Revista Educação & Cultura contemporânea
Universidade Estácio de Sá
Programa de Pós-Graduação em Educação
ISSN: 2238-1279

CHILDREN'S SOCIAL REPRESENTATIONS ABOUT VACCINE-VACCINATION

REPRESENTAÇÕES SOCIAIS INFANTIS SOBRE VACINA-VACINAÇÃO

REPRESENTACIONES SOCIALES INFANTILES SOBRE VACUNA-VACUNACIÓN

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https://doi.org/10.5935/2238-1279.2025v220035

Resumo

Com o objetivo de investigar os valores e crenças das crianças em relação à imunização por meio de vacinas, esta pesquisa foi desenvolvida com base nos princípios da pesquisa qualitativa em Representação Social, com crianças do 5º ano do Brasil, Colômbia e Portugal. Foi utilizado o teste de Associação Livre de Palavras, tendo o termo "vacina" como estímulo indutivo, embora as respostas fossem essencialmente sobre vacinação. A partir das palavras evocadas identificamos os elementos centrais, intermediários e periféricos das representações. Os grupos semânticos que compuseram o quadrante dos elementos centrais das crianças pesquisadas no Brasil foram "dor" e "medo", da Colômbia foram "medo", "cura" e "proteção", e de Portugal foram "ajuda", "saúde" e "proteção". Os resultados apontam para a importância do papel da educação em saúde como elemento norteador das crianças. Conclui-se que as crianças, aqui pesquisadas, portuguesas apresentam os elementos do núcleo central mais voltados para a promoção da saúde, enquanto que as emoções comparecem nas latinas, como o medo, fato menos veiculado no processo do ensino, contudo, mais próximo ao comportamento aprendido.

Palavras-chave: Representação social. Estudantes. Associação Livre de Palavras. Educação para a Saúde.

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ISSN: 2238-1279

Abstract

To investigate the values and beliefs of children about immunization through vaccines, qualitative research in Social Representation was conducted with 5th-grade children from Brazil, Colombia, and Portugal. The Free Association of Words test was used, with the term "vaccine" as the inductive stimulus, although the answers were essentially about vaccination. From the evoked words, we identified their representations' central, intermediate, and peripheral elements. The semantic groups that made up the quadrant of the central elements of the children surveyed in Brazil were "pain" and "fear", from Colombia were "fear", "cure", and "protection", and from Portugal were "help", "health" and "protection". The results point to the importance of health education as a guiding element for children. In conclusion, the core elements of Portuguese children focused on health promotion; in contrast, Latin-American children focused on emotions such as fear, which is less conveyed in the teaching process but closer to learned behavior.

Keywords: *Social Representation. Students. Free Association of Words. Health Education.*

Resumen

Para investigar los valores y creencias de los niños sobre la inmunización mediante vacunas, se desarrolló una investigación cualitativa en Representación Social, con niños de 5º grado de Brasil, Colombia y Portugal. Se utilizó el test de Libre Asociación de Palabras, con el término "vacuna" como estímulo inductivo, aunque las respuestas fueron esencialmente sobre vacunación. A partir de las palabras evocadas identificamos los elementos centrales, intermedios y periféricos de las representaciones. Los grupos semánticos que integraron el cuadrante de los elementos centrales de los niños encuestados en Brasil fueron "dolor" y "miedo", de Colombia fueron "miedo", "cura" y "protección", y de Portugal fueron "ayuda". "salud" y "protección". Los resultados apuntan a la importancia del papel de la educación para la salud como elemento orientador para los niños. En conclusión, los elementos centrales de los niños portugueses se centraron en la promoción de la salud; en contraste, los niños latinoamericanos se centraron en emociones como el miedo, que se transmite menos en el proceso de enseñanza, pero se acerca más a la conducta aprendida.

Palabras clave: *Representación Social. Estudiantes. Libre Asociación de Palabras. Educación para la salud.*

Introduction

In Brazil, immunization children's rates against 17 diseases reached 2017 the lowest levels in many years (Zorzetto, 2018). According to this author, the main reasons for this drop range from the misleading perception by part of the population that vaccination is not necessary because the diseases have disappeared, to problems with the computerized vaccination registration system. Furthermore, the reemergence of measles in Amazonas, which had been eliminated in 2016, occurred because of the drop in the coverage of the triple viral (Zorzetto, 2018).

A European Commission survey on measles vaccine trust, based on surveys conducted in all 28 countries during May 2018, showed that Portugal is the European Union country with the highest percentage of the population trusting the vaccines, considering them safe, effective and important for children. However, the European Centre for Disease Control reported more than 13,000 measles cases in Europe in one year, between September 2017 and September 2018 (Diário de Notícias, 2018).

The Epidemiological Bulletin of the Ministry of Health (Brasil, 2015) emphasizes that the lack of information about vaccines, as well as the way they are disseminated, collaborate with the decision not to vaccinate. Other factors that influence people's decision-making are public health policies, recommendations of health professionals, media and intrinsic factors to the individual, among them knowledge and information, past experiences, perception of the importance of vaccination and moral and religious convictions that contribute to the reappearance of infectious diseases (Moraes et al., 2018).

