

# Participatory and Inclusive Design Models from the Perspective of Universal Design for Children with Autism: A Systematic Review

Rallyson dos Santos Ferreira \*  and Thaís Helena Chaves de Castro Instituto de Computação, Universidade Federal do Amazonas, Manaus 69080, Amazonas, Brazil;  
thais@icomp.ufam.edu.br

\* Correspondence: rallysonferreira@ufam.edu.br

**Abstract:** As technology continues to evolve rapidly and new computing resources are introduced, the utilization of these tools poses increasing complexity for individuals with physical or neurological needs, primarily due to the absence of accessibility and inclusive principles. A promising solution involves shifting the focus from disabilities to abilities, and in that way, creating adaptive environments capable of accommodating various user profiles and minimizing disparities, ensuring universal access. However, a notable challenge arises, particularly for individuals with autism, who face barriers in participating in the software development process due to psychological conditions hindering their responsiveness to traditional data collection methods like questionnaires. This systematic review aims to investigate scientific articles that delve into participatory and inclusive design models tailored for children with autism. The primary objective is to explore adaptability within universal design frameworks in developing new computational artifacts. By addressing this gap, the review contributes to the ongoing effort to create more inclusive and adaptive digital environments, focusing on improving accessibility and enriching the experiences of users with autism.



**Citation:** Ferreira, R.d.S.; Castro, T.H.C.d. Participatory and Inclusive Design Models from the Perspective of Universal Design for Children with Autism: A Systematic Review. *Educ. Sci.* **2024**, *14*, 613. <https://doi.org/10.3390/educsci14060613>

Academic Editors: Charlotte Brownlow, Yosheen Pillay and Emma Goodall

Received: 14 March 2024

Revised: 29 April 2024

Accepted: 22 May 2024

Published: 6 June 2024



**Copyright:** © 2024 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

**Keywords:** participatory design; inclusive design; universal design; children with autism

## 1. Introduction

Working with computational products is a domain where universal access is the key to success [1]. The term “accessibility” extends beyond special needs or age, encompassing the quality of life of many users who need to be included in an increasingly computerized society [2]. This research delves into the crucial area of designing accessible interaction models for individuals with autism, a topic of significant relevance in computer science and accessibility.

Accessibility barriers exist in people’s daily lives, and they need to explore new physical spaces and access information, products, and services [3]. Creating more inclusive social environments requires being mindful of individual differences and functional capabilities. This understanding can lead to developing computational artifacts that adapt to specific characteristics, promoting equity and participation for all [4]. The potential impact of such artifacts, whether for permanently or temporarily disabled, or highly functional individuals, is immense [5,6].

Design projects that adhere to the universal design (UD) principles can mitigate issues encountered in software development [7,8]. UD involves creating products and environments that can be used by all users to the greatest extent possible without the need for any adaptations or specialized designs [9]. This means that all environments and tools should cater to the needs of various individuals, including those with differences in vision, hearing, mobility, motor skills, height, weight, comprehension, communication, and other diverse aspects [10].

Therefore, designing accessible software for any user is crucial, as it enables virtual action to be both feasible and comprehensible, accommodating diversity. Inclusion is an integral component of user interface design [11]. Consequently, by implementing inclusive design (ID) methods in developing environments, they become functional for users with specific needs or abilities [12–14].

However, in some cases, for instance, young individuals with autism are unable to engage in the software development process [15]. Moreover, when the users are children, comprehending their genuine needs and preferences in application development is even more challenging, as they lack the psychological capacity to respond to the questions utilized in data collection [16,17].

Therefore, this systematic literature review (SLR) aims to analyze scientific publications incorporating individuals with autism in the design process to characterize an accessible interaction design model to achieve individualized adaptability in computer artifacts based on UD. Furthermore, the research carried out here is also justified by the lack of proposals (SLR) in the databases IEEE Xplorer, ACM Digital Library, Science Direct, Google Scholar, Scopus, and SBS-OpenLib that address the topic and problem presented.

## 2. Research Methodology

With the aim of selecting high-quality articles, the methodological guidelines followed to guide this SLR were supported in accordance with [18]. Even though we were based on [18]’s guidelines, we confirmed and adjusted the SLR protocol using the comparison in [19]. Furthermore, this research followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) protocol [20], as it constitutes a set of procedures to catalog scientific articles in an organized and consistent way, in addition to having the necessary elements to select the data for the problem proposed here. Figure 1 demonstrates an adaptation for the research proposed here.

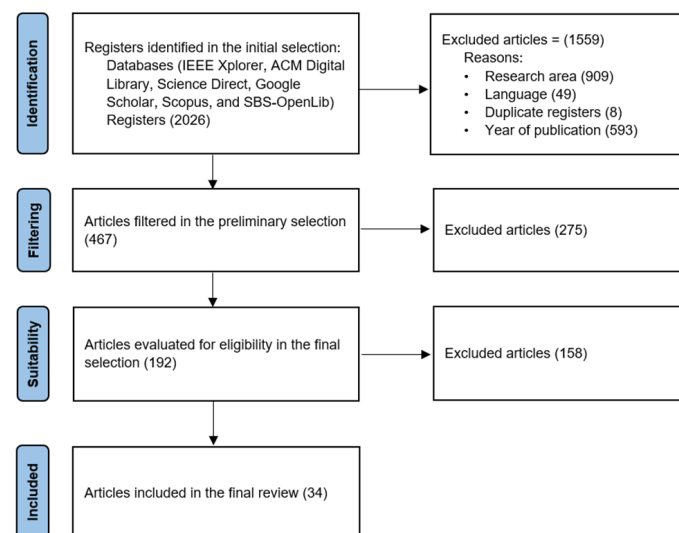


**Figure 1.** Systematic review methodology (adapted from [19]).

To ensure peer-reviewed studies of justified quality, the systematic review process was conducted by two reviewers. In the cases of disagreement among the reviewers, decisions were made by consensus, and when questions persisted, agreement between the reviewers was measured using Kappa coefficient statistics [21].

