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Use of comics in the promotion of school children's health: a scoping review

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This scoping review provides an analysis of the available experiences on the use of comics to promote the health of school children. It was registered in the Open Science Framework (OSF) under DOI: doi.org/10.17605/OSF.IO/Z5VX6. Seventeen studies were used, including articles, theses and dissertations. The results present the main characteristics of the studies such as year; country; sample characteristics; study design; description of actions and population/sample. The target population of each selected study was children younger than 10 years. The sample number of the studies ranged between 47 and 881 children. Fifteen studies developed the interventions in schools. 44.4% of the selected studies were published between 2011 and 2020, and the continents with the highest number of publications were South America and North America, with 33.3% each. Regarding the type of study, 55.6% used the non-randomized experimental method and 35.3% had themes related to specific diseases. The experiences that were considered successful were conditioned to the organizational structure of the use of comic books and how they were offered to school children.

KEYWORDS

children, comics, comic book, health education, school health promotion

1 Introduction

Health promotion, according to [Paim and Almeida \(2023\)](#), consists of the execution of actions related to the transformation of individuals' behaviors, interfering in their lifestyles. It is also considered as an intersectoral action organized through public policies that are intended to produce health, such as equitable policies for income and wealth distribution, basic sanitation, education, housing, and decent employment and work. A highlight is the articulation between education and health, as social practices.

With regard to education, health promotion strategies gain diverse formats that make it possible for audiences to access the content of the messages transmitted. Thus, the objective of reducing health inequalities, giving autonomy to communities and improving health throughout the course of life can be achieved in community, school, labor, and other spaces ([Silva, 2019](#)).

Health promotion actions considered effective are those that lead the target audience to change the determinants of health in real-life conditions. Furthermore, the point of view of what is considered successful is different, based on the various actors involved, such as health promoters, the benefited population, and researchers. These different perspectives are the result of a long process of construction and appropriation of knowledge on topics of social interest (Unión Internacional de Promoción de la Salud y Educación para la Salud, 1999).

In health promotion strategies, the act of communicating is considered as the basis for the effectiveness of health care actions and well-being of the population. Thus, communication is the process of sharing the experience so that it becomes common heritage, which leads us to reflect on the quality of this communication and the breadth it reaches or should reach within a community. There are known barriers to communication, such as: not knowing how to listen, the use of inaccessible language, threats and suggestions that cannot be fulfilled, denial of the perception of the other and the expression of false support (Martins and Araújo, 2008).

In general, barriers are related to the cognitive capacity of the receiver to understand the message, and the ability to send it with the necessary adaptations to make the communication effective, given the individual and contextual asymmetries. Therefore, carrying out educational activities presupposes the use of methodologies that are consistent with the age, accessibility, and infrastructural conditions of the target audience (Senhoras, 2020; Santos et al., 2021).

For children, there are specificities that need to be considered because, depending on their age, the communicative approach and the message need to be transmitted in a meaningful way. In the school age group, children rely less on what they see and more on what was taught by their family members, demand explanations continuously and are interested in the functional aspect of everything (procedures, objects, decisions). In addition, giving them the opportunity to explore an event similar to their environment or even their problem, through a story, drawing or video, can interfere with thinking and change their perceptions or fears (Hockenberry and Wilson, 2014).

The school space can be considered an environment conducive to promoting the health of children, as it promotes sustained educational achievement, and stimulates the health and well-being of students, parents, caregivers and the community. The comprehensive focus on school to promote health and well-being improves academic achievement, school attendance, and school retention, by extension benefiting the health and well-being of children and adolescents, school staff, and the community (World Health Organization, 2021).

Therefore, it is necessary to understand that the conjuncture of the children who receive health information does not guarantee the application of this knowledge in their routine, to the detriment of the children having stimulation for learning different from the adults, especially when integrating in health education significant games, characters and activities in their routine (Carvalho, 2016).

Stimulation for learning in school-age children is based on the understanding that they have the ability to reason about the world in a more logical and adult way, although they acquire the ability to perform these operations only in concrete terms, using the sense organs, seeing, touching, and experimenting. For successful learning, it is essential that they contemplate opportunities to count, compare, and analyze (Rodrigues and Melchiori, 2014).

Among the playful strategies used in the education of children, comics can be mentioned. The various elements that make up comics must be understood in the context of the target audience and be confronted with social reality, as their narrative is a living structure where readers are involved. This involvement is due to the invitation that comics make for their readers to enter their “reality,” creating conditions for them to fit into the narrative (Pereira and Alcântara, 2021). In this sense, health education is facilitated with the use of comics as far as their characteristics help not only in the construction of concepts, but also in the appropriation of scientific discourse, including by the children (Santos et al., 2023).