To capture the unvaccinated, Moura et al. (2018) highlight that there must be new strategies to know and reach this population. One of these strategies is raising awareness and incorporating new actors into the epidemic scenario, such as the scientific society, schools and universities. The acquisition of habits and attitudes constitute the most important dimensions of a Health Promoting School (HPS); for this to occur, the educator's role in the formation of the participant and critical citizens is fundamental (Araujo, 2013; Brasil, 2000; Lusquinhos & Carvalho, 2017, 2019). The concept of HPS emerged in 1991, in which schools adhering to this project implement a structured and systematized plan for improving the health of all students and teaching and non-teaching staff (OPAS, 1998; WHO, 1986).

In Brazil, the actions developed in the school environment take as reference the School Health Program (*Programa Saúde na Escola* - PSE), established by Decree n. 6286 of the Presidency of the Republic of Brazil in 2007. This program aimed to: i) promoting health and the culture of peace, reinforcing the prevention of health problems, as well as strengthening the relationship between the public health and education networks; ii) articulating the actions of the Unified Health System (*Sistema Único de Saúde* – SUS) to those of the public basic education networks, to expand the scope and impact of these organizations, related to students and their families; and iii) strengthen community participation in basic education and health policies, in the three government levels (Brasil, 2007).

In 1997, Colombia adopted the Regional Initiative of Health Promoting Schools, promoted by the Pan American Health Organization - PAHO and, in 1999, drafted a policy document called "Healthy School, Joy of Living in Peace", intending to formalize the role of healthy school facing health promotion policies (Campos, Robledo-Martínez, Arango-Soler & Agudelo 2012). In Portugal, the Directorate-General of Health and the Directorate-General of Education agreed on the goals and strategies for the implementation of HPS, and the country joined the European Network of Health Promoting Schools (ENHPS) in 1994 with only ten pilot schools and four health centers (Faria & Carvalho, 2004). It was expanded in 1997, and currently, all Portuguese elementary and secondary schools are considered Health Promoting Schools (SHE, 2013).

Thus, it is clear that teaching is the most effective way to help students acquire the knowledge, attitudes, values, and skills necessary to adopt a lifestyle that promotes their health (Stolarski, 2005). Then, it is the school's role to provide its students with knowledge re-elaboration to conform to values, skills, and practices favorable to health. School health education can be understood as a way to articulate the school with the community to build significant social responses (Chassot, 2006; Meyer, Mello, Valadão & Ayres, 2006).

Thinking about this need for an education that promotes scientific dissemination in the field of health, which enables the current generation to solve everyday problems and act critically in the context that surrounds them, the concern focuses on teacher training. Kimura, Cardoso, and Nascimento (2021) listened to undergraduate students about the challenge of becoming a teacher and pointed to the need to implement policies for restructuring curricula and valuing the teaching profession. In turn, Cardoso-Brabo and Sousa (2006) refer that most teachers of all levels of education have a mistaken vision of Science from the point of view of contemporary epistemology, which is one of the main obstacles to the renewal of teaching since it strongly influences the way of thinking, the attitudes and the way teachers teach.

It is in this context that this research is inserted, facing an educational scenario influenced by the accelerated pace of change in Science and Technology (ST), social transformations and pressure on the environment, requiring a new mentality, which should be more critical and participatory, with the goal that the subjects act not only in solving problems but also in decision making.

> A science and technology, through scientific dissemination, come to occupy an increasingly important and intrusive place in the most developed contemporary societies, which leads Moscovici to consider that the phenomenon of social representations constitutes something specific, not only as a psychosociological process but also as a historical phenomenon (Almeida et al., 2014, p.60)[6].

Recently, in March 2022, the pandemic of COVID-19, a disease caused by the new coronavirus (SARS-CoV-2), mobilized more than forty countries, scientists, pharmacists and various institutions around the world in search of a solution with the production of a vaccine (Hosangadi et al., 2020). Never has so much been said about vaccines, concomitant with the antivaccine movement that has gained strength associated with the crisis of confidence in science, reinforcing the importance of access to correct information and scientific dissemination as key elements that contribute to public health (Galli & Modesto, 2021).

Thus, education, while focused on the processes involving the subject and being the school responsible for the dissemination of science, is articulated with the theory of Social Representation (SR) that considers this subject as the elaborator of SRs, and such representations are contextualized constructions (Spink, 1993). Social representations determine how members of a group act and how they manage issues involving education (Gatti, 2003, p. 192). Thus, knowing the social representations of a social group is relevant since they influence the teaching and learning process (Magalhães, Maia & Alves-Mazzotti, 2009).

Therefore, research in the area can generate information that enables more concrete and directive actions in the field of Health Promotion in the school environment. In this sense, this work aimed to identify the meaning that Brazilian, Colombian and Portuguese children attribute to vaccination.

Social Representation in the context of education

[1] A ciência e a tecnologia, através da divulgação científica, passam a ocupar um lugar cada vez mais importante e intrusivo nas sociedades contemporâneas mais desenvolvidas, o que leva Moscovici a considerar que o fenômeno das representações sociais constitua algo de especifico, não apenas enquanto processo psicossociológico, mas também enquanto fenômeno histórico (Almeida, Santos & Trindade,2014, p.60).

O Social transformations bring along a symbolic framework that transits social groups, which agrees with the Social Representation Theory (SRT). Caravaca Morera Padilha, Vieira Da Silva & Sapag, (2015) and Gaspi, Duarte & Magalhães Júnior (2020) retrace the historical course of Social Representation, a theory elaborated by Serge Moscovici in 1961 (Moscovici, 2015), stemming from Emilio Durkheim's concept of collective representation. "Unlike Durkheim, who starts from collective representations to explain society, Moscovici is forced to explain the process of construction of social representations" (Sancovschi, 2007, p.11).