The initial proposal of this SLR was to use a filter of a maximum of 5 years (2018 to 2022). However, with the low inclusion in the number of relevant articles and for updating purposes (current period for publication), the filter was extended to 10 years, covering 2013 to 2023.

### 2.1. Research Questions

The SLR was initially conducted using research questions following the PICO acronym for participants, interventions, comparators, and outcomes (PICO) [22]. For participants, we defined children with autism; as interventions, we were looking for software artifacts resulting from the design; for comparators, different models, methods, or approaches for design with children were defined; and for outcomes, we expected to find a combination of techniques for designing with children with autism. These perspectives led us to the following research questions:

[RQ1] What methods or techniques of the participatory design (PD) and ID, or UD, are currently being used to involve children with autism in the technology design processes?

[RQ2] What models currently accommodate and guide the rehabilitation and learning activities for children with autism?

[RQ3] To what extent are researchers working with children with autism while designing computational artifacts?

### 2.2. Search Key

Based on the research questions and keywords, a search key (string) was created to consult the databases: ("INCLUSIVE DESIGN" OR "PARTICIPATORY DESIGN" OR "UNIVERSAL DESIGN") AND ("INCLUSIVE DESIGN" OR "PARTICIPATORY DESIGN" OR "UNIVERSAL DESIGN") AND ("CHILDREN WITH AUTISM").

### 2.3. Databases

To guarantee the quality of the studies, six databases were consulted and chosen because they are the most recognized nationally and internationally in engineering, information technology, and education. They also present good indicators for publishing articles, conferences, and book chapters. They are IEEE Xplore, ACM Digital Library, Science Direct, Scopus, Google Scholar, and SBC-OpenLib (SOL). We followed the recommendations provided in the RSL literature mentioned by [23] to select the articles that present primary studies. Therefore, we prefer the articles with quantitative data. However, because the models we are looking for are more qualitative in nature, we had to include these articles as well. However, we chose the articles with solid arguments based on some inference mechanism and not on mere assumptions.

### 2.4. Inclusion Criteria

As inclusion criteria, the following were defined: (i1) the research that presents or discusses application models aligned with the PD and ID designed for children with autism; (i2) the research that presents any artifact, tool, software, application, tangible game, or system developed for children with autism; (i3) the study addresses adaptive design techniques for children with autism; and (i4) the study presents any technique or method that includes children with autism in the design process.

### 2.5. Exclusion Criteria

As exclusion criteria, the following were defined: (e1) the studies that do not correspond to the research area; (e2) the articles not written in Portuguese and English; (e3) the articles with duplicate entries; and (e4) the articles published before 2013.

### 2.6. Selection Strategy

In the selection strategy, a review method was applied in three phases called initial selection strategy, preliminary selection strategy, and final selection strategy. In the initial selection strategy, which corresponds to the study identification phase, the research began with a search in the databases. The works retrieved from the databases were initially stored and documented in a bibliographic reference organization software (Start). In total, the databases returned 2026 articles (Table 1).

**Table 1.** Query results in databases.

| Data Base           | English | Portuguese | Total |
|---------------------|---------|------------|-------|
| IEEE Xplore         | 898     | 19         | 917   |
| ACM Digital Library | 632     | 20         | 652   |
| Science Direct      | 176     | 5          | 181   |
| Google Scholar      | 73      | 36         | 109   |
| Scopus              | 96      | 7          | 103   |
| SBS-OpenLib         | 59      | 5          | 64    |
| Total               | 1934    | 92         | 2026  |

To complete the initial phase, the exclusion criteria informed in e1, e2, e3, and e4 were applied. The result is exemplified in Table 2.

**Table 2.** Articles excluded in the initial selection phase.

| Database            | Exclusion Criteria |          |                   |                     | Total |
|---------------------|--------------------|----------|-------------------|---------------------|-------|
|                     | Search Area        | Language | Duplicate Records | Year of Publication |       |
| IEEE Xplore         | 389                | 24       | 2                 | 296                 | 711   |
| ACM Digital Library | 304                | 16       | 4                 | 223                 | 547   |
| Science Direct      | 88                 | 3        | 0                 | 32                  | 123   |
| Google Scholar      | 59                 | 4        | 0                 | 13                  | 76    |
| Scopus              | 57                 | 2        | 2                 | 8                   | 69    |
| SBS-OpenLib         | 12                 | 0        | 0                 | 21                  | 33    |
| Total               | 909                | 49       | 8                 | 593                 | 1559  |

In the preliminary selection strategy, filters were applied by reading the titles, abstracts, introductions, and conclusions of the stored works to identify relevant studies. To assess the quality of the studies, the articles were classified into three categories: accepted, rejected, or doubtful [24]. The articles classified as doubtful were analyzed in full (partial or complete reading) and subsequently classified as accepted or rejected.

Finally, in the final selection strategy, the articles were analyzed in full (complete reading) and recorded by the reviewers to justify the acceptance of the work based on the inclusion criteria.

