

Mediators' perceptions about the inclusion of autistic people in Science Museums

ABSTRACT

This study aimed to raise mediators' perceptions about including people with Autism Spectrum Disorder in the activities developed in Brazilian science museums and centers and to identify their inclusive practices. Sixty-five mediators working in science museums in four Brazilian regions (Southeast, Northeast, South, and Midwest) participated in this study. The instrument for data collection was a semi-structured questionnaire made available on Google Forms. The collected data were analyzed through thematic analysis and simple frequency graphs. The results indicate that the mediators have been attending to the public with ASD in science museums but without training on inclusive practices for this public. Mediators notice the lack of attention, repetitive movements, and discomfort due to the noise in the museum during the visits of the public with ASD. In short, we can infer that mediators have been looking for strategies aimed at communication accessibility. However, scientific dissemination institutions need to invest in professional training and implement actions aimed at the inclusion of the public with ASD.

KEYWORDS: Accessibility; Autism Spectrum Disorder; Science Museums.

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Percepções de mediadores sobre a inclusão de autistas em museus de ciências

RESUMO

Esse trabalho teve como objetivo levantar as percepções de mediadores acerca da inclusão de pessoas com transtorno do espectro autista (TEA) nas atividades desenvolvidas nos museus e centros de ciências do Brasil e identificar suas práticas inclusivas. Participaram deste estudo 65 mediadores atuantes em museus de ciências localizados em quatro regiões brasileiras (Sudeste, Nordeste, Sul e Centro-Oeste). O instrumento para coleta de dados foi um questionário semiestruturado disponibilizado no Google Forms. Os dados coletados foram analisados por meio da análise temática, além de gráficos de frequência simples. Os resultados indicam que os mediadores têm atendido nos museus de ciência, o público com TEA, porém sem uma formação acerca de práticas inclusivas para o público em questão. Durante a visita, os mediadores percebem no público com TEA falta de atenção e movimentos repetitivos e incômodos em função do barulho presente no museu. Em suma, podemos inferir que os mediadores buscam estratégias voltadas para a acessibilidade comunicacional, contudo, verifica-se a importância de investimentos das instituições de divulgação científica na formação profissional, além da implementação de ações voltadas para a inclusão desse público.

PALAVRAS-CHAVE: Acessibilidade; Transtorno do espectro autista; Museus de ciências.

INTRODUCTION

As spaces of non-formal education and science dissemination, science museums have the social role of broadening scientific knowledge in a democratic and inclusive way, being a space to complement formal education. According to the new definition of museums established by the International Council of Museums (ICOM, 2022), they should be inclusive and accessible, highlighting aspects regarding the accessibility of people with disabilities to scientific and cultural goods.

However, previous studies point out that many of these spaces are still not prepared to receive people with disabilities (Rocha et al., 2020; Rocha et al., 2021). From a review of the measures and indicators of accessibility in museums and science centers, Rocha et al. (2020) established three indicators: physical accessibility (physical access, accommodations, space use, design, and use of objects); attitudinal accessibility (attitudes that seek to eliminate social barriers, inclusive practices, reception, engagement, and institutional policy), and communication accessibility (regarding equipment and resources that allow the overcoming of barriers in interpersonal communication, including writing and informative materials, etc.). When analyzing the accessibility measures present in museums, the authors concluded that the majority involved only the physical accessibility of their infrastructure and exhibitions. Among the investigated science museums, most (61.5%) do not invest in training their professionals (mediators) to reduce communication barriers with the visiting public. In this regard, some studies point out the feeling of lack of preparation and insecurity of those attending a public with disabilities in Brazil and abroad (Kulik & Fletcher, 2016; Rocha et al., 2021). Silva (2022) emphasizes the lack of inclusive initiatives and accessibility strategies for the public with intellectual disabilities. The author also highlights that, in Brazil, it is rare to find specific training in this area for museum professionals; training is minimal or nonexistent. Moreover, the lack of public investment affects these professionals, many of whom are scholarship holders and, therefore, stay for a short time in the museums (Carlétti & Massarani, 2015).

A common characteristic in science centers and museums is the presence of people responsible for receiving, serving, welcoming, and communicating with visitors. These professionals have different denominations: "mediators, educators, monitors, guides, interpreters, etc." (Massarani et al., 2022, p. 2). According to Henrique Junior and Pereira (2024), mediators in science interactive museums are not explainers, as they seek to lead the public to reflect on scientific knowledge from their own experiences. Besides this, they promote different interactions between the scientific exhibitions and the visitors, being "an agent that can enhance the deepening and broadening of the discussions" (Rocha & Marandino, 2020, p. 12). The mediator in science centers and museums is vital to guarantee an enriching and inclusive experience for all visitors, contributing to scientific education and raising the public's interest in science. To fulfill this role, these individuals must be prepared to promote a mediation that answers the demands and particularities of the visiting public.

In this sense, in this work, we discuss the insertion of the public within the autism spectrum disorder (ASD) in science centers and museums and the mediation processes for this public. According to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), ASD is an early-onset disorder of neurodevelopment (since early childhood), characterized by a deficit in two central areas: 1) in communication and social interaction and 2) repetitive and restricted patterns of behaviors, interests, and activities (American Psychological Association [APA], 2023).

