase the likelihood of their repetition in similar contexts. On the other hand, the DSM-5 also defines self-injury in the context of neurodevelopmental disorders, noting that it can occur without suicidal intent and is associated with deficiencies in impulse control, communication difficulties, and atypical sensory responses. These factors interact to increase the likelihood of self-injurious behaviors, which, in these cases, have repetitive and persistent characteristics as part of the behavioral profile of neurodevelopmental disorders (American Psychiatric Association, 2013). In other words, self-injurious behaviors are reinforced by the effects they produce and will persist as long as they continue to yield the same outcomes in similar situations (Hanley et al., 2003). These behaviors are particularly prevalent in individuals with neurodevelopmental disorders, such as Autistic Spectrum Disorder (ASD) (Maenner et al., 2023). They can affect various areas of their functioning and quality of life (Waizbard-Bartov et al., 2023). Therefore, it is imperative to have effective and timely treatments to address these behaviors and reduce the associated disability

The prevalence of autism in infants has shown a sustained increase in recent years (Alrehaili et al., 2023). Various studies have supported this trend, demonstrating an increasing proportion of individuals with ASD compared to the general population, ranging from 1 in 36 (Maenner et al., 2023), 1 in 59 (Iyama-Kurtycz, 2020), and 1 in 100 (Zeidan et al., 2022). In the latter study, a male-to-female ratio of 4:1 was found, with 30% of cases also presenting comorbid intellectual disability. This rise in prevalence, along with the significant impact on the autonomy of individuals with ASD whose specific needs are not addressed promptly, makes this condition a substantial focus for public health research.

Self-injurious behaviors are highly prevalent in individuals with ASD (Maenner et al., 2023), occurring frequently in those with associated intellectual disabilities as well as in those without intellectual impairment (Soke et al., 2017; Rydzewska et al., 2019). The function of these behaviors can vary over time and throughout the development of the individual with ASD (Furniss and Biswas, 2020). Furthermore, they are linked to neurobiological mechanisms related to self-regulation and coping with stress and anxiety (Rothbart, 2007).

The risk factors for self-injurious behaviors in individuals with ASD vary depending on the presence or absence of intellectual disability (Furniss and Biswas, 2020). In individuals with ASD and intellectual disability, risk factors include atypical sensory processing, insistence on sameness, deficits in social and communicative functioning, and high levels of anxiety (Dempsey et al., 2016; Duerden et al., 2012; Soke et al., 2017). In individuals with ASD without associated intellectual disability, the risk factors are limited to atypical sensory processing, insistence on sameness, and deficits in social and communicative functioning (Black et al., 2017; Rattaz et al., 2015; Rodgers et al., 2012). Additionally, Paula (2018) highlights that genetic vulnerability is a critical factor in the development of self-injurious behaviors in this population, noting that this genetic predisposition

can interact with specific environments to intensify the manifestation of these behaviors. According to Paula (2018), certain environmental and contextual factors can act as triggers in individuals with a genetic predisposition, increasing the likelihood of self-injurious behaviors.

Functional communication training is an evidence-based intervention that has shown positive results in reducing the frequency and intensity of excessive behaviors, including self-injurious ones (Ghaemmaghami et al., 2021; Tiger et al., 2008). Functional communication training is based on the differential reinforcement of other behaviors, a behavioral modification technique that proposes an alternative, topographically different but functionally equivalent, to a behavior identified as problematic (Carr & Durand, 1985). The aim of replacing the problematic behavior is to reinforce the continued occurrence of the alternative behavior. Simultaneously, the extinction of the interfering or problematic behavior is sought, eventually establishing a new behavioral repertoire that maintains the same functionality but varies in its presentation mode, helping the individual develop socially relevant behaviors (Vollmer et al., 2020). In the context of this research, this refers to behaviors related to the communication of needs and the establishment of bidirectional relationships based on verbal behavior (Durand, 1990).

Single-case studies have found that functional communication training helps regulate self-injurious and repetitive behaviors, particularly in children with ASD (Carr & Durand, 1985; Ghaemmaghami et al., 2021; Tiger et al., 2008). However, a comprehensive literature synthesis that systematically evaluates its impact on regulating these behaviors in the population above has not yet been conducted. This gap in the available evidence poses a barrier to identifying effective and efficient interventions for various self-injurious behavior topographies, hindering the development of optimal treatment solutions for this issue.