### 3. Results and Discussion

The SLR results indicate the acceptance of 34 articles, representing 1.68% of the total. Table 3 presents the final result according to the selection phases.

**Table 3.** Results of the search according to the selection phases.

| Database            | Database Query | Initial Selection | Preliminary Selection | Final Selection |
|---------------------|----------------|-------------------|-----------------------|-----------------|
| IEEE Xplore         | 917            | 206               | 54                    | 2               |
| ACM Digital Library | 652            | 105               | 65                    | 17              |
| Science Direct      | 181            | 58                | 14                    | 1               |
| Google Scholar      | 109            | 33                | 19                    | 5               |

**Table 3.** *Cont.*

| Database    | Database Query | Initial Selection | Preliminary Selection | Final Selection |
|-------------|----------------|-------------------|-----------------------|-----------------|
| Scopus      | 103            | 34                | 21                    | 6               |
| SBS-OpenLib | 64             | 31                | 19                    | 3               |
| Total       | 2026           | 467               | 192                   | 34              |

The final list of the articles accepted by the SLR was organized according to the databases consulted and exemplified in Tables 4–9.

**Table 4.** Final list of articles selected in IEEE Xplorer.

| IEEE Xplorer |                                        |                                                                                                    |                       |                          |                                |                            |
|--------------|----------------------------------------|----------------------------------------------------------------------------------------------------|-----------------------|--------------------------|--------------------------------|----------------------------|
| No.          | Authors                                | Objectives                                                                                         | Evaluation Instrument | Children’s Participation | Participation of Professionals | Principles of Adaptability |
| 01           | Sofian, Hashim, and Sarlan (2021) [25] | Identifying the design preferences of children with autism through the perspective of proxy users. | Questionnaire         | No                       | Yes                            | No                         |
| 02           | Mubin et al. (2021) [26]               | Using gamification to improve social skills in children with autism.                               | Interview             | No                       | No                             | Yes                        |

**Table 5.** Final list of articles selected in ACM Digital Library.

| ACM Digital Library |                                       |                                                                                                                                    |                               |                          |                                |                            |
|---------------------|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|--------------------------|--------------------------------|----------------------------|
| No.                 | Authors                               | Objectives                                                                                                                         | Evaluation Instrument         | Children’s Participation | Participation of Professionals | Principles of Adaptability |
| 01                  | Cesário et al. (2016) [27]            | Assist children with autism in teaching and communicating through a virtual environment to become autonomous in atomized routines. | Observation and questionnaire | Yes                      | Yes                            | No                         |
| 02                  | Tang (2016) [28]                      | Recognizing and reading the emotions of children with autism through an Internet of Things approach.                               | Observation and questionnaire | Yes                      | No                             | Yes                        |
| 03                  | Leal, Teixeira, and Silva (2016) [29] | Design personas to improve communication and develop technologies for children with autism.                                        | Questionnaire                 | Yes                      | Yes                            | No                         |
| 04                  | Zheng et al. (2017) [30]              | Design an adaptive training system to monitor the attention levels of children with autism.                                        | Observation and interviews    | Yes                      | Yes                            | Yes                        |

Table 5. Cont.

| ACM Digital Library |                                                    |                                                                                                                                   |                          |                          |                                |                            |
|---------------------|----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|--------------------------|--------------------------|--------------------------------|----------------------------|
| No.                 | Authors                                            | Objectives                                                                                                                        | Evaluation Instrument    | Children's Participation | Participation of Professionals | Principles of Adaptability |
| 05                  | Frauenberger, Makhaeva, and Spiel (2017) [31]      | Combining methods for participatory design with children with autism.                                                             | Case study               | Yes                      | Yes                            | No                         |
| 06                  | Wilson et al. (2017) [32]                          | Help children with autism record and express their interests in support, home, and classroom settings.                            | Study design             | Yes                      | Yes                            | Yes                        |
| 07                  | Kolakowska, Landowska, and Karpienko (2017) [33]   | Introduce a game designed to automate the measurement of therapy progress for children with autism.                               | Observation              | Yes                      | No                             | No                         |
| 08                  | Dickstein-Fische, Pereria, and Fischer (2017) [34] | Improve the collection of relevant data, such as gestures and expressions, in therapy sessions with children with autism.         | Observation              | Yes                      | No                             | No                         |
| 09                  | Abdullah and Brereton (2017) [35]                  | Support the communication and interaction of children with autism in classroom activities to better express their real interests. | Observation              | Yes                      | Yes                            | No                         |
| 10                  | Spiel et al. (2017) [36]                           | Develop an approach for participatory assessment with children with autism.                                                       | Case study               | Yes                      | No                             | Yes                        |
| 11                  | Melo et al. (2017) [37]                            | Identify the preference patterns of children with autism regarding interface components.                                          | Interview and case study | Yes                      | Yes                            | No                         |
| 12                  | Johnson and Picard (2017) [38]                     | Accelerate learning and skill acquisition in children with different neurological developments.                                   | Case study               | Yes                      | No                             | Yes                        |
| 13                  | Chen, Wang, and Su (2017) [39]                     | Develop operational communication skills and facilitate asking for help in children with autism.                                  | Observation              | Yes                      | Yes                            | Yes                        |
| 14                  | Cibrian et al. (2018) [40]                         | Understanding the attention and emotions of children with autism when listening to different sounds.                              | Observation              | Yes                      | Yes                            | No                         |