Therefore, knowing the main characteristics of the different public visiting the museum is vital for knowledge mediation and the participation of everyone during the activities proposed by the space of science dissemination. Kulik and Fletcher (2016) highlighted the concerns of guardians of ASD children during a visit to the museum. According to the authors, guardians are afraid of people's judgments about their children's behavior, as those working in the museums, such as mediators, do not know the specificities of these children. In the study, they also show a lack of interest in visiting these places with them because there are no activities for their children in cultural spaces. Furthermore, the spaces do not seek to promote communicational and attitudinal accessibility (Kulik & Fletcher, 2016). On the other hand, some studies point out the benefits of people with ASD to participate in activities in science centers and museums, such as socialization, sharing of information and communication, and curiosity stimulation (Deng, 2015; Langa et al., 2013; Mulligan et al., 2013). However, to provide effective participation of people with autism, science museums need to create accessible environments, guaranteeing an inclusion that favors overcoming limitations and promoting communicational and attitudinal accessibility.

We can also highlight the specialized literature studies that show the relationship between the promotion of scientific education with children with ASD and the development of social abilities, such as communication and social interaction, besides raising interest in scientific themes (Martins & Pereira, 2021; Pereira et al., 2023). In these works, we can perceive that, though these children have difficulties in communication and social interaction, bringing them to a scientific environment can enhance the development of these abilities. Hence, the strategies of scientific education towards the inclusion of people with ASD in spaces of formal and non-formal education tend to have promising results for autists.

Considering the above, this study has the following guiding question: How do mediators perceive and promote the inclusion and accessibility of people with ASD in Brazilian science centers and museums? To answer this question, the article raised the perceptions of mediators about the inclusion of people with ASD in the activities developed in the science museums and centers in Brazil and identified their inclusive practices. We hope this work can help discover the inclusive practices already implemented in Brazilian science centers and museums and understand their challenges. Furthermore, it reflects on the inclusion and accessibility of people with ASD in different spaces of non-formal education.

ACCESSIBILITY FOR PEOPLE IN THE AUTISM SPECTRUM IN MUSEUMS

A visit to a museum can create several instabilities for a person with ASD. According to the DSM 5-TR, some autists can present sensorial overload called “hyper- or hyporeactivity to sensory input or unusual interest in sensory aspects of the environment (e.g., apparent indifference to pain/temperature, adverse response to specific sounds or textures, excessive smelling or touching of objects, visual fascination with lights or movement).” (APA, 2023, p. 61). Thus, some elements in the museum can limit and/or hinder the mediation process, such as loud or sudden noises, shining and blinking lights, and rough objects (Theriault & Jones, 2018).

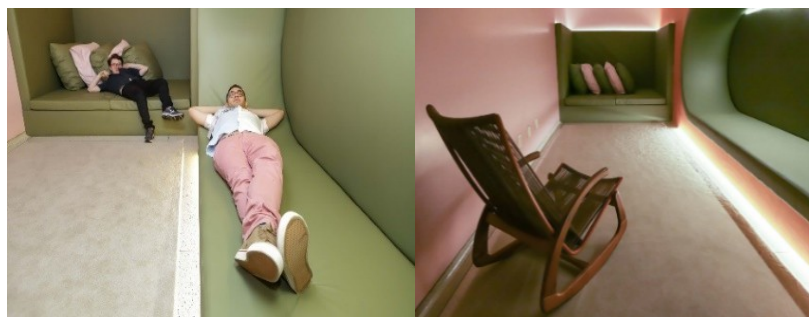
In this perspective, Kulik and Fletcher (2016), in a study about accessibility North American museums, highlight that parents of children with ASD are afraid of taking their children to museums because of the many sensorial stimuli —noise, blinking lights, many people — that could lead to their children’s dysregulation or stress. In their turn, Lussenhop et al. (2016) show the accessibility strategies undertaken in some North American museums regarding sensorial issues, in which different museum environments provide a welcoming space, limiting the resources of light and sound in the exhibitions. Regarding inclusive practices of people with ASD, Salasar (2019) believes that communication is the base of message transmission in museums. Therefore, when welcoming an autist, it is essential to seek accessible communication strategies, as it can be hard for them to understand slang and double-meaning expressions.

Considering the need for science centers and museums to rethink these spaces, Fletcher et al. (2023) work with the concept of “sensorial paradises,” which consist of creating self-regulation environments for neurodivergent children, their families, and friends, when necessary, during the visit to museums, science centers, zoos, and other spaces. To do so, the authors presented seven guidelines when creating these spaces: a) manage the acoustics and noise; b) promotion of focus and concentration; c) provide more than one space of entrance and exit; d) space compartmentalization; e) creation of zones based on senses; f) creation of transition zones to facilitate the circulation in the space; and g) security. Hence, it is possible to offer freedom to the autistic public, considering that visitors can access the place whenever they need help to self-regulate because “sensorial paradises” seek to offer visitors a type of shelter that can vary from simple to more elaborate spaces.

In Brazil, *Museu Oscar Niemeyer* (MON), in Curitiba, has a sensorial accommodation room (figure 1), a strategy aiming to support the process of autists' sensorial self-regulation in the museum space. Hence, the room wishes to promote a welcoming environment, creating self-regulation opportunities.

Figure 1

Sensory accommodation room at Museu Oscar Niemeyer



Source: *Agência Estadual de Notícias* (2022).

The program “*MON para todos*” [MON to all] also offers sensorial maps, for example, a pictographic communication system that indicates which are the most common sensorial stimuli in several places of the space, reducing autists' sensorial disorganization (Kerches, 2022). Providing this sensorial information in advance can help autists and their families to prepare beforehand for a visit to a science museum (Hoskin et al., 2020).

The pictographic communication system uses images to represent words or ideas to broaden the communication of people with temporary or permanent difficulties in speech (Nascimento et al., 2021; Pereira, et al., 2023). According to the DSM 5-TR, many individuals “have language deficits, ranging from complete lack of speech through language delays, poor comprehension of speech, echoed speech, or stilted and overly literal language” (APA, 2023, p. 60). Considering this, the pictographic communication system can provide a visual structure that can help the communication of people with ASD, mitigating difficulties in understanding and expressing verbal language. For those without orality deficits, the system contributes to reducing anxiety when offering predictability and clearness about what to expect during the visit.