Thus, the representation is something that has a meaning for someone, the thought arising from the relationship between the subject and the object with which it relates, forming symbols that are expressed in the mind, and when collectively elaborated, gives meaning in communication with each other, allowing the interpretation of reality. For Alves-Mazzotti (2008), Moscovici's works constitute the conceptual matrix of SRT, which was later systematized by Jodelet when defining SR as a form of social thought. SRs are conceived through this network of concepts and images, which evolve through time and space so that they can be presented in a varied and complex way, interweaving cognitions and social bonds, making the SRs socially constructed (Caravaca Morera et al., 2015).

The SRT presupposes different ways of communicating, guided by different goals, whether consensual, common sense, formed in everyday life, or scientific; each generates its own universe, with language and internal hierarchy that characterizes it. The SRs are most often built in the consensual sphere because they "reflect on how individuals, groups, social subjects build their knowledge from their social, cultural inscription, etc., on the one hand, and how society makes itself known and builds this knowledge with individuals on the other" (Arruda, 2002, p.128).

Rateau, Moliner, Guimelli, and Abric (2012) contribute to the historical aspect of SRT in the clarification of fundamental concepts and in the way Serge Moscovici defined the two basic principles of SR: objectification and anchoring (Moscovici, 2015). Objectification is how a new object is incorporated and given a symbol, an image representing reality, constituting the figurative core penetrating the social body thorough communication and collective generalization that naturalizes the object. Anchoring co-occurs with objectification; it comprises the way the object finds its place analogously, in familiar

categories assimilated by an already existing and hierarchized network of meanings and is therefore interpreted differently depending on the social group.

The familiarization is a constructive process of anchoring and objectification because the purpose of the representations is to turn the unfamiliar into familiar, in that the representations are always a product of interaction and communication that acquires a specific form and have the function of conventionalizing the object, giving it a definite form and category, to then be a model shared by a group of people and constitute a type of reality (Moscovici, 2015); representations also have a prescriptive function, which imposes an irresistible force on the group and states what should be thought, thus being rethought, recited and represented (Moscovici, 2015).

Based on the structuralist approach (Gaspi et al., 2020), SRs present a hierarchical structure that acts as entities, with two different and complementary components, the central core and the peripheral elements:

1) The central core, proposed by Abric (2001), contributes to the identity of the group, where the cognitive elements are found concerning an object, with stable property, ensuring permanence and stability of the representation and constituting its common ground, the homogeneity of the group. The central core is the fundamental element of the representation, being unifying and stabilizing, and more resistant to change:

> The elements of the core, besides being dissociated from the context that produced them, acquire a greater autonomy that increases their possibility of use for the individual. The core is simple, concrete, graphic, coherent, and corresponds to the value system which the individual uses as reference, according to the culture, normative and social rules (Caravaca Morera, et al., 2015, p.1162)[7].

The central core has the following four characteristics: (i) it is marked by collective memory and, therefore, reflects the social and historical conditions of the group; (ii) it constitutes the common ground shared by the collectivity; (iii) it is stable and ensures the continuity of the representation; and (iv) it is insensitive to the social context (Rateau, 2012; Sá, 1996).

[7] Os elementos do núcleo, além de estarem dissociados do contexto que os produziu, adquirem uma autonomia maior que aumenta sua possibilidade de utilização para o indivíduo. O núcleo é simples, concreto, gráfico, coerente e corresponde ao sistema de valores ao qual o indivíduo utiliza como referência, de acordo com a cultura, as normativas e as regras sociais (Caravaca Morera et al., 2015, p.1162).

2) The peripheral elements, in line with the central core, allow a representation to be adapted to various social contexts, with the following three functions: (i) prescribe behavior and position-taking, which allows the group to know what is or is not normal; (ii) allow the personalization of the representation; this is what can lead to different interpretations of the object within the same group, even being compatible with the central core constitutes an internal variability of the peripheral system; and (iii) protect the central core, because the transformation of a SR often occurs through previous modifications in these peripheral elements (Rateau, 2012). In comparative studies, Sá (1996) clarifies that when differences occur in the composition of the peripheral system, but not in the central core, it is the same representation.

Considering that the SRT addresses the popular knowledge of common sense, shared and experienced by individuals in their social context (Gaspi et al., 2020), it is expected that the teacher is the professional able to help the student in the construction of new knowledge and wisdom for their daily practice, from social and reflective practice. Alves-Mazzotti (2008) highlights the role of SRs in education by valuing the understanding of symbolic processes that permeate the educational system. "Because of their relations with language, ideology, and the social imaginary, and especially because of their role in guiding conducts and social practices, social representations constitute essential elements for the analysis of the mechanisms that interfere in the effectiveness of the educational process" (Alves-Mazzotti, 2008, p.21).

Mohamed Chaid, a researcher from Sweden, has investigated SRs in an educational context and suggests SRT as an alternative way to study and explain teaching and knowledge acquisition processes in learning. The author highlights the significant interference of media in this process, as "the representations people elaborate in the world of learning are shaped by these modern instruments of communication" (Chaib, 2015, p. 364). Moreover, by investigating 5th-grade students in basic education about vaccination, Gaspi and collaborators (2019; 2025) have highlighted the need for enhancing teacher training in health education.

This access to information in digital media challenges teachers and traditional teaching with printed books and information; thus, media contribute to spread of people's conceptions and representations of the world. Teachers must understand the types of representations their students bring

to school, because "social representations are formed and disseminated mainly through non-formal and informal learning processes" (Chaib, 2015, p.365).