Table 5. Cont.

| ACM Digital Library |                                   |                                                                                                    |                           |                          |                                |                            |
|---------------------|-----------------------------------|----------------------------------------------------------------------------------------------------|---------------------------|--------------------------|--------------------------------|----------------------------|
| No.                 | Authors                           | Objectives                                                                                         | Evaluation Instrument     | Children's Participation | Participation of Professionals | Principles of Adaptability |
| 15                  | Zhu, Hardy, and Myers (2019) [41] | Involve children with autism in co-design workshops through a participatory and iterative process. | Co-design workshops       | Yes                      | Yes                            | No                         |
| 16                  | Johnson et al. (2020) [42]        | Improving communicative and affective exchanges between non-verbal children with autism.           | Interview and observation | Yes                      | No                             | No                         |
| 17                  | Pinheiro and Marques (2021) [43]  | Design an accessible app to automate daily routines for children with autism.                      | Inspection methods        | No                       | Yes                            | No                         |

Table 6. Final list of articles selected in Science Direct.

| Science Direct |                                |                                                                       |                       |                          |                                |                            |
|----------------|--------------------------------|-----------------------------------------------------------------------|-----------------------|--------------------------|--------------------------------|----------------------------|
| No.            | Authors                        | Objectives                                                            | Evaluation Instrument | Children's Participation | Participation of Professionals | Principles of Adaptability |
| 01             | Kamaruzaman et al. (2016) [44] | The development of a numerical learning app for children with autism. | Task-centered design  | Yes                      | Yes                            | No                         |

Table 7. Final list of articles selected in Google Scholar.

| Google Scholar |                                     |                                                                                                    |                                         |                          |                                |                            |
|----------------|-------------------------------------|----------------------------------------------------------------------------------------------------|-----------------------------------------|--------------------------|--------------------------------|----------------------------|
| No.            | Authors                             | Objectives                                                                                         | Evaluation Instrument                   | Children's Participation | Participation of Professionals | Principles of Adaptability |
| 01             | Braz et al. (2014) [45]             | Create alternative designs to personalize apps for children with autism.                           | Paper prototyping                       | Yes                      | No                             | Yes                        |
| 02             | Rosa, Silva, and Aymone (2018) [46] | Propose an approach to help children with autism communicate through design and augmented reality. | Case study and experiments              | Yes                      | Yes                            | Yes                        |
| 03             | Magkafa and Newbutt (2021) [47]     | Implement co-design practices in creating accessible interfaces for children with autism.          | Observation and feedback                | Yes                      | Yes                            | No                         |
| 04             | Rodrigues et al. (2023) [48]        | The creation of guidelines for designing accessible interfaces for individuals with autism.        | Practical experience and questionnaires | No                       | Yes                            | No                         |

Table 7. Cont.

| Google Scholar |                            |                                                                                                    |                       |                          |                                |                            |
|----------------|----------------------------|----------------------------------------------------------------------------------------------------|-----------------------|--------------------------|--------------------------------|----------------------------|
| No.            | Authors                    | Objectives                                                                                         | Evaluation Instrument | Children's Participation | Participation of Professionals | Principles of Adaptability |
| 05             | Pereira et al. (2023) [49] | Facilitate the design of interfaces for individuals with autism through design thinking practices. | Interviews            | Yes                      | Yes                            | No                         |

Table 8. Final list of articles selected in Scopus.

| Scopus |                                        |                                                                                                                                               |                                  |                          |                                |                            |
|--------|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|--------------------------|--------------------------------|----------------------------|
| No.    | Authors                                | Objectives                                                                                                                                    | Evaluation Instrument            | Children's Participation | Participation of Professionals | Principles of Adaptability |
| 01     | Castro, Castro, and Lima (2016) [50]   | Incorporate the social rules of peer interaction in children with autism through physical models.                                             | Structured interview             | Yes                      | No                             | Yes                        |
| 02     | Malinverni et al. (2016) [51]          | Promote social initiation in children with autism using inclusive approaches in therapeutic games.                                            | Participatory design workshops   | Yes                      | Yes                            | No                         |
| 03     | Santos, Breda, and Almeida (2016) [52] | Evaluate a universal learning environment to support the development of mathematical reasoning in children with autism.                       | Case study                       | Yes                      | No                             | Yes                        |
| 04     | Castro and Lima (2017) [53]            | Report a design method for designing intelligent and adaptive computational artifacts for children with autism.                               | Workshops and co-design sessions | No                       | Yes                            | Yes                        |
| 05     | Satterfield and Fabri (2017) [16]      | Emphasize the importance of participatory design to understand the real needs of children with autism.                                        | Case study                       | Yes                      | No                             | Yes                        |
| 06     | Leite et al. (2019) [54]               | Present an ergonomic study to identify facial expressions in children with autism in order to assist them in teaching and social interaction. | Questionnaire                    | Yes                      | No                             | No                         |

**Table 9.** Final list of articles selected in SBC-OpenLib.

| No. | Authors                      | Objectives                                                                                                                                                          | SBC-OpenLib                           |                          |                                |                            |
|-----|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|--------------------------|--------------------------------|----------------------------|
|     |                              |                                                                                                                                                                     | Evaluation Instrument                 | Children's Participation | Participation of Professionals | Principles of Adaptability |
| 01  | Passerino et al. (2013) [55] | Integrate an alternative communication platform with another for developing activities to help children with autism with an emphasis on homecare and homeschooling. | Design centered on the context of use | No                       | No                             | Yes                        |
| 02  | Neto et al. (2017) [56]      | Provide more autonomy and social inclusion through an app for children with autism.                                                                                 | Questionnaire and interview           | Yes                      | Yes                            | No                         |
| 03  | Moita et al. (2017) [57]     | Present the design, development, and validation of an assistive game, with a focus on building narratives for individuals with autism.                              | Observation and questionnaire         | Yes                      | Yes                            | No                         |