Implementing different accessibility strategies encompasses an integrated work, considering that promoting the inclusion of people with ASD in science museums should be a shared responsibility of the whole institution, not limited to mediators. This implementation involves a holistic approach that embraces the conception of activities, exhibitions, and professional training. Santos (2024) debates this collective and holistic action, as changes in the space of scientific dissemination do not depend only on the mediator but also on other actors, such as managers and other people involved in the conception of exhibitions and activities. It is important to think of mediation strategies focused on attending to all types of visitors equally so that inclusion can occur effectively in science museums and centers and enable equity between people with ASD and other public.

METHODOLOGY

The research is descriptive, in which we studied some mediators' experiences and perceptions who work in Brazilian science centers and museums. According to Gil (2021), the descriptive research seeks to raise a group's opinions, attitudes, and beliefs. The approach to the problem is qualitative, whose interpretations of the

phenomena and the attribution of meanings are the basis of the investigation process (Minayo & Costa, 2018).

Therefore, to collect data, we invited mediators, monitors, guides, and educators of Brazilian science museums and centers present in *the Guia de Centros e Museus de Ciências da América Latina e Caribe 2023* [Guide of Science Centers and Museums in Latin America and the Caribbean] (Massarani et al., 2022) to answer an online questionnaire between June 2023 and May 2024. Sixty-five mediators from 32 science museums and/or centers in Brazil. We will call mediators all these professionals to facilitate understanding in this work.

The research was announced to science museums and organizations of scientific dissemination countrywide through the emails present in the *Guia de Centros e Museus de Ciências da América Latina e Caribe 2023*, social media, such as WhatsApp® groups of *Associação Brasileira de Centros e Museus de Ciências* (ABCMC- Brazilian Association of Science Centers and Museums), Facebook, and Instagram. The mediators participating in the research were recruited from the snowball methodology. According to Vinuto (2014), this technique helps collect data from difficult groups to be accessed. It is a form of non-probabilistic sample that uses reference chains. The researcher should locate group members to be investigated through personal contacts or social networks. These first participants are asked to indicate or recruit other members of the group they might know to participate in the research.

The research was authorized through the signing of the Mediators' Consent Form, created for the specific ends of this study, in agreement with the resolutions of *Conselho Nacional de Saúde* (CNS- National Health Council) nº 466/12 and 510/16. It was also approved by the Research Ethics Committee of *Instituto Federal do Rio de Janeiro*, under protocol number 089908/2023 and report number 6.667.886. For ethical reasons, the names of participant mediators were omitted.

QUESTIONNAIRE DEVELOPMENT FOR MEDIATORS ABOUT AUTIST INCLUSION IN SPACES OF SCIENTIFIC DISSEMINATION

We created a semi-structured questionnaire using Google Forms, composed of questions associated with the research objectives to collect data. The questionnaire was structured into three sections: (i) presentation of the research and researchers, (ii) Consent form, and (iii) questionnaire with 12 open and closed questions, organized in the following way:

- How long have you been working with scientific dissemination?
- In what museum do you work?
- What type(s) of accessibility does the space have?
- Which strategy(ies) is/are used to reach and/or help autists?
- What signs do mediators perceive when receiving visitors with atypical behaviors during museum mediation?
- What resources do you consider essential for including autists in science museums and centers?

– How does training regarding the inclusion of autistic people in spaces of scientific dissemination take place in the museum space?

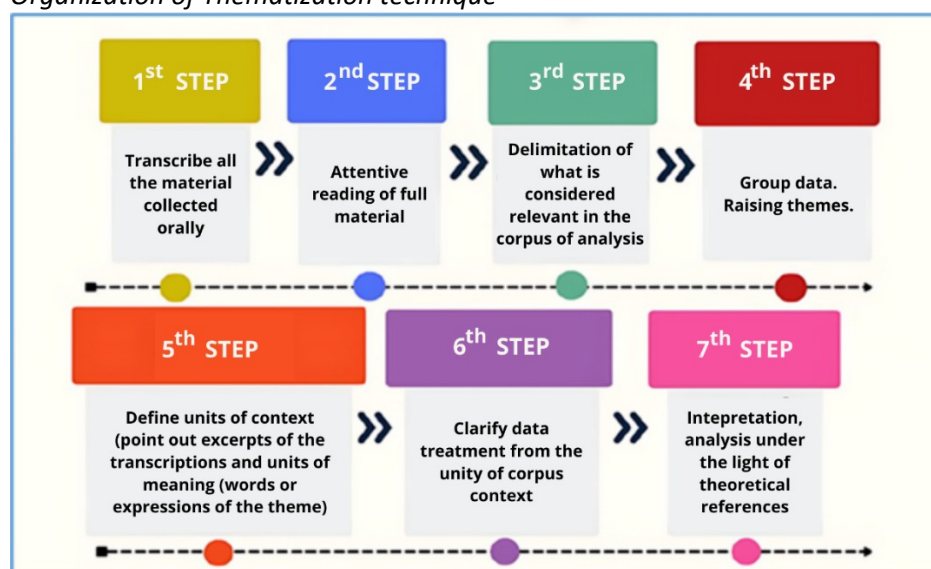
We highlight that four researchers from three science museums in Rio de Janeiro validated the first version of the questionnaire. According to Sampaio et al. (2021), validation is important to help researchers create the instrument, allowing changes for the later application to the target audience.

DATA ANALYSIS TECHNIQUE

To analyze the open question: "Which strategies have you used to reach and/or help autistic people?" we used the technique proposed by Fontoura (2011), called Thematic Analysis, which has seven necessary steps to be implemented (figure 2).