Our study aimed to conduct a systematic review of the literature to determine whether functional communication training is efficacious in improving the regulation of self-injurious behaviors in children and adolescents diagnosed with ASD.

METHODS

Design and protocol

We used the criteria proposed in the PRISMA 2020 statement for systematic reviews and meta-analyses (Page et al., 2021) (see supplementary material 1). Our protocol was registered in PROSPERO (CRD4202424540914).

Eligibility criteria

The present systematic review was based on the PICOS strategy (P: participants, I: intervention, C: comparison, O: outcomes, and S: study design) (Amir-Behghadami & Janati, 2020), which allowed structuring the research question of this study: is functional communication training significantly effective in regulating self-injurious behaviors in children and adolescents diagnosed with ASD?

In this sense, the present research proposes the following inclusion criteria for review studies.

Participants: Children and adolescents under the age of 18 are diagnosed with ASD. Reviews that include research in which the family or primary caregivers of this population receive the intervention will also be considered, as long as they are the indirect applicators of the intervention.

Intervention: Functional communication training is derived from the differential reinforcement process (hence it is found under both names) of Applied Functional Analysis (ABA).

Comparison: it is not necessary to compare it with other treatments.

Outcome: Regulation of self-injurious behavior, understood as a quantitative reduction in the frequency, intensity, or duration of such behavior as measured by direct or indirect behavioral observation scales.

Studies (types of studies): randomized clinical trials and single-case experimental studies conducted from 1985 (date of proposal of the functional communication training protocol) to the date of the search: May 04, 2024.

It is worth mentioning that the following exclusion criteria were considered: systematic reviews, meta-analyses, case studies, studies focusing on a diagnosis other than autism, quasi-experimental studies, studies conducted in adult populations, letters to editors or other non-peer-reviewed articles (books, chapters, book reviews, dissertations, etc.).

Finally, it is pertinent to mention that the (Cochrane Effective Practice and Organisation of Care (EPOC), 2017) recommends making explicit the reason for including certain types of studies; in the case of the present research, we seek to extrapolate and generalize the data found to obtain robust information about the effectiveness of functional communication training for the regulation of self-injurious behaviors in children and adolescents with ASD. This aspect can be achieved when there are experimental conditions such as randomization in the assignment of variables, the establishment of control groups, and the guarantee of replicability.

Information sources

The search was carried out in the main databases of international prestige in psychology, neuropsychology, and other health sciences. Four reference sources were selected: PubMed, Scopus, Web of Science (WOS), and Embase.

Search Strategy

Key terms derived from the PICOS proposal were identified: autism, children and adolescents, functional communication training, self-injurious behavior, randomized clinical trials, and single-case experimental studies. The search was carried out by translating these terms into English, as this is the language in which most of the scientific production exists. Once translated, we searched for mesh terms (medical subject headings) from the National Library of Medicine of the United States. This allowed us to homologate other terms that allude to the same concept. These terms were combined using the Boolean connectors “AND” and “OR” (see supplementary material 2).

It should be noted that depending on the database used, some codes or ways of designing the search strategy may change: In PubMed, the [mesh] specifier is used for homologous terms, in addition to the [tiab] search engine, so that key terms are searched both in the title and the abstract or summary; in SCO-

PUS, the "TITLE-ABS-KEY" specifier is used so that terms are searched in the title, abstract and keywords by their English names; in WOS, "TS" is used to search for the terms of the subject in the title, abstract and keywords; in EMBASE, the "/exp" terminator is used to search not only for the term but also for other related terms, in addition to "ti,ab,kw" to search for the terms in the title, abstract and keywords, thus allowing a more detailed and complete exploration of the information.

The Appendix section details the selected concepts, results, and search strategies designed for each database: PubMed, Scopus, Web of Science, and Embase, whose searches were conducted on May 4, 2024. The recording of this information contributes to the transparency of scientific work, as it allows any other researcher to verify the accuracy of the recorded data at any time (Cochrane Effective Practice and Organisation of Care (EPOC), 2017).