The tables with the information corresponding to each research (Tables 4–9) contain the analysis parameters: the objectives of each study; the proposed evaluation instrument, whether the project used the participation of children with autism, even indirectly; if there was, there was also the participation of the main stakeholders (teachers, psychologists, physiotherapists, and designers), including the parents or guardians of children with autism; and whether the research presents the principles of adaptability in the universal context. These findings are crucial for understanding the involvement of children with autism and stakeholders in developing technologies for autism.

Therefore, these parameters (columns 4, 5, 6, and 7) should be discussed due to their importance to the objectives proposed here. These parameters are related to the research questions and are essential to understand them and, thus, answer them. They are as follows:

- The participation of children with autism at a young age (4–10 years old) and directly;
- The participation of primary stakeholders in the process of developing new technologies for children with autism;
- Uses methods for children with autism through adaptability and universal design.

Regarding the first aspect observed (column 5), although twenty-eight studies report that the methodology applied involves children with autism, six do not do so directly, carrying out the consultation through their proxies or professionals who monitor the assessments by observing the children and responding to questionnaires and interviews. Moreover, despite being focused on “children with autism”, some research (16 in total) does not work with these users at an early age [17,25,27,28,30,33,39–41,43,45–47,52,56,57]. These challenges highlight the complexities and sensitivities of directly involving children with autism in technology development.

The other six studies [25,26,43,48,53,55] that did not use child participation (in person) at any project stage conducted their projects with the participation of some professionals and through information extracted from previous experiences. These authors worked on projects that target children with autism as end users using methodologies such as inclusive design, gamification, accessible interface design, and intervention to assist in therapy sessions.

The difficulties of involving children with autism in the development of projects are also reflected in the number of works that presented the profile of these users, with only

six in total [37,40,41,47,51,57]. Therefore, the majority of the research (28 in total) does not make it clear how they identify the interests of the children with autism in activities, as well as their primary skills and needs [58,59]. Therefore, it becomes complex to design effective technologies for this audience when it is impossible to define a profile to know the level of empathy [60] or understand their deficiencies and assimilate the degree of interaction with the design proposed in applications [36].

In column 4 (evaluation instrument), we observe that in 19 studies, observation, interviews, and questionnaires were used as evaluation methods, with interviews and questionnaires being applied to professionals and parents without consulting the children with autism themselves. Despite varied abilities or mixed needs, projects aimed at autistic audiences must create ways to engage children in activities and provide empirical evaluations of technologies and interactive activities [14].

Another relevant aspect is the involvement of health professionals, education professionals, and parents in design projects for children with autism (column 6). We observed that in 13 studies, there is no direct participation, or it is limited to just one professional or guardian. This participation is not just beneficial but essential, as the experience of living with children with autism can help interpret and define the main priorities regarding the design and validate these applications [61]. Children's participation underscores our shared responsibility to create more effective technologies for children with autism.

An important detail about the research selected in this SLR is that a total of 23 articles [25,27–29,31,33,34,36,37,39–43,45,46,48,49,51,54,55,57] are committed to helping autistic users in the communication process, especially children. Other research is dedicated to helping with the social [26,50,56] and learning [30,32,35,38,44,47,52,53] aspects.

Despite the importance of working on the social aspects [62–64] and learning [65,66] with individuals with autism, communication attributes [67–69] are essential, including improving social skills. Stimulating learning and improving the forms of communication with this population favors affectivity, which helps with social dysfunction, making them more participative and, therefore, recognizing their priorities becomes possible in practice.

The last aspect highlighted (column 7) corresponds to the few tools with adaptive characteristics (14 in total) suitable for the different characteristics of autism. This aspect is desirable because educational activities for children with autism must be adapted to each case so that the individual develops and increases their learning skills [70]. In addition, they must be able to be applied to other audiences, considering universal characteristics.

Through the selection process of this SLR, the articles extracted from the databases were divided into three categories according to the keywords “participatory design and inclusive design”, “universal design and adaptable design models”, and “design projects for children with autism”. It is worth mentioning that grouping through keywords is a way of answering the research questions (RQ1, RQ2, and RQ3). These categories are presented in Figure 2.

Figure 2 reveals a notable trend: the number of accepted articles experienced a significant increase from 2016 to 2017, with 21 articles. The year 2017, in particular, stood out as the most productive, with 14 articles accepted. This surge in research output is a significant development, indicating a growing interest and commitment to the field. However, the subsequent years, starting from 2018, saw a decline in the number of accepted articles, averaging 1.66% per year. This decline, coupled with the scarcity of accepted articles in 2022, underscores the need for continued research and innovation in the field of autism and inclusive design.

It is concerning that most of the research (58.82%—20 articles) is being conducted without adaptive methods. This trend indicates a lack of focus on techniques that could enhance the participation of children with autism in the design process. The unique characteristics of autism, which can pose challenges to integration in software development, are not adequately addressed. Furthermore, the research overlooks the importance of universal precepts that could also benefit non-autistic users.