Figure 2

Organization of Thematization technique



Source: Abreu and Fontoura (2022, p. 5).

The testimonies collected in this work were long; thus, we present the units of context that emerged in the questionnaire in the results. For the closed questions of the instrument, we analyzed the data separately and grouped them into categories of similarities for comparative analyses. Later, we created simple frequency graphics based on these answers using the Google Forms app.

RESULTS AND DISCUSSION

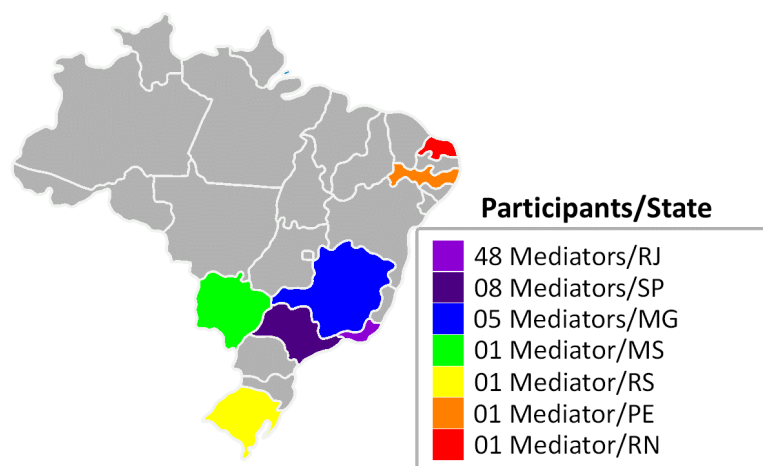
We present the results following the order of the questionnaire, creating the following topics: mediators' geographical distribution; mediators' profile; inclusive practice in the spaces of scientific dissemination in the mediators' perception; strategies used by mediators; mediation with autistic people and mediators' training to attend autistic people in the museum.

MEDIATORS GEOGRAPHIC DISTRIBUTION

We received 65 answers validated by the mediators of 31 spaces of scientific dissemination. The spaces are located in 11 Brazilian cities, distributed into seven states. In Figure 2, we can see that the states with higher participation in the research are in the Southeast region, mainly in the states of Rio de Janeiro, São Paulo, and Minas Gerais.

Figure 3

Geographic distribution of responding mediators



Source: Created by authors (2024).

As seen in figure 3, in the state of Rio de Janeiro, we had 48 answers (74%), 25 (38%) of mediators working in the capital; 15 (23%) answers from mediators in the Mesquita science museum; one answer from Barra Mansa with 1% and two answers in the science space of Duque de Caxias (3%). In the state of São Paulo, we had eight answers (12%), six in the capital, one in Salesópolis, and one in Jacareí. In Minas Gerais, we reached five (7%) mediators' answers distributed into five science museums in the following cities in the countryside: Itueta, Ipatinga, Juiz de Fora, Poços de Caldas, and Uberlândia. In the states of Mato Grosso do Sul, Rio Grande do Sul, Pernambuco, and Rio Grande do Norte, we had one (1%) answer in each state. We could also identify the relation by state of non-formal education spaces where the participant mediators work (table 1).

Table 1
Regional distribution of science museums and centers where the mediators work

Region	State	Science spaces
Southeast	Rio de Janeiro	Aquário Marinho do Rio de Janeiro; Ciência Móvel/Fiocruz; Casa da Ciência – Centro Cultural de Ciência e Tecnologia da UFRJ; Espaço Ciência InterAtiva/IFRJ; Ciências sob Tendas/UFF; Museu Ciência e Vida; Museu de Astronomia e Ciências Afins; Museu da Geodiversidade/UFRJ; Museu da Vida/Fiocruz; Museu de Anatomia Por dentro do Corpo/UFRJ; Museu de Ciências da Terra; Museu de História Natural do ISERJ; Museu do Amanhã; Museu Interativo de Ciências do Sul Fluminense; Quintal da Ciência.
	São Paulo	Centro de Memória Instituto Butantan; Museu de Microbiologia do Instituto Butantan; Museu Biológico Instituto Butantan; Museu Ipiranga; Museu da Energia de Salesópolis; Museu de Anatomia Veterinária da Faculdade de Medicina Veterinária e Zootecnia/USP; Museu de Antropologia do Vale do Paraíba.
	Minas Gerais	Centro de Ciências/UFJF; Fundação Jardim Botânico de Poços de Caldas; Museu Arqueológico Coronel Pimentel; Museu Dica - Diversão com Ciência e Arte; Parque da Ciência de Ipatinga.
Northeast	Pernambuco	Espaço Ciência
	Rio Grande do Norte	Museu Câmara Cascudo/UFRN
Center-West	Mato Grosso do Sul	Empresa Natureza em Foco
South	Rio Grande do Sul	Museu Zoobotânico Augusto Ruschi do Instituto da Saúde Universidade de Passo Fundo.

Source: Created by the authors (2024).

In Table 1, we can see a higher number of answers from science museums in the state of Rio de Janeiro, where 15 spaces are represented. Furthermore, there were seven spaces of scientific dissemination in São Paulo and five in Minas Gerais. We believe we had more answers from Rio de Janeiro spaces because we work in this state. However, in this study, we perceived that the highest number of mediators is concentrated in the Southeast region.

Massarani et al. (2022) and Carlétti and Massarani (2015) discuss the distribution of mediators in Brazilian regions, pointing out the higher concentration of professionals in the Southeast states. Besides this, according to the *Guia de Centros e Museus de Ciências da América Latina e Caribe 2023* (Massarani et al., 2022), out of the 448 science centers and museums distributed in 18 Latin American countries, there are 74 science museums and centers distributed in the states of Minas Gerais, São Paulo, Espírito Santo, and Rio de Janeiro. We highlight

that the Southeast concentrates most of the Brazilian population (Instituto Brasileiro de Geografia e Estatística [IBGE], 2022).