In this sense, SRs precede formal learning processes. The function of SRs in the educational context is to build a consensual relationship between the teacher, the student and the learning object, a fully negotiable relationship, having SRs as a sociocognitive facilitator that guides the communication process, defining the conduct and behavior of these actors. Therefore, SRs can be a tool to improve program planning in educational settings and, due to the basic foundations of the theory (communication, social interaction and common-sense knowledge) provide support for the proposal of SRs as an alternative theory of learning (Chaib, 2015).

Rateau et al. (2012) bring in the anchoring of representation, proposed by Moscovici, the possibility of incorporating a new object, which subsidizes the role of education, by providing the integration of the new to a preexisting system. The authors argue that this insertion process of the new object does not happen spontaneously, without conflict, because the older one is persistent, resulting in an innovative mixture.

This incorporation of the new object is perceived in research that inserts training along with the research process, as in the case of the research conducted on the representation that teachers shared about Environmental Education, while activities related to the environment were carried out (Galvão & Magalhães Júnior, 2016). The word "awareness" composed the central core of representation and was present in the teachers' speech; however, the authors question whether the teacher has an appropriation of this term or uses it because they are experiencing its repetition in various speeches around environmental education. Therefore, the school and the other spaces where the subjects are inserted contribute to social representations. Thus, this research with students from three countries aims to answer the question: What meaning do these students attribute to vaccination?

Methodological procedures

Data collection occurred among 5th-grade students from Brazil, Colombia, and Portugal. Convenience sample in schools with a university partnership. In one school for the country: Manaus (Brazil), Villavicêncio (Colômbia) and Braga (Portugal). Data were obtained through the Free Word

Association Test (Bauer & Aarts, 2002; Carmo, Leite & Magalhães Júnior, 2017), which had the expression "vaccine" as an inductive stimulus.

This test, when applied, required the individual to write the first five words that came to mind about the inductor word used. Then, the words were classified according to their degree of importance, assigning the number one for the most important and up to five for the least important. This technique of word ranking allows the re-evaluation of the order in which they were readily evoked, allowing a cognitive organization of these terms (Naiff, Naiff & Souza, 2009; Rocha, 2009). After the ranking, the student was asked to put a justification for each word a justification for each word to give us the meaning behind each word (Magalhães Júnior & Tomanik, 2012; Carmo, Magalhães Júnior, Kiouranis & Triani, 2018) and fill in personal data, such as age and gender.

The frequency is formed by the occurrence of the same evoked words or the ones with the same meaning that will give rise to the groups; therefore, the groups are formed by words with the same semantic content. Some words were more frequent and readily evoked, being classified as more important and given a classification 1 and 2, while others were not so frequent and last remembered, and therefore, classified from 3 to 5. Words with the same semantic meaning are grouped, and those with only one frequency and no proximity to others are discarded. According to the literature, they do not present the importance of the representativeness of the group (Magalhães Júnior & Tomanik, 2012).

The diversity of frequency and degree of importance attributed to the meaning of the words allow them to be grouped in different quadrants, demonstrating how the answers of the participants were organized through frequency analysis (F) and the average order of evocations (AOE), it is possible to know the structural composition of the Social Representation. The AOE uses the sum of the degree of importance that participants attributed to a particular word or semantic group, divided by the frequency with which the word was evoked, that is, the sum of the number of times the term was evoked (Galvão & Magalhães Júnior, 2016; Magalhães Júnior & Tomanik, 2013).

The frequency (f) and average order of recall (AOE) of each group and the average frequency (F) and average of the average orders of recall (AOE) of the groups were determined using the formulas proposed by Galvão and Magalhães Júnior (2016): average order of evocation (AOE) per group (∑G/f (G = degree of importance; f = group frequency), the average of the frequencies (F = ∑f/GS (∑f = sum of the

frequencies of all the groups; GS = number of semantic groups)) and the average of the AOE: ∑AOE/GS (sum of the AOE of each group; GS, number of semantic groups) (Galvão & Magalhães Júnior, 2016).

According to the assumption of the structural perspective of social representations of Abric (2001), the distribution in four quadrants allows the classification of the probable central and peripheral elements of a social representation. The words with a high frequency and to which subjects attribute importance in the definition of the object express a central and organizing meaning of the social representation. The first quadrant is the information that probably groups the central core of the Representations, and the second and fourth quadrants are the first and second periphery, respectively. In the third and fourth quadrants are the elements belonging to the contrast zone, which can support both the central core and the peripheries (Bertoni & Galinkin, 2017; Ortiz, Triani & Magalhães Júnior, 2023).

The test was applied collectively in the classroom and took about 20 minutes.

Figure 1 presents the number of students by country and gender. All were between 10 and 12 years old.

Figure 1 – Number of students per gender investigated in Brazil, Colombia and Portugal

Country	Female	Male	No identification	Total
Brazil	12	11	1	**24**
Colombia	11	11	4	**26**
Portugal	09	12	-	**21**
Total	**32**	**35**	**6**	**73**

Source: The authors, 2023.

Test results for the three countries surveyed

Results for Brazilian students

When analyzing the evocations made by the 24 Brazilian students, all of them answered and evoked the five words, registering a total of 120 words, which were organized into 12 groups. From this total, 10 words were discarded for having a frequency equal to one, leaving 110 words for analysis. The mean frequency was 9.16, and the mean evocation order (MEO) was 3.03. According to the averages

obtained, we delimited the words that were central, intermediate, and peripheral elements of the representations.