About health promotion for children, comics can promote the linking of character stories to their life stories, especially when health education takes place in a school environment. It is still possible to identify that many campaigns of the Ministry of Health of Brazil have their own characters to encourage healthy habits for children (Santos et al., 2012).

In Brazil, the availability of comic books with themes aimed at health education arose from the need to interact with children and young people, facilitating the understanding of complex subjects, such as that presented in the story “What’s Happening?” by Turma da Mônica, which portrays Epilepsy in a child (Souza and Organização Panamericana da Saúde, 2019).

The comics are not yet widely used, but there are efforts to implement this media in educational projects, to reach the most diverse audiences, reaching the needy populations whose access to information is limited by their conditions (Prado et al., 2017). Thus, the collection of comics with themes that are of interest in the health field is extensive, as an example of stories by the Turma da Mônica (Souza and Organização Panamericana da Saúde, 2004), Sesinho (Sesi, Ministério da Saúde, 2010), and O menino maluquinho (Ziraldo, Associação de apoio à merenda escolar, 2006), in Brazil. In a preliminary search in national and international databases, other independent productions were also found, and these were developed from specific and collective needs.

The existing possibilities for the use of educational resources, such as comics, in order to promote the health of school children, can be evidenced through studies. Considering the need to identify the theoretical framework on the topic under discussion, this study aimed to systematically map which experiences are available on the use of comics in promoting the health of school children from a scoping review, which made it possible to graphically represent the distribution of studies on the subject.

2 Materials and methods

This scoping review is conducted by the recommendations proposed by the Joanna Briggs Institute¹ and its results organized by the Preferred Reporting Items for Systematic Review and meta-Analyses extension for Scoping Reviews (PRISMA-SCR). With prior

1 A group of methodologists are responsible for developing methodological resources for research. The network is for anyone interested in scoping reviews. The goal is to connect and share resources to improve the quality of scoping reviews.

registration of protocol in the Open Science Framework (OSF) under DOI: doi.org/10.17605/OSF.IO/Z5VX6.

A scoping review is recommended for mapping the literature on a topic of interest, especially when reviews have not yet been published. It also does not aim to find the best evidence on a health intervention but can gather various types of evidence and present how it was produced (Cordeiro and Soares, 2020). The methodological path was outlined in 3 main stages, namely: (Paim and Almeida, 2023) systematic search and development of research question; (Silva, 2019) definition of eligibility criteria; (Unión Internacional de Promoción de la Salud y Educación para la Salud, 1999) selection of evidence sources. The details of each stage are described below.

2.1 Systematic search and elaboration of the research question

The research question was constructed using the PCC strategy, which recommends the mnemonic as essential components: P-Population, C-Concept, C-Context. The following elements were defined: P (School children); C (Comics as a health education tool); C (Health promotion). Based on this, the following research question was elaborated: *what experiences are available about the use of comics in promoting the health of school children?*

The search strategy included three stages: in the first, the search was limited to Health Descriptors (DeCS) and Medical Subject Headings (MeSH), followed by an analysis of the most frequent words on the central theme (Table 1).

In the second stage, searches were carried out in all databases using the descriptors identified in the previous stage, elaborating the search strategies with Boolean descriptors and operators. In the third stage, carried out in November 2023, the identification of relevant studies in the databases of the Medical Literature Analysis and Retrieval System Online (MEDLINE), Cochrane Library, Excerpta Medica Database (EMBASE), Abstract and citation database of peer-reviewed literature (SCOPUS) and Web of Science, the search was also carried out in the Virtual Health Library (VHL), Online Scientific Electronic Library (SCIELO) (Table 2).

Sources of unpublished studies and gray literature such as theses and dissertations were considered. The search was carried out on organizational websites such as Google Scholar and the Brazilian

Digital Library of Theses and Dissertations. The search strategy for these sources was the use of keywords related to the theme such as “Comics,” “Health Education” and “Schoolchildren.”

2.2 Criteria for eligibility

The final sample of this study was selected based on the inclusion criteria, such as: articles and complete studies, whose participants were children up to 10 years old, who addressed interventions using comics in health promotion, in English, Spanish and Portuguese. Publications that did not answer the research question and duplicate articles were excluded.

The justification for choosing the age range is based on the age classification presented in the National Child Health Care Policy, which follows the concept of the World Health Organization (WHO), which considers: a “Child” – a person in the age ranges from zero to 10 years old (Brasil, 2018).

2.3 Selection of evidence sources

The articles resulting from the initial selection stage were entered into the Rayyan web application and were independently evaluated by two reviewers in the double-blind function. Upon completion of the evaluation of the titles, abstracts and objectives according to the review question, the evaluation was open for discussion of the selection of each reviewer. There were disagreements between the reviewers, and these were resolved by consensus.