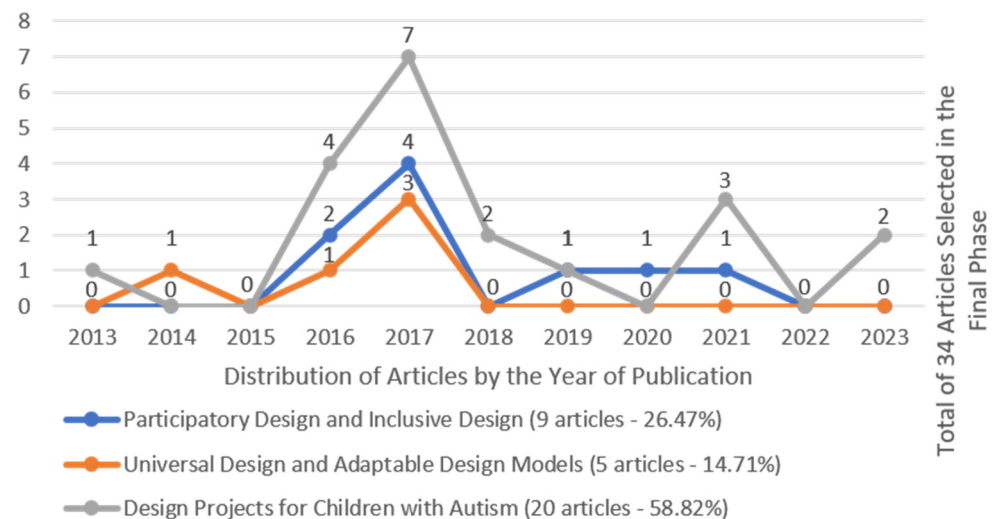


**Figure 2.** Temporal distribution of studies selected in the SLR by year of publication.

Inclusive design is not just a concept but a powerful intervention tool for addressing the issues of inclusion in society. This is particularly relevant in the context of children with autism, where inclusion is becoming increasingly necessary. Our society's evolving diversity calls for innovative approaches that can integrate everyone, regardless of their individual limitations or deficiencies [71]. Therefore, the role of inclusive design in our research and practices cannot be overstated, and its implementation should be a priority for all of us.

#### 4. Analysis of Research Questions through Working Groups

This section presents the methodologies of the works selected in the final selection of this SLR, with these data referring to the research questions.

##### 4.1. Participatory Design and Inclusive Design (RQ1)

The works cataloged in PD and ID present methods and techniques that aim to establish the ways of supporting children with autism based on participatory approaches, involving all interested parties in the life cycle of a system design process [41]. However, in most cases, designers develop artifacts relying only on their experience and documents initially produced in the data collection phase, without directly involving critical stakeholders in the process, which is not enough to implement inclusive systems [16]. The use of PD approaches, on the other hand, is not just a method but a transformative process that can lead to the creation of inclusive and accessible programs that genuinely meet the needs of target groups [47].

Blending methods (merging two or more techniques to achieve a certain goal) is an example of how to contribute to the design process to build individual objects for children with autism through participatory activities. Merging methods are important in these cases as they allow designers to reinterpret and adapt techniques and tools based on different characteristics, identifying other user profiles. However, as it is an approach based on autistic characteristics, it is crucial to have the guidance and input of health professionals, educators, and parents in these activities [31]. Likewise, as we are dealing with autistic people, it is necessary to pay close attention to the limitations of each of them with the aim of minimizing difficulties and overcoming different obstacles when involving them in PD sessions. It is necessary to provide a pleasant experience by observing the aspects in which they have the most difficulties, being able to involve them in any phase of the project, and thus obtaining the necessary results [37]. Despite this complexity, this process becomes essential and requires additional effort, as the inclusion of these users boosts the practice of diversity [44].

In the project by [32], the authors demonstrate that it is possible, through the PD process, to register and express the interests of children with autism in supportive contexts, such as the home and the classroom. This habit allows professionals to understand how children’s communication and engagement improve when supported by flexible design tools. Promoting affinity between everyone involved in technology development can help designers identify the needs of autistic users [29]. However, it is necessary to include, in the process, parents and community members who live with and know autistic people in order to improve communication with these individuals [42].

The objectives for adopting PD may arise from expanding and adapting technological resources to the demands of users with disabilities in their design. Furthermore, PD provides a means of involving the end user at any stage of the design process, just as ID makes both the software product and the design process itself accessible. These two processes are essential for recognizing different types of users and how their needs and skills may change over time, corresponding to their priorities.

Table 10 demonstrates the characteristics identified in the articles cataloged in the SLR in the group on participatory design and inclusive design which are related to the research question (RQ1). In addition to the authors, the title of the studies, the methodologies, techniques and models, and the conference, magazine, or book in which they were published are presented.