Selection process

During the search process, all identified records were downloaded in RIS format and consolidated into a Zotero file that served as a repository for all retrieved records. However, this file may have contained duplicate records removed using both automated and manual methods. The list of unique records was then exported from Zotero to Rayyan, a web tool designed explicitly for systematic reviews (Ouzzani et al., 2016). The review of titles, abstracts, and full texts was performed independently by two investigators. To resolve discrepancies in evaluating these sections, two reviewers discussed each point in meetings organized for this purpose. A third reviewer was called upon to make the final decision if an agreement could not be reached. It is worth noting.

Data extraction process

Two authors collected information from the included studies using a data extraction form previously designed in a Microsoft Excel spreadsheet. The extraction form was assessed: a) general information (authors, year of publication, title, country, and language); b) characteristics of the participants (age range, percentage of females, total number of participants, prevalence of diagnosis, and level of impairment associated with the diagnosis of ASD); c) characteristics of the interventions (duration, frequency and brief description of the intervention); d) information on passive comparators (i.e., nothing, waiting list and treatment as usual) or active comparators (i.e., sensory therapy as usual) or active comparators (i.e., sensory therapy as usual). e.g., nothing, wait-list, and treatment as usual) or active comparators (e.g., sensory therapy, pharmacological therapy, psychological therapies, and other ABA-based therapies)*; e) main outcomes (means, standard deviations, and numbers of participants before and after the intervention, effect size of the control and intervention groups); f) other relevant information such as conflicts of interest, funding, and number of study arms.

Analysis plan

Our protocol originally proposed a meta-analysis. However, we did not perform such an analysis because our review did not find any clinical trials or single-case experimental studies (as will be presented later). Cochrane's recommendation for empty reviews suggests reporting studies that partially meet the inclusion criteria. Therefore, a descriptive sub-analysis of these studies was conducted, in which each one was individually described.

Originally, a meta-analysis and a risk of bias assessment using the RoB2 tool were planned. However, since the review yielded no results, these analyses could not be conducted.

RESULTS

Study selection

Our study identified 67 records in the different databases. Duplicate records were excluded (n=23), and 44 records were reviewed by title and abstract. Subsequently, only 16 records were reviewed for full text. However, all records were excluded as none met our inclusion criteria (see Figure 1). The 16 records examined in full text are listed in supplementary material 3, along with the reasons for each record's exclusion. Therefore, the present systematic review is declared empty.

Finding an empty systematic review should not be interpreted as a negative assessment of the study, but rather as an opportunity to identify areas of science that need further attention and research (Yaffe et al., 2012). The Cochrane Network provides specific guidelines for reporting systematic reviews in which no eligible studies are found that meet the established inclusion criteria (Cochrane Effective Practice and Organisation of Care (EPOC), 2017). These guidelines emphasize the importance of transparency in explaining the absence of eligible studies to avoid the inclusion of untrue data, which was rigorously followed in this study.

Secondary analysis of excluded records

In the case of empty systematic reviews, the Cochrane Network suggests considering research that does not meet all inclusion criteria or has some exclusion criteria. However, it may still be helpful for secondary analyses (Cochrane Effective Practice and Organisation of Care (EPOC), 2017). These studies may contain relevant data related to the research objectives or serve as a guide for future research. Following this recommendation, we analyzed four articles that, although initially excluded, were considered beneficial to answer our research question partially.

Bienstein and Nussbeck (2009)

This study details an individual intervention conducted with a 10-year-old female patient diagnosed with ASD and a possible associated intellectual disability. A descriptive (non-experimental) case study design was used to document the intervention's assessment, planning, and implementation, which focused on functional communication training. A reduction in self-injurious and other diagnosis-related problem behaviors was observed, however, hypothesis tests were not used because it cannot be determined that there would have been a significant reduction. Although the study provides evidence for the effectiveness of this intervention in reducing self-injurious behaviors, it is essential to note that, due to the non-randomized nature of the research and the lack of a control group, the results are not generalizable to other populations.

Muharib et al. (2019)

This study describes the design, implementation, and evaluation of a functional communication training intervention for two children diagnosed with autism, ages five and six. Using a non-experimental case study approach, it was found that only one of the children exhibited self-injurious behaviors, such as violent head shaking. Both children were preverbal, meaning they did not functionally use oral language. The intervention used an electronic device to facilitate communication by exchanging pictures. Results indicated improvements in regulating both children's behaviors; however, hypothesis testing was not conducted to determine a statistically significant reduction in these behaviors.