For the data mapping stage, a complete reading of the selected studies was performed, two forms were filled out with the systematization of the data obtained and distributed according to the variables: year; country; sample characteristics; study design; description of actions and population/sample. The presentation of the results was constructed by identifying information related to the descriptive variables and will be presented in the results section.

The details provided in each article review were based on the information provided by the studies’ authors. Some studies were able to give a larger amount of data and, consequently, we were able to capture more information. While others offered little data. Therefore,

TABLE 1 Distribution of descriptors and keywords by platform.

Platform	Descriptors (DeCS/MeSH)	Keywords
DeCS	Comics Gibis Comic Book Health Education School Health Promotion Health Promotion in the School Environment	Comics Gibis Comic Book Health Education School Health Promotion Health Promotion in the School Environment
MeSH	Graphic Novel Comic Book Health Education School Health Promotion School Health Services	Graphic Novel Comic book Health Education School Health Promotion School Health Services

Brazil, 2024. Source: research data, 2024.

TABLE 2 Search strategies Brazil, 2024.

Databases/Journal portal	Search strategy
BVS	(comics) OR (gibis) OR (comic book) AND (health education) AND (school health promotion) OR (health promotion in the school environment)
	(graphic novel) OR (comic book) AND (health education) AND (school health promotion) OR (school health services)
Pubmed/Medline	(((((Graphic Novel) OR (Comic book)) AND (Health Education)) AND (School Health Promotion))) Filters: Child: 6–12 years
Scielo	(Comics) OR (Gibis) OR (Comic Book) AND (Health Education) AND (School Health Promotion) OR (Health Promotion in the School Environment)
	(Graphic Novel) OR (Comic book) AND (Health Education) AND (School Health Promotion) OR (School Health Services)
Web of Science	Comic book (All Fields) AND Health Education (All Fields) AND School Health Promotion (All Fields)
Embase	('graphic novel' OR (graphic AND novel) OR 'comic book' OR (comic AND ('book'/exp. OR book))) AND ('health education'/exp. OR 'health education' OR (('health'/exp. OR health) AND ('education'/exp. OR education))) AND ('school health promotion' OR (('school'/exp. OR school) AND ('health'/exp. OR health) AND ('promotion'/exp. OR promotion))) Filter: Child: 7–12 years
Scopus	((TITLE-ABS-KEY(Graphic Novel) OR TITLE-ABS-KEY(Comic book) AND TITLE-ABS-KEY(Health Education) AND TITLE-ABS-KEY(School Health Promotion) OR TITLE-ABS-KEY(School Health Services)) AND (LIMIT-TO (OA,"all"))) AND (LIMIT-TO (EXACTKEYWORD, "Article") OR LIMIT-TO (EXACTKEYWORD, "Child") OR LIMIT-TO (EXACTKEYWORD, "Health Education")))
Cochrane	(Graphic Novel) OR (Comic book) AND (Health Education) AND (School Health Promotion)

Source: Medical Literature Analysis and Retrieval System Online (MEDLINE), Cochrane, Biomedical Research Database (EMBASE), Abstract and citation database of peer-reviewed literature (SCOPUS) and Web of Science, the search was also carried out in the Virtual Health Library (VHL), Online Scientific Electronic Library (SCIELO) (2024).

the degree of review of the studies was different depending on what was provided to us. Table 3 provides the characteristics of the articles selected to compose this scoping review.

3 Results

The primary search in the databases presented in the methods section resulted in 94 records, to which were added the 38 records identified by searching the sources of unpublished studies, of which 39 duplicates were removed. Full-text unavailability excluded one study. At the end, 17 records remained in the sample, and they were grouped into tables. Figure 1 indicates the PRISMA-ScR flowchart that depicts the selection of evidence sources.

According to Table 3, 44.4% of the selected studies were published between 2011 and 2020, and the continents with the highest number of publications were South America and North America, with 33.3% each. Regarding the type of study, 55.6% used the non-randomized experimental method and the thematic area of the interventions was related to specific diseases (35.3%).

The target population of each selected study was children younger than 10 years. The sample number of the studies ranged between 47 and 881 children. Ten studies exclusively used comics as a resource for health promotion in interventions with children, and 15 studies developed interventions directly in schools. The characteristics of the selected trials are presented in Table 3.

3.1 Overview and synthesis of the studies

The studies presented in Table 3 were characterized based on the themes of comics, intervention methods and their results. According to Figure 2, most of the stories had themes about specific diseases, 11

studies exclusively used comics as a resource for health promotion in the intervention with children, and 11 answered in their results that after the intervention the target audience improved the understanding of the theme.

The study of Vigano (1983), considered the oldest found for this scoping review, presented an innovative proposal for the time and considered advanced compared to recent studies. The objective of the project was to use comics about the use of drinking water and basic sanitation to promote changes in community attitudes and behaviors. Each comic contained topics such as the cause of water contamination and ways to purify it.