**Table 10.** Characteristics of work on participatory design and inclusive design.

| No. | Authors                                       | Title                                                                                                              | Methods/Techniques/Models                                                                                  | Journal/Conference/Book                                                    |
|-----|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| 01  | Kamaruzaman et al. (2016) [44]                | Developing user interface design application for children with autism                                              | Participatory design method with children with autism to develop a learning app.                           | Procedia—Social and Behavioral Sciences                                    |
| 02  | Leal, Teixeira, and Silva (2016) [29]         | On the Creation of a Persona to Support the Development of Technologies for Children with Autism Spectrum Disorder | Persona technique to assist in the communication of children with autism and their proxies.                | International Conference on Universal Access in Human–Computer Interaction |
| 03  | Frauenberger, Makhaeva, and Spiel (2017) [31] | Blending Methods: Developing Participatory Design Sessions for Autistic Children                                   | Blending methods for participatory design sessions with children with autism                               | Research Concepts & Participatory Design                                   |
| 04  | Spiel et al. (2017) [36]                      | Participatory Evaluation with Autistic Children                                                                    | Approach to participatory assessment with children with autism                                             | Conference on Human Factors in Computing Systems                           |
| 05  | Wilson et al. (2017) [32]                     | Digital Strategies for Supporting Strengths- and Interests-based Learning with Children with Autism                | Using self-expression technologies to improve communication with children with autism                      | Conference on Computers and Accessibility                                  |
| 06  | Satterfield and Fabri (2017) [16]             | User participatory methods for inclusive design and research in autism: A case study in teaching UX design         | Participatory design methods for case studies with children with autism                                    | International Conference of Design, User Experience, and Usability         |
| 07  | Zhu, Hardy, and Myers (2019) [41]             | Co-designing with Adolescents with Autism Spectrum Disorder: From Ideation to Implementation                       | Co-designer technique for involving children with autism in the software design process                    | Australian Conference on Human–Computer Interaction                        |
| 08  | Jhonson et al. (2020) [42]                    | The ECHOS Platform to Enhance Communication for Nonverbal Children with Autism: A Case Study                       | Participatory case study to improve communication for children with autism                                 | Interaction Design and Children                                            |
| 09  | Magkafa and Newbutt (2021) [47]               | Implementing co-design practices for the development of a museum interface for autistic children                   | Co-design in the context of participatory design to design accessible interfaces with children with autism | In book: Recent Advances in Technologies for Inclusive Well-Being          |

#### 4.2. Universal Design (RQ1) and Adaptable Design Models (RQ2)

The objective of universal design (UD) is to develop design models in which any user, whether with some difficulty or mixed abilities, can interact without restrictions, taking advantage of the available resources. And despite the need to develop software adaptable to the autistic population, most research is being carried out for non-neurotypical children. However, the works collected in this SLR on adaptive design models (ADM) demonstrate viable and exciting solutions to support the objectives proposed here and follow the principles of UD. These solutions have the potential to revolutionize the field of special education and create dynamic learning environments for children with autism and other accessibility difficulties.

The use of different approaches demonstrates how adaptive technologies can contribute to understanding the characteristics of users with different specific needs [52]. However, when projects target a particular problem, they leave several questions when extending their solution to other people with disabilities. When it comes to designing for the autistic population, the vast majority have limitations, and the main reason why this happens is the variation in the different levels of autism that exist [45]. However, by combining the principles of universal design with adaptive design models, we can create a new paradigm in special education. This approach holds the potential to develop dynamic learning environments specifically designed to help not only children with autism but also with other accessibility difficulties. The importance of guiding research with ADM lies in the fact that it promotes a richer understanding of these users, allowing researchers to identify and analyze the methodological potential of different interface design approaches, as well as accelerating learning and skill acquisition, and encouraging social, cognitive, and motor development [38].

It is worth mentioning that these projects, even though they are adaptive systems for autistic people, do not eliminate the presence of educators who need to be well familiar with the children to know their profile and adapt the learning content to the related training, and thus inform, through feedback, changes in attention levels and behaviors [30]. An important characteristic observed in adaptive systems is how educators can provide personalized service since their students can have different profiles, especially when it comes to children with autism.

The methodology used in [53] demonstrates how promising the technique of combining (merging) different approaches is to develop design projects that can adapt to user profiles. This proposal presents the models of artifacts that must adapt to the way they interact with people from different aspects and highlights that holding workshops and co-design sessions can help designers and education professionals to practice identifying the particularities of the environment for each one of the children (in this case autistic).

Design recommendations, informed by the works in this section, based on fundamental user characteristics, enable software designers and educators to understand and develop inclusive tools that can be adapted to each user's needs. Furthermore, these recommendations provide solutions not only for the autistic population but also for other audiences.

Table 11 demonstrates the characteristics identified in the articles cataloged in SLR in the group on universal design and adaptive design models which are related to the research questions (RQ1 and RQ2).

**Table 11.** Characteristics of work on universal design and adaptable design models.

| No. | Authors                 | Title                                                                              | Methods/Techniques/Models                                                                                       | Journal/Conference/Book                         |
|-----|-------------------------|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-------------------------------------------------|
| 01  | Braz et al. (2014) [45] | An Alternative Design Perspective for Technology Supporting Youngsters with Autism | Design using alternative metadesign and semiotic engineering to support communication for children with autism. | International Conference on Augmented Cognition |

Table 11. Cont.

| No. | Authors                                | Title                                                                                                               | Methods/Techniques/Models                                                                       | Journal/Conference/Book                                                                                     |
|-----|----------------------------------------|---------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| 02  | Santos, Breda, and Almeida (2016) [52] | Learning environment for Autism Spectrum Disorders: A universal approach to the promotion of mathematical reasoning | A universal design approach for evaluating a learning app for children with autism.             | Conference on Software Development and Technologies for Enhancing Accessibility and Fighting Info-exclusion |
| 03  | Jhonson and Picard (2017) [38]         | SPRING: Customizable, Motivation-Driven Technology for Children with Autism or Neurodevelopmental Differences       | Heterogeneous case study to stimulate learning skills in children with autism.                  | Interaction Design and Children                                                                             |
| 04  | Zheng et al. (2017) [30]               | An EEG-based Adaptive Training System for ASD Children                                                              | Adaptive design for iterative learning for children with autism.                                | ACM Symposium on User Interface Software and Technology                                                     |
| 05  | Castro and Lima (2017) [53]            | Designing for children using the RtD and HCD approaches                                                             | Human-centered design and co-design to design computational artifacts for children with autism. | International Conference on Universal Access in Human–Computer Interaction                                  |

#### 4.3. Design Projects for Children with Autism (RQ3)

The last research group, characterized as design projects for children with autism, brings significant contributions to these users focused on work that seeks to reduce mainly social difficulties [51], communication difficulties [46], and the learning process [35].