Hall et al. (2022)

This study examines the efficacy and long-term sustainability of a previous intervention (follow-up) to reduce challenging behaviors in children with Fragile X syndrome delivered via telemedicine. The goal was to evaluate the effectiveness of an intervention that persists when subjects return to their natural environments. The results indicate that children who received functional communication training showed a reduced tendency to exhibit challenging behaviors.

It is important to note that although the study focuses on fragile X syndrome and not autism spectrum disorders (ASD), the behavioral manifestations may be similar. Previously, conditions such as Rett syndrome and childhood disintegrative disorder were classified within the autism spectrum according to the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (Rosen et al., 2021). In addition, telehealth training requires parents and caregivers to be trained to perform the activities guided, suggesting a promising approach for future functional communication interventions. This study highlights the importance of investigating the sustainability of outcomes after the intervention ends, a critical but understudied aspect in the management of self-injurious behaviors (Ghaemmaghami et al., 2021).

Casey and Merical (2006)

This study evaluates the use of functional communication training with individuals with ASD who exhibit self-injurious behaviors, as part of the procedure involves extinction, which in some cases may reinforce the target behavior. This single-case (non-experimental) design study describes the case of an 11-year-old patient who underwent a functional communication training intervention to reduce self-injurious behaviors.

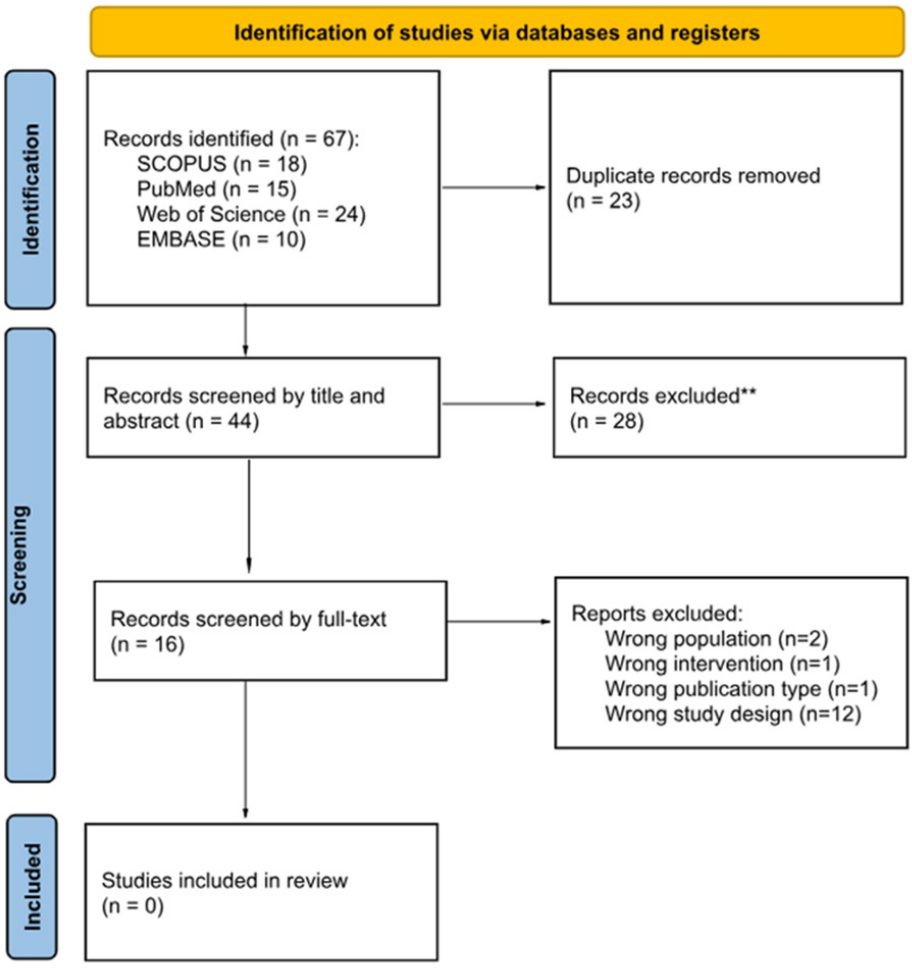

Figure 1. Figure 1. Flowchart.