During the pre-test of the comics, each child received a questionnaire with five questions related to the content of the class to be answered before receiving the comics. Then, the children took the comics to read at home; and the next day the teacher taught a health education class using the content of the pedagogical guide and asking 4 questions related to the comics, expanding each answer with information taken from the guide. At the end of the class, the children were given questionnaires with 11 questions (five from the previous questionnaire, plus six on the content of the comics; Vigano, 1983).

As a result, the correct answers to the first five questions rose from 59 to 80%. During the test, the correct answers about boiling water to purify rose up to 90%. Ninety-five percent of the children indicated that they liked the characters, and the teachers expressed their satisfaction with the materials and welcomed the opportunity to use them (Vigano, 1983).

The results of the study by Yuan et al. (2000), after interventions with schoolchildren through the use of educational video and comics on transmission and prevention of schistosomiasis, showed that both groups (experimental and control) adhered to knowledge after the intervention, with a statistically significant association between doing the intervention and acquiring knowledge, so that those who did the intervention know more than those who did not ($p < 0.001$).

TABLE 3 Characteristics of selected articles.

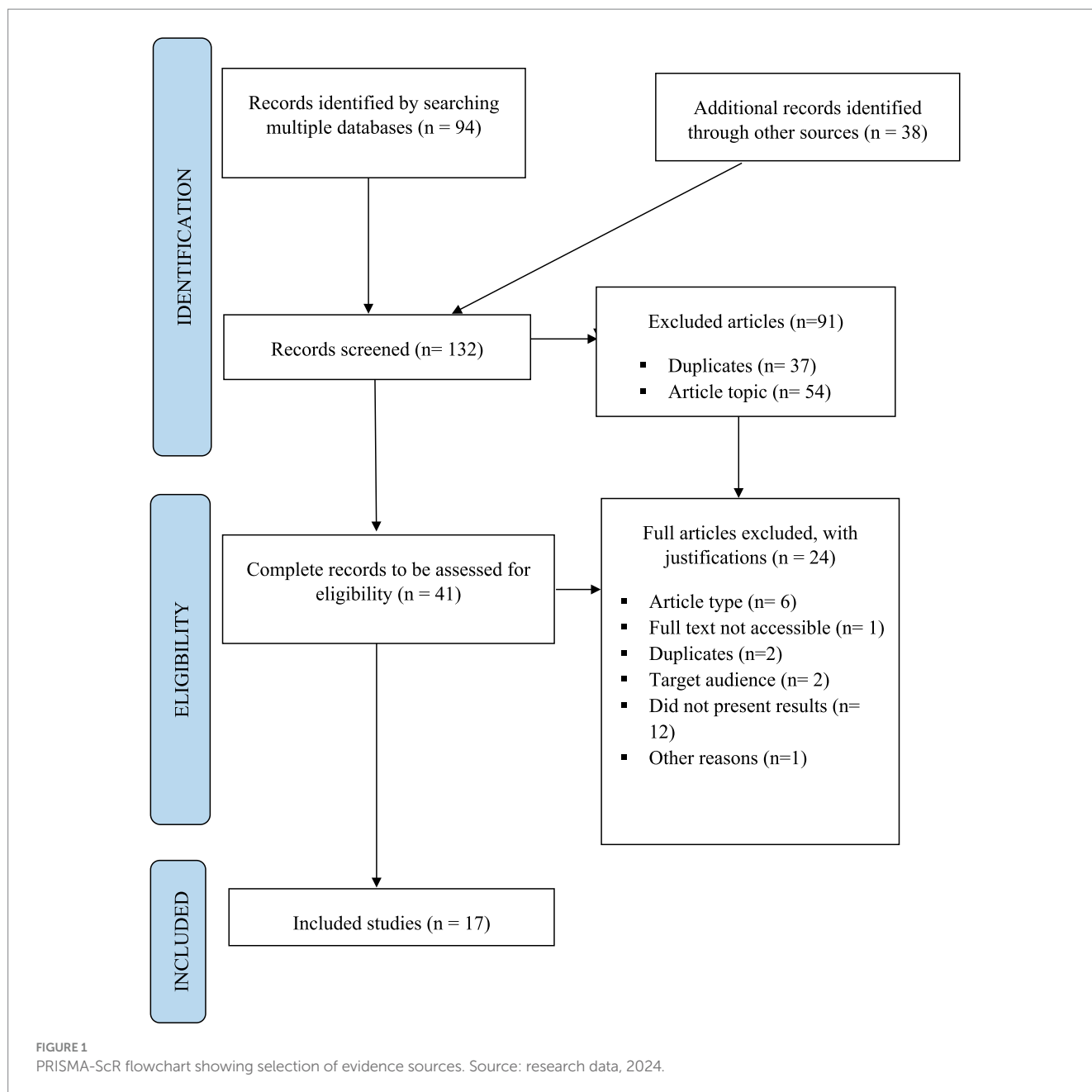
Author/s and Publication Year	Country of study	Sample characteristics	Study themes	Research Design
Vigano (1983)	Honduras	54 children from three schools in rural region of Honduras.	Clean water and sanitation	A pilot study
Yuan et al. (2000)	China	1739 fourth grade children from 50 primary schools in the Dongting Lake region.	Bilharziasis	Quasi-experimental
Santos (2003)	Brazil	386 children ranging in age from 7 to 11 years	Toxocariasis	Experimental
Garcia et al. (2004)	Brazil	60 students, of both sexes, aged 8 to 10, enrolled in a state elementary school in Araraquara - SP, chosen through a draw.	Oral Health	Experimental
Rebolho (2005)	Brazil	80 2 nd and 3 rd grade schoolchildren, aged 7–11 years, from a Municipal School, in the State of São Paulo	Postural education	Experimental
Sinha et al. (2011)	United States/ India	Students, aged between 5 and 7 years, both in West Virginia, in the United States ($N = 74$), and in West Bengal, India ($N = 39$).	Burns.	Experimental
Kovacs et al. (2011)	Spain	574 school-age children (8 years) distributed in 12 schools. Two groups were created, one control and one intervention.	Back pain	Randomized clinical trial