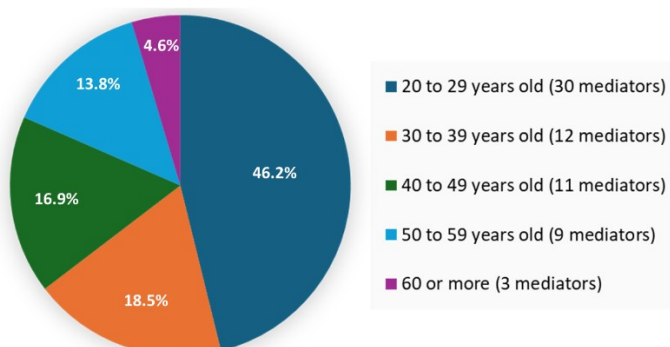
As shown by Massarani et al. (2022), there is no survey on the total number of mediators working in spaces of scientific dissemination. However, we believe our data can provide relevant information on mediators' perceptions about the inclusion and accessibility of autistic people in science museums and centers.

RESEARCH PARTICIPANTS' PROFILE

The analysis of participants' profiles shows that regarding age (figure 4), 30 mediators (46.15%) are between 20 and 29 years old, and 12 (18.46%) are between 30 and 39 years old. Regarding participants' gender, most (49%) are women (49%), 43% are men, and 7% did not provide this information.

Figure 4

Mediators' age (n=65)



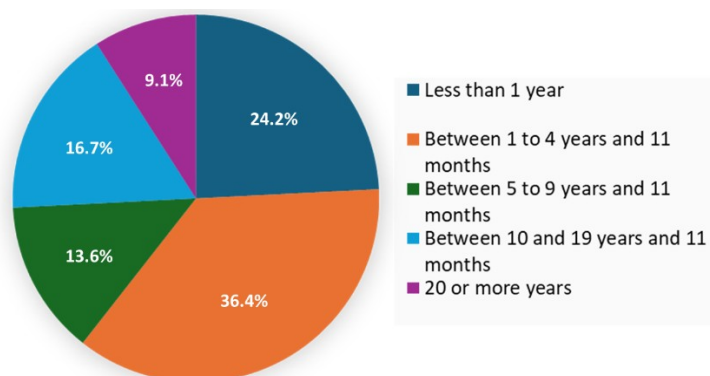
Source: Created by the authors (2024).

The results found in this research corroborate those from Carlétti and Massarani (2015) and Massarani et al. (2022), which indicate a higher number of female mediators and the age range between 20 and 29 years old. The predominance of women and the short work duration seem to be a tendency in science centers and museums, as other studies point out (Carlétti & Massarani, 2015).

Regarding the time working in spaces of scientific dissemination, out of the 65 answers, 36.4% of participants worked in the field of science museums and centers for between one to four years and 11 months, and 24.2% for less than a year (figure 5).

Figure 5

Time working in the mediation space (n=65)



Source: Created by the authors (2024)

Carlétti and Massarani (2015) affirm that the mediators participating in their study worked less than four years in the spaces of scientific dissemination, showing the fragility of the connection with the mediator, who is paid through study grants, showing that it is not considered a profession. The short permanence in the space tends to fragilize the mediators' work, as the process of formation of this subject also includes experience and exchange of experiences with the public and with other mediators and professionals working in the space.

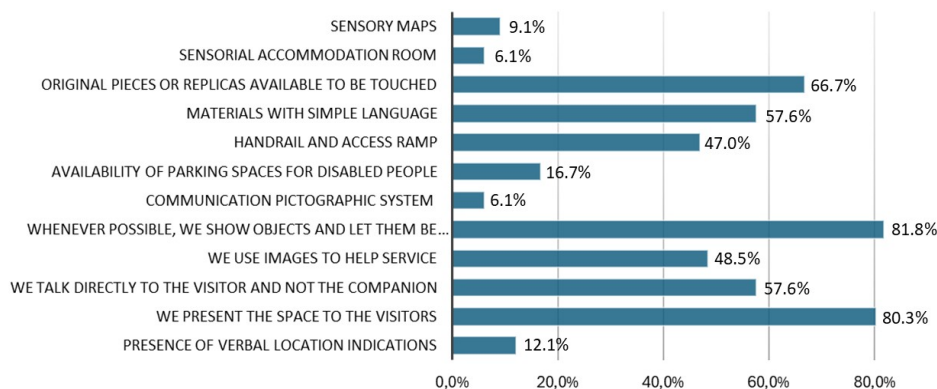
INCLUSIVE PRACTICES PRESENT IN THE SPACE OF SCIENTIFIC SPACE IN THE MEDIATORS' PERCEPTION

Based on the questionnaire, we sought to investigate the inclusive practices used by mediators during the activities with autists. The participants could choose more than one answer to these questions.

According to Figure 6, we found as inclusive practices the following mediators' actions: "Whenever possible, we show the objects and let them be touched" with 81.8%, "We present the space to the visitor" (80.3%), "We talk directly with the visitors and not the guardian" (57.6%), and "Used images to help understanding" with 48.5% of the answers. Regarding the types of accessibility in scientific spaces, we can observe a higher frequency of the following answers: "Original pieces or replicas available to be touched" (66.7%), "Materials with simple language" (57.6%), and "Handrail and access ramp" with 47% of answers. The inclusive practices mentioned in the questionnaire were selected based on studies about the inclusion of people with ASD in Brazilian and North American museums. In these studies, the researchers observed that such strategies resulted in greater interaction and inclusion of autists in these spaces (Deng, 2015; Hoskin et al., 2020; Langa et al., 2013; Lussenhop et al., 2016; Mulligan et al., 2013).