The researchers highlight the success of intervention without resorting to techniques such as extinction or positive punishment and point out that the use of differential reinforcement in different situations, contingent and non-contingent, produced similar results. In addition, it is emphasized that the intervention was followed up for up to two years, showing that the benefits obtained were maintained to some extent over time. This aspect underscores the importance of including long-term evaluation procedures in research reports of this type of intervention (Ghaemmaghami et al., 2021).

DISCUSSION

The central contribution of the present review is to identify that there is no experimental evidence to support the efficacy of functional communication training in regulating self-injurious behaviors in children and adolescents with ASD.

The lack of evidence may be because our review's two main search terms have highly variable definitions, such as ASD and self-injurious behaviors. This highlights the need for greater conceptual precision in future research.

On the one hand, about self-injurious behaviors, it has been observed that this term shares its semantic field with other terms that require greater precision and operationalization, such as non-suicidal self-injury, which still needs to be the subject of further research for its precise definition (American Psychiatric Association, 2023). Another example is the dichotomy of terms such as self-harm and self-injury. The literature suggests that the difference between them is that the former implies an intention to harm, whereas the latter does not. Paula (2018) explained that the difficulty here lies in the fact that intentionality may be required in some instances, such as those with ASD, intellectual disabilities, and the absence of functional oral language, which makes it challenging to identify the person's purpose in self-harming and therefore to determine which term to apply to their activity. Furthermore, the concept of "challenging behavior" is presented as a broad term encompassing the destruction or damage of the environment or the person himself, implicitly including self-harm (Muharib et al., 2019). In this sense, it is essential to note that when reviewing studies dealing with self-injurious behavior, it is valid to ask whether the exact definition of such behavior is being used, highlighting the need for greater precision and uniformity in the concept (Paula, 2018). Similarly, in the proposal of Furniss and Biswas (2020), self-injurious behaviors are described as those that develop in stages, starting with behaviors controlled by responsive and operant conditioning processes and progressing to a compulsive stage. It is noted that the functional communication training procedure may be more effective in one of these stages and less effective in others, suggesting the need for segmentation or diversification to achieve greater precision in selecting the specific population to be studied.

On the other hand, regarding the definition of ASD, Rosen et al. (2021) note that in previous editions of the DSM-IV manual, it was mentioned that this diagnostic label included other clinical conditions such as fragile X syndrome, Rett syndrome, and childhood disintegrative disorder, among others. This leads us to consider the possibility that these terms and other conditions related to neurodevelopmental impairments and a behavioral phenotype like ASD could be included as inclusion criteria in future research. In addition, there is evidence that functional communication training is practical in regulating behavioral excesses, particularly those related to the social initiative and functional communication deficits, in individuals with ASD and intellectual disability, both boys and girls (Bienstein & Nussbeck, 2009; Casey & Merical, 2006; Muharib et al., 2019). However, it remains to be determined whether self-injurious behaviors developed in other subgroups, such as ASD without intellectual disability, can also be addressed by this type of training, given that there are anatomical and functional differences that suggest that the same self-injurious behaviors may have different causes depending on the ASD subgroup investigated, as pointed out by Uljarević et al. (2017) and Traynor et al. (2018).

In line with the above, it is essential to mention that basic communication intervention programs for children with ASD with intellectual disabilities are effective in reducing a wide range of overreaching behaviors (Brignell et al., 2018). However, many of these behaviorally oriented programs need to explicitly incorporate terms such as functional communication training or differential reinforcement into their theoretical frame of reference, making it difficult to identify using the search strategy used in the present study. Therefore, a review of this concept is necessary.

As noted above, functional communication training is based on differential reinforcement; both techniques are derived from applied behavior analysis, a technological branch of behavior analysis. Traditionally, applied behavior analysis has been studied using single case studies in which standardization of the individual's pre-intervention baseline conditions served as the control variable. This approach allowed for the accumulation of evidence to strengthen the efficacy of interventions for social functioning and communication difficulties. However, the lack of randomization in the results and the use of control cases limits the generalizability of the results. As Smith (2012) points out, this is one of the aspects in which branches such as neuropsychology and behavior analysis are expected to make progress, since they have traditionally opted for case studies, especially in people with injuries or neurodevelopmental disorders, which, although they provide information about the interventions under consideration, do not allow for the generalization of their results and, therefore, for the acquisition of solid evidence to establish it as a proven effective intervention. The latter aspect has been historically pending for the discipline of behavior analysis.