Camargo (2012)	Brazil	548 children aged 6 to 10 years, enrolled in elementary school in public and private schools in São Paulo.	Sleep disturbances	Randomized clinical trial
Branscum et al. (2013)	United States	71 children aged 8 to 11 years, 47% boys and 53% girls	Healthy habits	Experimental
Leung et al. (2014)	United States	Fifty-seven youth (mean age 10.8 y; 54% female; 74% black/ African American) attending after-school programs in Brooklyn, NY participated in a pilot study in which they were randomly assigned to receive the comic or a non-health-related newsletter	Fresh fruit consumption	Randomized pilot study
Mendelson et al. (2017)	Israel	61 patients with Juvenile Idiopathic Arthritis with a mean age of 14 ± 3.3 (range 8 to 18) years, 67% female, 83% Jewish and 17% non-Jewish. Thirty-nine percent had oligoarthritis, 13% systemic, 32% polyarthritis, 11% psoriatic, and 5% enthesitis-related JIA. Disease was active in 46%; 40% were treated with disease-modifying biologics/anti-rheumatic drugs, and 34% were in remission with medication.	Juvenile idiopathic arthritis (JIA)	Experimental
Kato et al. (2017)	Japan	268 students aged 11–12 years in 11 public primary schools in Tochigi Prefecture, Japan.	Stroke	Experimental
Wengreen et al. (2021)	United States	881 children from kindergarten through fifth grade (ages 5–11) attending one of four public primary schools.	Fruit and vegetable consumption	Randomized clinical trial
Mioramalala et al. (2021)	Madagascar	244 children with a mean age of 11.4 (± 1.5) years, 125 in the urban area and 119 in the rural area. The age group of 11 to 12 years represented 48.4% of children.	Seizure disorders	Quasi-experimental
Silva (2019)	Brazil	47 children aged between 06 and 12 years (53.19% male and 46.81% female) who received dental care in a specialized health unit.	Oral health	Experimental
Porcu et al. (2022)	Italy	896 students from 14 primary schools in 67 classrooms. The mean age of the students was 8.7 (± 1.2) years.	Parasites	Experimental
Nascimento et al. (2023)	Brazil	27 boys (9.3 ± 0.9 years) and 29 girls (9.5 ± 0.7 years), students from two classes of a municipal school in the city of Petrolina, located in the Northeast region of Brazil.	Postural education	Experimental

Source: research data, 2024.

Differences in safe and unsafe water use between students in the intervention and control groups were statistically significant ($p < 0.001$) and the percentage of students able to correctly answer questions about infection increased in the intervention group.