Figure 6

Inclusive practices in the spaces of science dissemination in the perception of mediators (n=65)



Source: Created by the authors (2024).

Regarding the inclusive practices presented, the mediators seem receptive and conscious of the importance of inclusion, understanding the need to create strategies and spaces to answer the needs of people with ASD better. Theriault and Jones (2018) discuss certain common characteristics among people with autism, such as the need for routine and order and difficulties in language understanding and expression. Therefore, seeking to communicate clearly and, whenever possible, stimulate physical interaction with exhibition elements can be efficient strategies to promote inclusion in the museum environment. Another interesting strategy employed by mediators is to talk directly with the visitor. This conversation should be direct, clear, and objective, as some autists struggle to understand and adapt to social contexts (APA, 2023).

We can also observe in Figure 6 that the presence of sensory maps (9,1%), communication pictographic systems (6,1%), and sensorial accommodation rooms (6,1%) are less frequent, showing the need for these science museums and centers to invest in communication and attitudinal accessibility (Rocha et al., 2020). Science museums and centers can trigger excessive sensorial stimuli; parents of autistic children suggest a sensorial room or silent space for autists' sensorial regulation (Langa et al., 2013). Sensorial rooms are important inclusion tools for autistic children and adults. The space must be designed to allow them to relax, explore, and involve all their senses, with little light, soft objects, and different textures, besides being separate from the main space (Lurio, 2016). Developing "sensorial paradises" (Fletcher et al., 2023) distributed through the visitation environment should also be considered a self-regulation strategy with visits to slow down autists' sensorial systems when visiting a science museum. People with ASD can share certain characteristics such as different sensorial experiences, non-standard ways of learning and approaching the solution of problems, deeply focused thoughts, and passionate interests in specific topics (Theriault & Jones, 2018). Thus, there is a need to make sessions and/or workshops accessible to autists, as these people might have trouble understanding the exhibition or workshops (Theriault & Jones, 2018). However, it is important to stress that some of these changes, such as creating a sensorial accommodation room and "sensorial paradises," though necessary, are not simple. They demand the involvement not

only of mediators but also managers, as they will mean more costs and, probably, new spaces will need to be acquired within the museums (Santos, 2024).

STRATEGIES USED BY MEDIATORS

As inclusive practices, we can also highlight the strategies employed by mediators during the mediation process. In this sense, we used thematization to analyze the testimonies (Fontoura, 2011). Hence, as observed in Table 2, we find the following themes from the mediators' answers: exhibition freedom, clear communication, hyperfocus, and talk with the guardian.

Table 2

Analysis of the questionnaire about the strategies used in the mediation with autists

Theme	Context unit
Exhibition freedom	"patience to Interact with the exhibition as freely as possible." (Mediator M.1)
	"I gave space for the visitor to feel comfortable." (Mediator M.2)
	"I let them at ease". (Mediator M.3)
	"freedom inside the museum." (Mediator M.4)
	"openness for the public to interact freely, whenever possible, with the exhibition pieces". (Mediator M -5)
	"I tried my best to let the visitor at ease, and he would choose where he wanted to stay and what modules to watch." (Mediator M.6)
	"I use the strategy of letting the autistic visitor explore the space." (Mediator M.7)
Clear communication	"Clear communication, without analogies or slang." (Mediator M.8)
	"Alternative communication". (Mediator M.4)
	"Use of simple language." (Mediator M.9)
	"Use of simple language and short explanations." (Mediator M.5)
	"clear language and no analogies." (Mediator M.10)
Hyperfocus	"accessible language." (Mediator M.11)
	"focus on what the visitor shows more interest in." (Mediator M.12)
	"call attention to objects or colors that interest people." (Mediator M.13)
	"observe people's interests in the activity so they can enjoy it better." (Mediator M.14)
Talk with guardian	"Availability to talk about the hyper-focus." (Mediator M.1)
	"I talked and listened to the guardian (children from 3 to 6 years

Theme	Context unit
	old)". (Mediator - M.15)
	"Dialogue with the guardian." (Mediator M.16)
	"Constant communication with the person visiting together." (Mediator M.8)
	"Talk with the guardian or the support." (Mediator M.17)
	"Ask help from the children's mediator to understand their specificities." (Mediator M.18)
	"Talk with teachers or those following them to understand the specificities." (Mediator M.19)

Source: Created by the authors (2024).

In Table 2, we can see the theme "Exhibition freedom," in which some mediators use mediation strategies to give freedom for the visitors to wander around the museum spaces freely. According to mediator M.7, "a strategy I use is to let the autistic visitor explore the space so I can notice what he likes or not, then I follow the visit according to his interest but also approach the necessary topics." Understanding and trying to know visitors' interests is a way to welcome and promote effective interaction between the person with ASD and the museum elements. When analyzing the testimonies of the guardians of children with ASD, Langa et al. (2013) observe that part of the testimonies converge to the need for museums to allow children's independence during the visit, promoting a calm environment where they do not feel pressured or overloaded.

Zambrano and Sánchez (2019) point out the importance of spaces of scientific dissemination to improve communication with people with ASD. Corroborating the authors, Varner (2015) highlights the need for museums and science centers to use direct language to explain in advance what is expected when entering the exhibition.

Mediator M.5 reflects on "giving space for the public to interact freely, whenever possible, with the exhibition pieces." In this sense, Villalba (2019) explains that using artistic objects to understand elements is an interesting way for autists to understand things. Kulik and Fletcher (2016) and Lussenhop et al. (2016) reflect on the interaction between mediators and ASD children, as their guardians feel welcomed and safe when an effective interaction occurs.