Figure 2 – Elements of the SR referring to Vaccine presented by students in Brazil.

Central Elements – 1st quadrant			Intermediate Elements – 2nd quadrant		
High f and low Average Order of Evocations F≥9,16 e AOE<3,03			High f and low Average Order of Evocations F≥9,16 e AOE≥3,03		
Word	Freq.	AOE	Word	Freq.	AOE
Fear	20	2,55	Positive Feelings	13	3,62
Pain	17	2,41	Health	13	3,15
			Protection	12	3,16
Intermediate Elements – 3rd quadrant			*Peripheral Elements – 4th quadrant*		
Low f and low average Order of Evocation F< 9,16 e AOE<3,03			Low f and high average order of Evocations F<9,16 e AOE≥3,03		
Word	Freq.	AOE	Word	Freq.	AOE
Nervous	9	2,89	Sadness	8	3,62
Cure	4	2,00	Crying	7	3,14
Insecurity	3	2,30	Needle	2	4,00
			Anger	2	3,50

Source: The authors, 2023.

By analyzing Figure 2, it can be said that the words or semantic groups "Pain" and "Fear" possibly constitute the central core of the Representations that the surveyed students share about vaccine and vaccination, as they present high frequency and low AOE, as pointed out by Ortiz et al. (2023). The negative representation they express about vaccines is shown.

We selected the writing of some students and the meaning they gave to the words that came to mind when they performed the justification of the words:

"The fear for me is when I go to the doctor's room I am afraid of the needle." (11-year-old male student).

"I am very afraid; sometimes I am afraid of the needles because sometimes they are big, and it makes you want to cry, and it gives you pain, and it seems that your arm falls asleep; it makes you want to scream, scream in pain." (11- year-old female student).

Results for the students in Colombia

When analyzing the evocations made by the 26 Colombian students, 24 evoked the five words requested, one evoked 4 words, and one evoked 3 words, consisting of a total of 127 words registered, which formed 19 groups. Of this total of words, 17 were discarded for having a frequency equal to one, leaving 110 words for analysis; the mean frequency was 5.58, and the mean evocation order (MEO) was 2.96.

Figure 3 presents the central, intermediate and peripheral elements of the representations.

Figure 3 – Elements of the SR referring to the Vaccine presented by the students in Colombia.

Central Elements – 1st quadrant			*Intermediate Elements – 2nd quadrant*		
High f and low Average Order of Evocations F≥5,58 e AOE<2,96			High F and high Average Order of Evocations F≥5,58 e AOE≥2,96		
Word	Freq.	AOE	Word	Freq.	AOE
Fear	16	2,81	Pain	18	3,00
Medication	13	2,85	Application	9	3,67
function			material		
Protection	8	2,50			
Cure	6	2,50			
Intermediate Elements – 3rd quadrant			*Peripheral Elements- 4th quadrant*		
Low F and low Average Order of Evocations F< 5,58 e AOE<2,96			Low F and high Average Order of Evocations F<5,58 e AOE≥2,96		
Word	Freq.	AOE	Word	Freq.	AOE
Health	5	2,00	Tension	4	3,25
Distrust	3	2,67	Blood	4	3,00
Wellness	3	1,67	Infection	3	3,33
Illness	2	2,50	Anguish	2	4,00
Hospital	2	2,50	Confidence	2	4,00
			Scare	2	3,50
			Vitamin	2	3,50
			Indecision	2	3,00

Source: The authors, 2023.

By analyzing Figure 3, it can be said that the semantic groups "Fear", "Medicine function", "Protection" and "Cure" possibly constitute the central core of the representations that the surveyed students share about the vaccine and vaccination.

We selected the meaning that some students gave by choosing and ordering the words when they performed the justification of the words (our translation):

"Vaccines are for not getting sick when we are not undecided; we feel pain, but it heals the illness; vitamins take away the pain". (Female student, 13 years old).

"So that later on you don't get sick; for fever, there is Paracetamol; for cough, they give you a pill; so that you don't catch the flu and you are well". (12-year-old female student).

"Fear of being injected in the buttock or arm; pain when they inject the needle in the arm; it prevents us from getting sick, to take care of our health; cotton prevents blood from coming out; indecision so that we avoid some disease". (12-year-old female student, no gender identification).

Results for the students from Portugal

When analyzing the evocations made by the 22 Portuguese students, one abstained from answering, leaving a total of 21 students, of whom only one evoked 4 words. 104 words were registered, forming 20 groups. Of this total, 13 words were discarded for having a frequency equal to one, leaving 91 words for analysis. The mean frequency was 4.55, and the mean evocation order (OME) was 2.99. Figure 4 presents the central, intermediate and peripheral elements of the representations.

Figure 4 – Elements of the SR referring to the Vaccine presented by the students from Portugal

Central Elements – 1st quadrant			*Intermediate Elements – 2nd quadrant*		
High f and low Average Order of Evocations F≥5,58 e AOE<2,96			High F and high Average Order of Evocations F≥5,58 e AOE≥2,96		
Word	req.	AOE	Word	req.	AOE
Protection		2,22	Pain		3,78
Health		1,44	Fear	4	
Doctor		2,67	Medicine		4,00
Help		2,00			

			Disease		3,60 3,00
Intermediate Elements – 3rd quadrant			*Peripheral Elements- 4th quadrant*		
Low F and low Average Order of Evocations F< 5,58 e AOE<2,96			Low F and high Average Order of Evocations F<5,58 e AOE≥2,96		
Word	req.	AOE	Word	req.	AOE
Cure Negative feeling Courage Bacteria Nurse Flu		2,00 2,00 1,33 2,50 2,50 2,50	Needle Analysis Important Curiosity Blood Microbe		3,33 4,50 4,50 4,00 4,00 4,00

Source: The authors, 2023.