In the study by Santos (2003), five pedagogical resources were used in an educational program on the epidemiology of toxocariasis,

applied to 385 students from a state public school in Brazil, namely: storyteller, Puppet Theater, comics with known and unknown characters, and theater. Assessments of immediate cognitive and behavioral learning were conducted through interviews and behavioral observations of children in specific situations. Comics obtained better results in children from more advanced grades, even



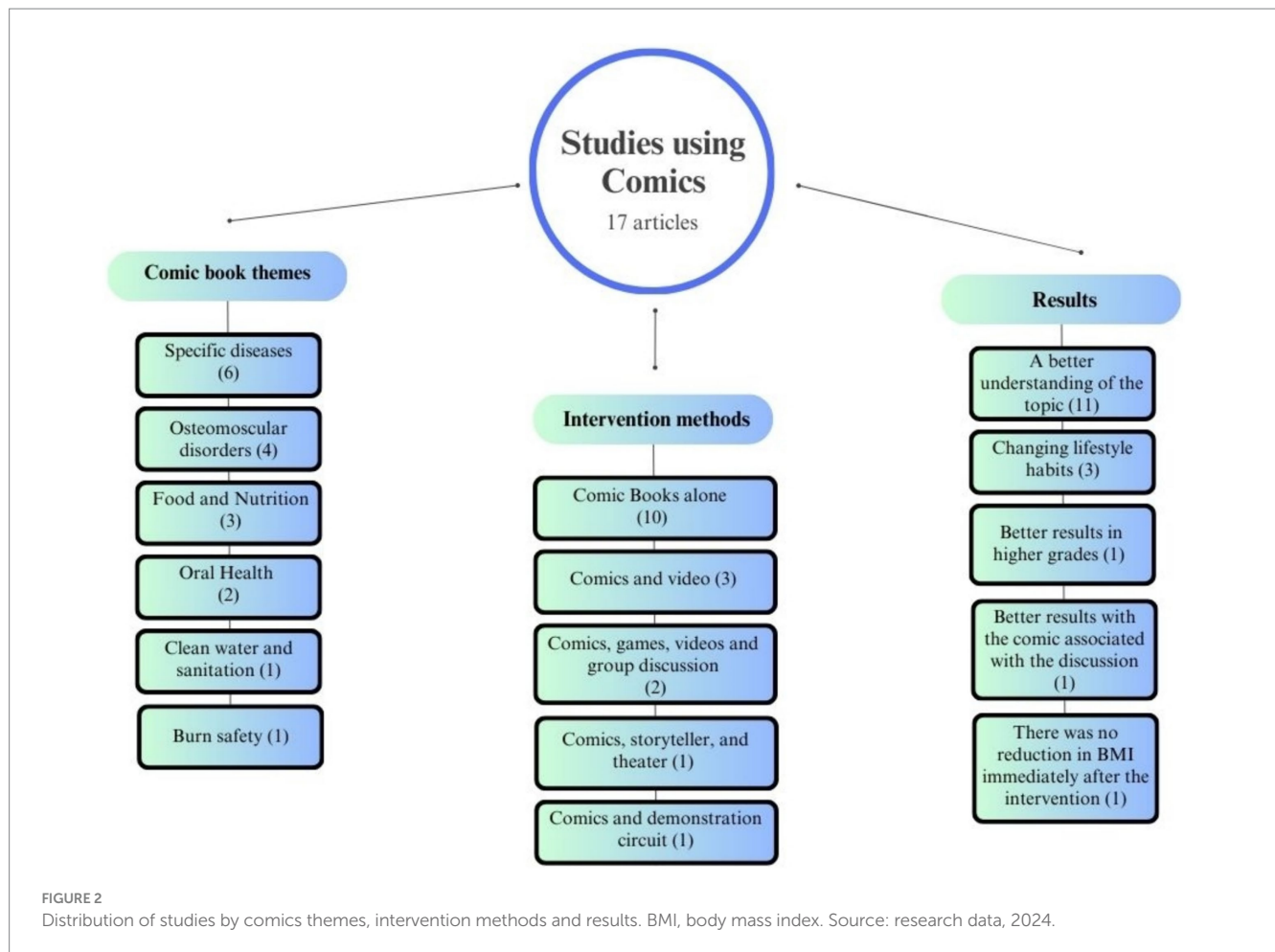
so in patterns below those who used oral language, a fact explained by the lack of familiarity with the applied resource or lack of basic knowledge existing in children from early grades.

In the study by Garcia et al. (2004), the intervention was structured for three groups of students, with the same number of participants. Groups I and II received the comics entitled “Mônica’s class and oral health” - prepared by Maurício de Sousa and were instructed to read; group III was the control. The difference between the two groups that received the story was that for group I the reading was performed at school and for group II the reading of the comics was associated with group discussion. The results showed that after the intervention, group I presented a statistically significant difference only in the question regarding the frequency of teeth brushing and 30 days later, this difference increased significantly. In Group II, there was a significant improvement ($p=0.019$) in the children’s standard of

knowledge regarding the concept of periodontal disease. However, the concept was not assimilated after 30 days of discussion.

The comics’ strategy was used in an experimental study on postural education with 80 schoolchildren divided into two groups, one that used only comics and another that associated the comics with a demonstration circuit, where the children experienced each correct and incorrect posture. The results of the study showed that no differences were detected in the learning and memorization of correct postural habits in both groups, except in the way of sleeping, where the rate of increase in correct answers was 23% for the demonstrative circuit, while the comics group presented only 7% (Rebolho, 2005).