The theme of "clear communication" did not appear in the testimony of most mediators participating in the research. According to the mediator M.8 a "clear communication, without analogies or slang" is needed. Through these narratives, we identified the mediators' concern with communicational accessibility. In this perspective, good communication practices with the public with ASD should stimulate interaction with the different elements in the museum in a clear and literal fashion (Salasar, 2019).

The analysis of the answers led us to identify the theme "hyperfocus," which is very common among people with ASD, characterized by special interests that "may be a source of pleasure and motivation and provide avenues for education" (APA, 2023, p. 61). Among the answers, there were testimonies such as observing

people's interests towards the activity so they can enjoy it better" (Mediator M.14). This excerpt is corroborated by Villalba (2019) because it shows that it is crucial to focus on the autists' abilities and strong points during an inclusive activity. Theriault and Jones (2018) consider that, in a museum, people with ASD can explore their interests and develop new abilities, as museum mediation can help develop these new abilities.

Mediator M.20's answer caught our attention by saying: "It is important to have a path that starts from the presented interest." According to Varner (2015), the visitation path is highly relevant to people with ASD and, when well-structured, can be developed in the following way:

"From the beginning, we set clear expectations and clear routines, making things predictable, making sure any activities kids are doing are illustrated in a step-by-step process. It's very important to go in a well-documented sequence, but it can be made simple, by using pictures and straightforward language to explain in advance what to expect when you enter a museum" (Varner, 2015, pp. 8-9).

Hladik et al. (2022) emphasize the importance of routine as a common characteristic of some autists. Thus, using a visitation path would avoid the sensorial overload that the space might trigger. Predictable environments tend to reduce the anxiety and stress associated with new and unknown situations for individuals with ASD. Predictability may play a key role in making the experience more comfortable and agreeable to autists.

In the last theme— "talk with guardian" —, we noticed that some mediators seek to mediate with autists through their guardians. Mediator M.20 points out that "they normally come with someone, and these companions take all the measures they believe to be necessary," mediator M.21 said: "Children had their own mediation companions, then, my direct care was not necessary." Regarding direct communication with the guardians for this work, Grandin and Panek (2015) highlight the importance of hearing and observing the autists to understand their needs and, thus, answer them. We know that, in some cases, this conversation is needed. However, we agree with the authors that to understand autists and their needs is vital to listen, observe, and know them to understand their needs (Grandin & Panek, 2015). On the other hand, the attitude of mediator M.18: "Ask help from the children's mediator to understand their specificities," showed her concern about knowing children's singularities to seek adequate service and personalized mediation. This attitude shows her commitment to welcoming the public and to communicational accessibility.

MEDIATION WITH AUTISTS

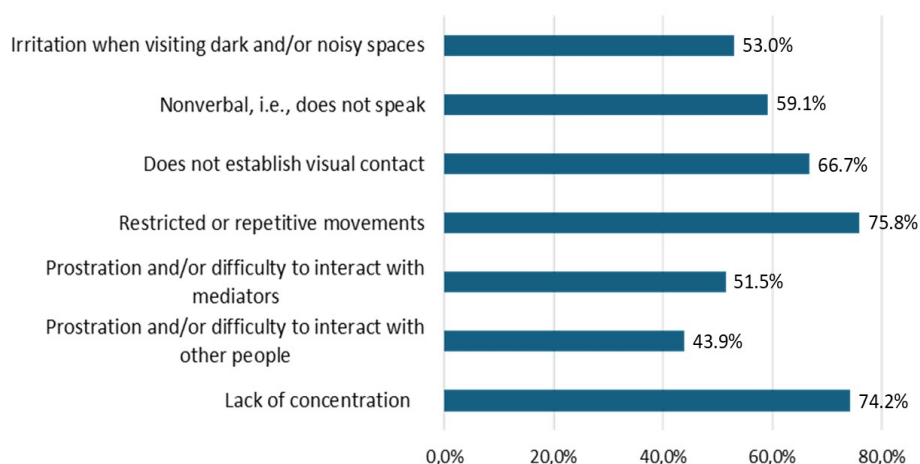
Regarding the mediators' contact with autists, we observed in questions 4 and 5 of the form, that most participants (92.4%) have already received autists when working in the museum. Massarani et al. (2022) affirm that the institutions of scientific dissemination receive many visitors annually. The answers obtained in the research also show that autists frequent science museums and centers, highlighting the importance of actions and strategies for the accessibility and inclusion of people with ASD in these environments. Regarding the signs observed in people with ASD, the mediators point out (figure 7): restricted or repetitive

movements (75.8%), lack of concentration (74%), no visual contact (66.7%), and no orality (59.1%).

These signs observed during visitations are common characteristics in autistic people. Nonetheless, it is important to stress that some people can have these characteristics. However, as it is a spectrum, each individual has their particularities. The stereotypical movements "normally present themselves in situations of idleness, excitement, frustration, sensorial overload, routine changes, such as self-regulation or self-stimulation" (Kerches, 2022, p. 15). The presence of non-verbal individuals also appears to be a significant percentage (figure 7), thus exposing the need to insert pictographic communication systems in the activities and exhibitions in formal education spaces.

Figure 7

Signs observed in visitors by mediators (n=65)



Source: Created by the authors (2024).

The irritation when visiting dark and/or noisy spaces, though in a smaller proportion, appears in 53% of answers. Theriault and Jones (2018) corroborate this data; the authors perceived that one of the barriers faced by autists in the museum was related to sensorial overload. Sensory overload can occur through the increase (hyperactivity) or decrease (hyporeactivity) of sensibility or uncommon interest in environmental sensorial aspects (APA, 2023). Thus, the vital importance of non-formal educational spaces to rethink the sensorial stimuli in the environments, besides creating spaces of sensorial self-regulation. We highlight that the mediator is not responsible for diagnosing a visitor with ASD, however, it is important to know some of these characteristics to promote accessibility. Therefore, previously talking with the guardians and observing visitors' behavior are key elements for the mediation process to take place successfully.