Discussion of the results

In this research, although the inducing stimulus was the expression "vaccine," students who participated in the study in all three countries responded in terms of the vaccine itself (its constitution and function) but also, above all, about vaccination (the process of managing the vaccine). The study was carried out with students attending a 5th-grade class at a school in each country studied and does not aim to generalize or inductively extrapolate the data, as is typical of TRS; the data conforms to the group to which they belong (Gaspi, Duarte & Magalhães Júnior, 2020).

Students in Brazil associated "vaccine" with the words or semantic groups "pain" and "fear" that constituted the central core (Figure 2). These two categories may be associated with painful memories and traumas experienced by students, which generate tension and anxiety, which corroborates previous studies by Gaspi and collaborators (2019) with Brazilian 5th-grade students, in which these exact words "pain" and "fear" also constituted the central core. Therefore, to mitigate possible conflicts between the

information received at school and that brought by the social context, it is important to take multidisciplinary action with the support of professionals from various areas. These actions are provided for in the Health at School Programme (Brasil, 2007) since school education and health are not the sole responsibility of the school but mainly involve joint actions between the Department of Education and the Department of Health.

Students in Colombia also presented the word "fear" (Figure 3), which was the only negative expression, and in Brazil, the central core of the representations was constituted only by negative words. For the students who participated in the research in Colombia, the other words were positive semantic groups: "cure", "protection", and "medicine function". In turn, the central core obtained by the Portuguese students' answers was constituted exclusively by positive semantic groups: "Protection", "Health", "Doctor", and "Help" (Figure 4). As in the previous study (Gaspi, Magalhães Junior & Carvalho, 2019), we note the need for strategies in science teaching in Brazil, with expanded discussion in the educational environment that favors immunization, as well as the need to understand the reasons that lead to the spread of negative culture about vaccines and vaccination.

The words "pain", "immunity" and "important" were also identified in the social representation of parents or guardians, residents in Goiânia - Goiás, about chickenpox vaccination, two words being positive, favorable to the practice of vaccination, and one related to the physical implication resulting from this action (Correia, 2015). Pain is one of the adverse events predicted in the epidemiological surveillance manual of the Ministry of Health, "among the expected events, we can have relatively trivial events, such as fever, pain and local edema" (Brasil, 2014, p. 40). The negative evocations such as pain and fear can be understood as they represent the adverse events caused by the vaccine, and the pain that the Health Surveillance points out is a pain after the application of the vaccine. These reports contribute to health professionals performing positive and assertive communication, not only with parents or guardians but also with the child seeking to minimize fears about vaccination. The school in Brazil and Colombia can and should also manage this information to promote the demystification that every vaccine causes pain because several do not even use the injectable form.

In other studies (Correia, 2015; Vaz, 2003), parents of Brazilian children show concern about the child's pain and feel sorry for them, but it is hardly an influencing factor for non-vaccination, because they

are aware of the importance of immunization. This pain that parents report seems to be more associated with the pain that children present in the SR, the pain of the needle puncture used in the vaccine.

The perception of immunization was present in the representation of children surveyed in Colombia (Figure 3), with the semantic group "protection", as well as in Portugal (Figure 4) with the semantic groups "help" and "health". These positive words represent important concepts that contribute to immunity, as they are favorable to the practice of vaccination, which can provide more peace of mind to parents or guardians. A study with parents of children in Romania, when asked about their children's vaccination, present a positive word: "immunization" in the central core, but also negative "suspicion", indicating doubts about the safety of vaccines and fear that the intentions behind their administration may be questionable (Arhiri, 2014).

In the group researched here, the "medicine function" and "cure" present in the central core in the representation of the children from Colombia is equivalent to "medicine" present as an intermediate element in the second quadrant in the representation of the children from Portugal. It is probably a conceptual misunderstanding, or the child associated the injectable route used in most vaccinations or with the medicine injection. Since they are 5th-grade students, many of these concepts are not consolidated, which may indicate that these representations come from common sense, most likely from the family context.

The word "vaccine" was also used in the evocation test for pregnant women, which sought to identify the attitudes, experiences, concepts, meanings of the children's vaccination process (Pugliesi, Tura & Andreazzi, 2010). These pregnant women evoked more frequently the words "prevention" and "protection", constituting the central core of the representations of the group. The author highlights that "even if some resented the pain involved in the application of some immunizers, they were compensated by the benefit they recognized implicit in the act" (p.81). The results signal that mothers are aware of the benefits of immunization, which results from several factors that determine the change in mothers' observance. Indeed, "vaccination is the preventive measure of greatest impact in reducing the occurrence of infection in any age group" (Brenol et al., 2013, p.14).

However, the antivaccine movement that originated in Europe is growing in Brazil (Pinto Junior, 2019). Publication on the antivaccine movement in Brazil points out some aspects of their maintenance,

such as the fear of deleterious effects (local inflammatory reactions, systemic and allergic effects), the low level of education and income, the misinformation of health professionals themselves, and the neglect of disclosure about the act of vaccination (Nassaralla et al., 2019). The authors warn that these circumstances are favorable for the reappearance of already controlled diseases, such as smallpox and measles.