For health education of children of primary school age on the main risk factors related to burn safety, including teaching children not to touch active stoves and not to light fireworks without supervision, among other guidelines, a comic was developed with



the theme. The target audience was children aged 5 to 7 years old. The study was conducted in schools in the United States and India. In both locations, there were significant increases in both groups in questions about avoiding hot stoves ($p < 0.01$) and fireworks ($p < 0.01$). Teachers reported that students enjoyed reading the comics and were engaged during the sessions and that the study demonstrated that a comic has value in teaching children about burn awareness (Sinha et al., 2011).

In a randomized clinical trial on methods of preventing and treating low back pain, a comic was used, and teachers were not asked to discuss the content in class. The result was evaluated by means of a questionnaire, distributed 1 week before, 1 week after and 90 days in the two study groups (experimental and control). The results showed that the chances of “success” for the intervention group were 1.61 (95% CI: 1.03–2.52) times greater than for the control group ($p = 0.038$; Kovacs et al., 2011).

In Camargo’s study (Camargo, 2012), there was a statistically significant difference ($p < 0.05$) in the correct answers of three questions applied to schoolchildren, before and after reading a comic about sleep disorders. The results showed the effectiveness of the comics ‘Snoring sleeps at home’ as an adjunct in the action of pediatric health education.

In the study by Branscum et al. (2013), a school program was used with an intervention on prevention, evaluation and treatment of overweight and obese children and stimulation for the execution of

lessons of healthy habits such as use of reduced screen time, consumption of water and beverages without sugars, consumption of fruits and vegetables and physical activity. This was implemented in groups of children, in 4 moments, each lasting 30 min. In both activities, it resulted in the creation of comics by the children with the themes involved. As a result, children did not show changes in the Body Mass Index percentile, as the intervention would need to be associated with a calorie deficit, in addition to the fact that parents are responsible for providing the food that children consume and it is not possible to control the children’s food intake. To this end, the authors considered the comics approach as a means of intervention to which messages can be transmitted.

Fruit consumption was the theme of the intervention carried out in schools in Japan, where the objective was to determine whether a single exposure to comics was able to influence food choices. Children were randomly assigned to receive the comics or a non-health-related magazine. – Newsletter. After reading, the students were given a snack and were able to choose between healthy and unhealthy options. Participants in the comic book group were significantly more likely to choose a healthy snack, compared to the attention control group ($p = 0.04$; Leung et al., 2014).

In the study by Kato et al. (2017), a joint intervention through classes on Stroke using cartoons and informative manga, 268 students were evaluated. The percentage of correct answers for each risk factor increased significantly right after class and at 3 months. The number

of students who correctly answered all four risk factors significantly increased after class ($p < 0.001$).

A study of juvenile patients with Juvenile Idiopathic Arthritis examined whether the comics 'Granddaughter and Medikidz', which narrates about the disease, would improve knowledge related to the disease and adherence to treatment. Among the 53 patients who completed the tests before and after, the mean score increased from 63 to 80% ($p < 0.001$; Mendelson et al., 2017).

Mioramalala et al. (2021) reported the effect of a single comics reading on epilepsy for school children from urban and rural areas of Madagascar. The results showed a significant improvement in the knowledge of these children after reading the stories ($p < 0.001$).

In the study by Wengreen et al. (2021), a game called FIT game was used, which used characters through stories that narrated about the achievement of goals of consumption of fruits and vegetables at school. The effect of the three-month intervention suggested that the children acquired the habit of eating more vegetables at school. The authors also discussed the possibility of associating other free and low-effort behavioral technologies with the FIT game to further increase its effectiveness.

"As Pitorescas Aventuras do Mamelinho" are comics about oral health that were offered to children who received dental care in a specialized health unit. As a result, it was observed that the number of children who started brushing their teeth due to the stimulation of this approach grew by 2.13%. There was an increase of 17.03% in the number of children who started to perform oral hygiene independently, without the help of parents or guardians, promoting self-care. However, the result of greater statistical significance was observed in the indications referring to the use of dental floss, which showed an increase of 55.32% of children who started using dental floss after the use of the methodology, and this result was confirmed by McNemar's statistical test ($p < 0.05$) that paired the nominal data before and after and indicated the result of $p = 0.0401$ (Haad Ruiz da Silva et al., 2022).

Also in the aforementioned study, a relevant information that was reported by the authors was that more than half of the children were already used to reading (59.57%), and most of them (97.87%) effectively read the journal, allowing the interpretation of the proposal.