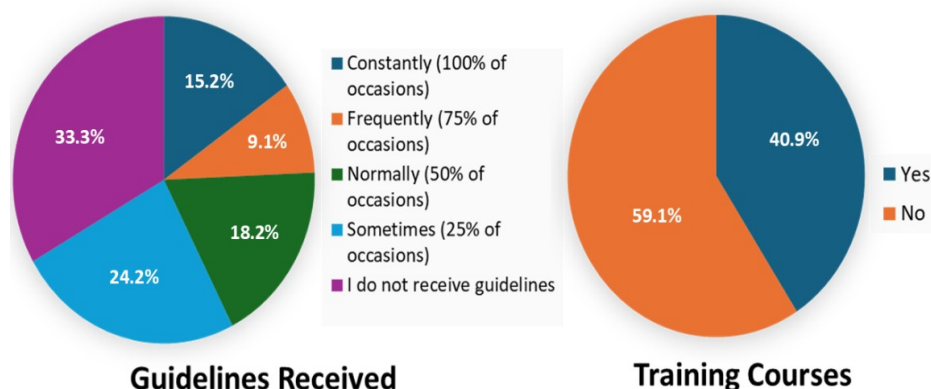
MEDIATORS' TRAINING TO ATTEND AUTISTS IN MUSEUMS

When questioned about the guidelines offered by science museums on how to work with people with ASD, 33% of mediators declared that they had not received

orientations from any professional in the museum. About the promotion of training courses for the inclusion of people with ASD, 59% answered they did not receive any training (figure 8);

Figure 8

Guidelines and training courses about the inclusion of people with ASD in science museums and centers (n=65)



Source: created by the authors (2024).

Mediators play a fundamental role in promoting inclusion in science museums because they act directly with visitors, a task that demands much knowledge and previous training. To Carlétti and Massarani (2015, pp. 13-14), "science centers and museums need to offer training courses, as there are no technical or vocational courses to train mediators."

In this context, training is vital for mediation's theoretical and professional development process, which demands strong scientific knowledge, communication abilities, and improvisation (Henrique et al., 2024; Massarani et al., 2022). That said, institutions of scientific dissemination must invest in this training. According to Kullik and Fletcher (2016), training programs should be created from the perspectives and experiences of people with ASD.

Furthermore, the perspective of other space actors, such as directors and other professionals, is also relevant. Santos (2024) highlights the importance of all professionals in the museum to be involved in including autistic people, actively participating in the observation and construction of knowledge. In their turn, Fletcher, Eckberg, and Blake (2018) point out the bridges that the spaces of scientific dissemination can establish with universities, favoring training and contributing to academic studies and practices. Therefore, science museums and centers need to incorporate inclusion in their museum education, promoting mutually beneficial learning and development opportunities, which means investing in social opportunities for neurodivergent people to act as mediators in these environments (Therriault & Ljungren, 2022). It is also necessary to highlight that as education spaces of scientific education, when science centers and museums propose accessible activities, they can also contribute to the cognitive development of people with ASD, mainly in sciences (Martins & Pereira, 2021). In this perspective, Pereira et al. (2023) perceived that promoting an inclusive scientific education favors the development of abstract thought and the communication of children with ASD, abilities commonly impaired in autistic people.

Hence, mediators need to be aware of their role as educators and promoters of science dissemination to all.

FINAL REMARKS

In this study, we investigated the perceptions and actions of some Brazilian mediators regarding the inclusion of people with ASD in the science centers and museums where they work. We observed that most of them had already received autists in the spaces of scientific dissemination. However, many have not received guidelines to serve and mediate to autists; they have not received continuous training in the theme.

Therefore, we perceived the need for science centers and museums to invest in training their mediators about this theme, which can occur through partnerships with teaching and research institutions, such as universities, seeking to promote actions and programs to train these professionals. Partnerships with universities can give access to updated knowledge, increase professionals' understanding of inclusion and ASD, and provide architectural, communicational, and attitudinal accessibility.

This work also allowed us to understand the inclusive practices employed by mediators. When offering freedom to circulate through the exhibition, they respect the need of some autists to move freely, which can help reduce anxiety and stress. As guardians know better the needs and preferences of the autistic individual, conversations with these people are also an important strategy to provide a more adequate service to the person's real needs. Speaking clearly and avoiding slang helps understanding because many people with ASD can have problems understanding figurative language or idiomatic expressions. These measures are important, considering that ASD is a neurological disorder with characteristics such as deficits in socio-communication abilities and stereotyped behaviors, besides learning difficulties. This information reached Fundação Butantan, which contacted us to give an educational lecture to all the workers of their four existing museums. By analyzing the presence of autists in their spaces, they sought to find ways to effectively include visitors during visitation.

The limitations found in this research are related to mediators' answers. Considering the number of science centers and museums listed in *Guia de Centros e Museus de Ciências da América Latina e Caribe 2023*, we expected more respondents. However, the answers we had led to reflections about the inclusion of people with ASD, mainly in Southeast Brazil.

Therefore, we stress the importance of science museums and centers to invest in the continuous training of their mediators, focusing on inclusion and accessibility for autists, including the experiences lived by mediators. Moreover, autists' perceptions would be extremely useful in building communicational and attitudinal accessibility in spaces of scientific dissemination. Incorporating the experiences of people with ASD can guide improvements in the practice, guaranteeing that the transformations in the museum space do indeed attend to the needs and particularities of this public.

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