Another research in Brazil, specifically with middle-stratum couples in São Paulo, showed that the arguments of couples who did not vaccinate are based on symbolic-practical referential that value and seek a healthier life and less intervention from allopathic medicine, as well as the autonomy of parents in the face of standardization imposed by the State (Barbieri, Couto & Aith, 2017). Several factors may have influenced the drop in childhood vaccination coverage in Brazil from 2010 to 2020, a situation which became worse in 2020, causing concern about the possibility of infectious-contagious diseases reaching the population again (Leite, Ribeiro, Vieira & Gama, 2022).

The main causes of refusal of vaccination are philosophical, religious, fear of adverse events, and ignorance about the severity and frequency of diseases (Mizuta, Succi, Montalli & Succi, 2019). Among the arguments of physicians against some immunizations are the superiority of the natural immunity produced by the disease itself over the lasting immunity caused by the vaccine and the possible induction of autoimmunity caused by vaccines (Levi, 2013). On the other hand, parents or guardians of children may exercise some carelessness or negligence (Brasil, 1990). As for the induction of autoimmunity, it is a theoretical assumption that lasting immunity does not occur in all types of diseases requiring repeated vaccinations (Levi, 2013). In this sense, vaccination has a social representation because it is not only an individual benefit but also a collective one, since the act of vaccinating or not can compromise an entire community.

According to Berger and Luckmann (1973), the human being goes through two types of socialization: i) the primary, when the child receives his training in the family; ii) the secondary - in the other stages where the subject interacts with other social groups, among them the school, which can rework what was inserted in the primary socialization. "In the family context of parent-child relationships, parents' performance is represented by various educational, social skills that can influence their children's behavioral repertoire" (Cia, Pereira, Del Prette & Del Prette, 2006, p.74). Indeed, there are various micro and macrosystems, emphasising the biological, psychological and social aspects that influence human

relationships and behavior (Cruz & Reis, 2022). For Moscovici (2015), there is a particular relationship between communication systems and social representations since the former modifies ways of perceiving, feeling, intuiting and thinking throughout history and the media, in turn, communicates, disseminates and propagates a certain social representation (Gomes, 2001).

These discussions on the antivaccine movement are controversial issues that can be articulated in socio-scientific issues, addressed in STS methodologies (Science, Technology and Society), which presuppose the articulation between technological development and its influence on society, as well as validate the actions of science that must be committed to social welfare, and not with the simple interests of developing technologies that are consumed without critical thinking in an increasingly capitalist world, without concern for the environment (Azevedo, Ghedin & Silva-Forsberg, 2013; Moraes & Araújo, 2012). STS proposes to discuss the presence of social participation in decision-making within the proposals of educational practices, it is associated with the discussion of issues that are on the agenda in the media or the students' daily lives (Strieder & Kawamura, 2017).

These data reinforce the need for educational actions, such as the one performed by Costa, Meneses, Carmo, Solis-Cordero, and Palombo (2020), which achieved increased vaccination coverage in children whose parents were stimulated through health education by being reminded about the child's vaccination status and its importance. Remembering that the non-vaccination in Brazil is an illegal practice and a violation of children's rights, provided in the Statute of Children and Adolescents (*Estatuto da Criança e do Adolescente - ECA*, 1990) that guarantees in Article 14, § 1 "It is mandatory to vaccinate children in cases recommended by health authorities."

As the school acts in this social and community interface, Health Promotion and Education must be in the teacher's training curriculum and thus "prepare education professionals to exercise the role of Health Promoters, inside the school and in the community where they live" (Ievolino & Pelicioni, 2005, p.108). Thus, the school should be the partner of the Health Unit because the context of school life is fundamental for health promotion (Lusquinhos & Carvalho, 2017; 2019); having the teacher as an articulating and formative element, not only transmitting knowledge about the dissemination and prevention of diseases but promoting healthy attitudes (Rodrigues et al., 2011). Therefore, Health Promotion and Education must link the community with the school, as provided for in its programme,

since it is essential to guide parents and primary care in constructing social representations on vaccination, using scientific data and reliable information.

We realize that teachers often act by imposing their own representation, as Alves-Mazzotti (2008, p.42) states: "as a socio-professional group, we build our own representations and, based on them, we build our practices and impose them on students, assuming that we know what is good for them". In teaching and learning processes, the importance of knowing the core of the SRs of a given group, according to Almeida Junior, Magalhães Júnior, and Batista (2022, p. 347), consists in "understanding the core of the representation and, based on this scenario, planning intervention actions when one aims to modify these representations". However, the modification of these representations has a direct correlation with the formation of this teacher, as concluded by Gaspi, Mendes, Magalhães Júnior, and Proença (2021), who, when researching the SR of graduate students about "Being a Science teacher", identified that the researched group presented formative characteristics of traditional pedagogy, more focused on the teacher than on the student.

In an exploratory comparative study of the national education plans in Brazil and Colombia, it is identified that in the National Education Plan (*Plano Nacional de Educação* - PNE) (2014-2024) of Brazil, in its frameworks there are the promotion of citizenship; improvement in the quality of education; humanistic, scientific, cultural and technological promotion. In the National Decennial Education Plan (*Plano Nacional Decenal de Educação* - PNDE 2006-2016) of Colombia there is a proposal for education for peace, coexistence, citizenship; Science and Technology integrated with education (Cuervo-Escobar, Bonamino & Costa, 2016).