In the study by Porcu et al. (2022), the intervention used a set of strategies in schools, including a multilingual educational comic book with activities and games, a teacher's guide and the development and production of the educational video of the cartoon "Fighting the parasite." Comparative analyses of the questionnaire results before and after the intervention revealed that the knowledge of the participating schoolchildren about *E. granulosus* improved by 22.8%.

The creation of comics and their use in children health education was reported in the study by Nascimento et al. (2023) who used comics as a teaching tool in a postural education program for students aged 7 to 10 years and verified the impact of comics on students' knowledge and posture. The intervention was carried out with 56 students in schools, who had no knowledge on the subject.

As a result, after the intervention referred to above, some differences were noted. The group achieved a knowledge rate between 94 and 100% in the four learning categories covered by the program; this interfered with the weight of the backpack and the way it was carried. Before reading the comics, 60% of the

students carried backpacks with loads greater than 10% of their body mass and 17% of the students had backpacks with two straps. At the end of the study, 93% of the students had backpacks of adequate weight and the number of students who used backpacks with two straps increased by 75%. In addition, the students' teachers reported having observed positive postural changes in the behavior of young people during classes (Nascimento et al., 2023).

4 Discussion

This scoping review aimed to identify which experiences are available on the use of comics in promoting the health of schoolchildren. Among the studies collected, it was possible to verify that most of the interventions were carried out in schools, but that the context of the school-age child in the hospital environment was also contemplated in the interventions.

The experiences presented in the results section, which were considered successful, were conditioned to the organizational structure of the use of comics and how they were offered to schoolchildren. The first difference identified between the studies was the variability in the duration of the intervention in each study was decisive to consider the study effective or not, some used 12-week protocols and others a single presentation.

The duration of intervention can improve the engagement of schoolchildren, as it provides more opportunities for practice, feedback, and refinement of acquired skills. In addition to improving the reduction of knowledge, and skills and promoting changes in behavior and attitudes (Hattie, 2009).

Another relevant factor for the success of the intervention was the use of strategies parallel to comic books, such as lectures, games, and newsletters. The combination of teaching methodologies allows mediators to address multiple paths to schoolchildren's knowledge, making them understand and master the content, in addition to meeting the children's different needs (Tomlinson, 2001). Consequently, the combination of methodologies can enhance student learning and the success of the intervention.

A necessary discussion for this study is that the reading of comics should be instructed for people who do not have the habit of reading comics, as these have particularities such as the logical direction of the comics (from left to right) and the differentiation between the types of balloons (scream balloon, thought balloon, narration balloon, among others). And understanding all these details before even reading is essential to ensure understanding of the content.

Children, depending on the age group, can also handle the stories according to their level of training. Thus, children who have not learned to read can interpret the story from the available images. According to the studies presented, only one (Santos, 2003) discussed in the results the impact of offering comics to children, without them having had prior contact, making the intervention process difficult and reducing the reader's ability to understand the content of the story.

Therefore, the importance of using comics as a tool to promote children's health is initially guided by primary issues such as investigating whether the public is a reader of comics. At the same time, the narrative structure of the story is considered

and whether it is adapted to the linguistic context of the readers. It is essential for the organization of the intervention that the supply of stories for children is not limited to just delivering the paper with drawings and waiting for the children to absorb all the messages, but it is necessary to use a process of immersion of these with the content for better understanding and absorption by the target audience, thus facilitating the achievement of the objective of the intervention.

5 Conclusion

This scoping review successfully addressed the issue of the article, identifying the available experiences on the use of comic books in promoting the health of schoolchildren and, from this, reinforcing the potential of this methodology for effective communication with children, on different topics. In addition, this study made it possible to understand the defining aspects of the effectiveness of an educational intervention with comic books, such as the duration of exposure and the use of associated strategies, such as educational videos and games.

As for the limitations, the greatest difficulty of this scoping review was to identify the studies that contemplated comics starting from their definition as sequential art, since many researchers used 'comics' as descriptors, but did not present in their study any usual relationship with the material.

Therefore, it is essential to continue analyzing studies of this nature, seeking to identify potential in educational interventions so that they can be replicated in school and non-school environments. It is also important to explore the effect of including comic books in the school learning routine and this prior immersion for future health education interventions using this methodology, as well as studies that contribute to defining a minimum time of contact between children and comic books for more effective communication.

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Author contributions

AS: Conceptualization, Data curation, Formal analysis, Methodology, Validation, Writing – original draft, Writing – review & editing. AdS: Formal analysis, Methodology, Supervision, Validation, Writing – review & editing. TV: Data curation, Formal analysis, Writing – review & editing. BX: Visualization, Writing – review & editing. RL: Formal Analysis, Visualization, Writing – review & editing. ÂO: Formal Analysis, Visualization, Writing – review & editing.

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Conflict of interest

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