Although positive effects have been observed with functional communication training, these results cannot yet be generalized to application in large groups or large-scale interventions in the ASD population. As noted above, the lack of randomized clinical trials precludes the availability of robust evidence to support the applicability of this technique in large populations.

As a result, information about the potential benefits of this intervention is fragmented and incomplete, making it difficult for broad segments of the population to access and benefit from this intervention. In addition, the lack of sufficient evidence reduces the likelihood that these proposals, although promising,

will be considered in public policies designed to address self-injury in people with ASD, which mainly affects those with lower socioeconomic resources (Talantseva et al., 2023). This may result in a lack of early and timely intervention, increasing the risk of self-harm becoming chronic over time, demonstrating an urgent and real need for attention.

Strengths and limitations

The main strength of our study is that a comprehensive review of major scientific article databases was conducted, ensuring a broad understanding of the available evidence. This makes it unlikely that randomized clinical trials or single-case experimental studies focusing on functional communication training to regulate self-injurious behaviors in children and adolescents under 18 years of age diagnosed with ASD were omitted.

However, our research also has certain limitations. First, key terms such as ASD, self-injury, and functional communication training have been conceptualized differently, broadening possible interpretations and making it difficult to identify the most relevant research systematically. Second, although our study focuses exclusively on the effectiveness of functional communication training in reducing self-injurious behaviors in children and adolescents with ASD, it is limited by not including other types of designs, such as nonexperimental and single-case studies with control conditions, which could have increased the number of studies considered. Third, the study excludes preprints, which implies the possible omission of relevant research in the publication process. Finally, excluding the PsycINFO database represents a limitation, as it may have led to the absence of additional studies relevant to our research question.

Future research lines

Future systematic reviews should include quasi-experimental studies to strengthen the evidence, although this may compromise the replicability and generalizability offered by control group clinical trials. Quasi-experimental studies can serve as a starting point to encourage more randomized clinical trials in this area.

In addition, it is critical to establish a clear delineation of ASD subtypes or a classification that includes phenotypic manifestations shared with other diagnoses to broaden the population sample in research. In addition, it is recommended that an "umbrella term" be developed to encompass the functional communication training and differential reinforcement implicit in programs designed to improve communication and socialization skills in individuals with ASD. A conceptual systematic review could be developed to define such an umbrella term.

Finally, based on the secondary analysis, a telehealth intervention focused on training the family, so that the indirect beneficiaries are the children and adolescents with ASD, emerges as a promising proposal. This trend of remote interventions has gained momentum in recent years and may offer effective solutions.

Conclusion

Our study found that, at the time of the search, no randomized clinical trials or single-case experimental studies had been published evaluating the effect of functional communication training in regulating self-injurious behaviors in children and adolescents under 18 diagnosed with ASD. As a result, the effectiveness of functional communication training in regulating self-injurious behaviors in this population is unknown based on the evidence reported in academic databases. However, uncontrolled and quasi-experimental studies suggest positive effects of this intervention in their functioning and foundation that justifies the need for controlled and randomized studies to assess its effectiveness in this population rigorously. The results of the present systematic review demonstrate the need for further research in this area, mainly focused on controlled studies that allow causal inference of the actual effect of functional communication training in regulating self-injurious behaviors in the ASD population.

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AUTHORS' CONTRIBUTION

Franco Tejada-Flores: Conceptualization, Methodology, Validation, Formal analysis, Investigation, Data Curation, Writing - Original Draft, Visualization.
Yscenia Paredes-Gonzales: Methodology, Validation, Formal analysis, Investigation, Data Curation, Writing - Original Draft.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest in collecting data, analyzing information, or writing the manuscript.

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Not applicable.

REVIEW PROCESS

This study has been reviewed by external peers in double-blind mode by Giuliana Salazar, Christian Canales, and another reviewer. The editor in charge was Renzo Rivera. The review process is included as supplementary material 4.

DATA AVAILABILITY STATEMENT

Not applicable.

DISCLAIMER

The authors are responsible for all statements made in this article.

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