The Basic Law of the Educational System in Portugal (National Curriculum - law decree 55-2018) establishes the curriculum for primary and secondary education, provides a National strategy for education for citizenship, and has as a guiding principle the promotion of improving the quality of teaching and learning; mobilization of educational agents for the promotion of educational success; assumption of the importance of the transdisciplinary nature of learning; assumption of arts, science and technology; promotion of education for citizenship.

These legal frameworks in the three countries show a close relationship with the principles of the Health Promoting School (HPS) that envisions a citizen, participatory and critical education (Araujo, 2013;

Faria & Carvalho, 2004; Lusquinhos & Carvalho, 2017; 2019; SHE, 2013) and articulation with the STS approach and TRS, by proposing social relations and how they influence human experience, quality of life, and social and economic progress. It involves understanding the impact of science and technology on society in a dimension aimed at the public understanding of science within the purpose of basic education for citizenship training (Aikenhead, 1994; Santos & Mortimer, 2002).

Final considerations

This research showed conceptual misconceptions in children surveyed from South America (represented by Brazil and Colombia) when associating the vaccine with cure and medicine, while children from Europe (represented by Portugal) were mistaken about the health professional who administers the vaccine, as it rarely is the doctor because it is the nurse's job.

The representation of children in the study in Amazonas reinforces the negative perception that children in Brazil have in their representations, as well as the lack of correct concept about vaccines may indicate that the various campaigns are not promoting a positive view in children about vaccines, such as those developed in the media, the National Vaccination Plan, the charge of the vaccination card for the effective enrollment of children in early childhood education and the force of law that requires parents or guardians to immunize children.

The importance of the SR of children regarding the vaccine consists in its application in various social contexts such as the informal family environment, non-formal ones such as health units and doctors' offices, and formal ones such as the school. It seems to us that the primary contribution is the one that the School can develop, through the possibility of pedagogical rethinking and the abandonment of the mechanization of teaching, which consists in passing on content, without its contextualization.

We also understand the contribution of SRT to elucidate the representations of children about vaccines, which can be used in teaching to promote a more directive proposal. Therefore, SRT can be a tool that provides insight into the educational reality and can contribute to the development of public policy. Associating the SRT with the STS approach is possible because, from the data of the central core, one can seek theoretical and practical proposals in the field of contextualization of social reality and development in S&T that can contribute to promoting possible misguided conceptual changes.

These results can be further studied in future research related to the National Education Plan of each country and the World Health Promotion Agenda. In the family context, there may be a crossing of data in the search for the SR of parents and children because, until now, the research has been carried out distinctly. The children present the central core rooted in common sense, probably with strong influence from the family group, indicating that the role of the school as a trainer must go beyond the children. The mention of needles or injections when talking about the relationship between vaccines and pain shows that, probably, children confuse the aspect of many vaccines being injectable with drug injections, reinforcing the role of the media as an ally of education.

Therefore, it is possible to think of a formative proposal for teachers, with the possibility of SRT studies, because if the educator understands the representation of their students and how they are schematized, those that are part of the central nucleus (more rooted and difficult to move), and the process of objectification and anchoring, it can contribute to understanding the complexity that involves the learning process for the student and also serves as a tool to adjust the teacher's teaching. It also makes it possible to think of effective proposals for teacher training in STS along with the concept of HPS, aiming at a teaching practice that articulates knowledge, skills and attitudes that help in the formation of a more participatory and autonomous citizen.

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Como citar este artigo:

ARAUJO, Cleusa Suzana Oliveira de; MAGALHÃES JÚNIOR, Carlos Alberto de Oliveira; VILAÇA, Maria Teresa; PERDOMO, Martha Inés Yossa; CARVALHO, Graça Simões de. Children's social representations about vaccine-vaccination. **Revista Educação e Cultura Contemporânea**, v. 23, 2026. Disponível em: https://mestradoedoutoradoestacio.periodicoscientificos.com.br/index.php/reeduc/article/view/11517. Acesso em: dd mmm. aaaa.

Financiamento: This study was financed in part by the “Coordenação de Aperfeiçoamento de Pessoal de Nível Superior” – Brazil (CAPES) – Finance Code 001. The first author is grateful to the Brazilian CAPES National Postdoctoral Program. The study was also partially supported by the Research Unit UID/317 (Research Centre on Child Studies of the University of Minho, CIEC) of the Portuguese Foundation for Science and Technology (FCT).

Contribuições individuais: Conceituação, Metodologia, Recursos, Software, Visualização, Curadoria dos Dados, Investigação, e Escrita – Primeira Redação: Cleusa Suzana Oliveira de Araujo e Carlos Alberto de Oliveira Magalhães Júnior. Análise Formal, Administração do Projeto, Supervisão, Validação, e Escrita – Revisão e Edição: Maria Teresa Vilaça, Martha Inés Yossa Perdomo e Graça Simões de Carvalho.

Aprovação Ética: O artigo cumpre os padrões éticos e seguiu integralmente o protocolo de Ética em Pesquisa (Número: 09703719.4.0000.5016).

Declaração de uso de Inteligência Artificial: Durante a preparação deste trabalho, os autores afirmam não terem utilizado recursos ou serviços de Inteligência Artificial e assumem total responsabilidade pelo conteúdo da publicação.

Revisores: Os autores (Revisão de Línguas e ABNT).

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Recebido em 31 de julho de 2025
Versão corrigida recebida em 10 de setembro de 2025
Aprovado em 16 de dezembro de 2025