Most of these studies have in common the goal of making children with autism self-sufficient in everyday tasks and learning activities, promoting their independence [27]. For this, communication skills are fundamental [57], especially in developing social interaction, as they make it possible to establish reciprocity and build intersubjectivity between them and other people [55]. Communication skills are also necessary to interact with children with autism in specific classroom activities to express their real interests better, facilitating their asking for help [39].

Recognizing interests and preferences [40] and identifying emotional reactions in children with autism becomes very complex, as they avoid eye contact and oral communication, and gestures are complex actions to understand [54]. However, this process is extremely important, as in addition to increasing the ability to collect relevant data, such as attention, affect, gaze direction, and gestures [34], it allows designers to implement tools to examine the level of the disability of these users, observing their emotions through facial expressions or body movements [28].

Emphasizing the collaborative nature of our research, direct assistance from proxy users to recognize preferences and design characteristics for children with autism is beneficial and essential in developing applications for this audience [37]. Despite knowing the importance of this collaborative approach, many works still need help to involve and include these actors in design projects [25].

Another fundamental factor in developing applications aimed at children with autism is the accessibility of computational artifacts [43]. In the software design process, solutions must be designed and developed to meet users' objectives [49]. Therefore, solutions must be developed with accessibility in mind to ensure that, regardless of the user's limitations, applications are accessible, easy to use, and satisfactory [48].

In addition to the communication and learning aspects, it is essential to help and understand the social aspects of children with autism [26]. Inclusive tools, such as gamified games, can help in this scenario by arousing their interest and attention [33]. Inclusive methods also favor the socialization of children with autism with other children [25]. Through the representations of physical spaces, which children with autism already know

and are familiar with, [50] demonstrates how this type of interaction can help to understand and incorporate the social rules of interaction with the peers of children with autism. Likewise, [56] proposes the creation of a mobile application to be applied in the daily lives of these users, being tested only on children with mild and moderate autism. This research seeks to use technology to give more autonomy and social inclusion to people who have a disability.

Table 12 demonstrates the characteristics identified in the articles cataloged in RSL in the group of design projects for children with autism and which are related to the research question (RQ3).

**Table 12.** Characteristics of works on design projects for children with autism.

| No. | Authors                                             | Title                                                                                                                             | Methods/Techniques/Models                                                                        | Journal/Conference/Book                                                    |
|-----|-----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| 01  | Passerino et al. (2013) [55]                        | SCALA e Siesta Cloud: uma integração para aplicações homeschooling visando a inclusão                                             | Context-centered design for alternative communication with children with autism.                 | Simpósio Brasileiro de Informática na Educação                             |
| 02  | Malinverni et al. (2016) [51]                       | An inclusive design approach for developing video games for children with Autism Spectrum Disorder                                | Inclusive design and the fusion of methods to create therapeutic games for children with autism. | Computers in Human Behavior                                                |
| 03  | Cesário et al. (2016) [27]                          | Crescendo: Routine Learning App for Children with Autism Spectrum Disorders                                                       | Object-oriented tasks for automating routines with children with autism.                         | Interaction Design and Children                                            |
| 04  | Tang (2016) [28]                                    | Helping Neuro-typical Individuals to “Read” the Emotion of Children with Autism Spectrum Disorder: An Internet-of-Things Approach | An Internet of Things approach for emotion recognition in children with autism.                  | Interaction Design and Children                                            |
| 05  | Castro, Castro, and Lima (2016) [50]                | A playground model to stimulate social interaction in autistic children                                                           | Inclusive design process to support psychotherapy sessions for children with autism.             | Simpósio Brasileiro sobre Fatores Humanos em Sistemas Computacionais       |
| 06  | Abdullah and Bereton (2017) [35]                    | Mycalendar: Supporting Children on the Autism Spectrum to Learn Language and Appropriate Behaviour                                | Self-directed approach to supporting communication in non-verbal children with autism.           | International Conference on Universal Access in Human–Computer Interaction |
| 07  | Chen, Wang, and Su (2017) [39]                      | The Effectiveness of Using Auto Organizational Menu to Communicate with Classmates: A Case Study of Autism Spectrum Disorders     | Intervention method for the communication of children with autism through a case study.          | International Conference on Software and Computer Applications             |
| 08  | Dickstein-Fischer, Pereria, and Fischer (2017) [34] | Interactive Tracking for Robot-Assisted Autism Therapy                                                                            | Applied behavior analysis therapy to collect relevant data from children with autism.            | ACM/IEEE International Conference on Human–Robot Interaction               |
| 09  | Kolakowska, Landowska, and Karpienko (2017) [33]    | Gyroscope-Based Game Revealing Progress of Children with Autism                                                                   | A combination of methods for measuring therapy progress with autistic children.                  | International Conference on Machine Learning and Soft Computing            |
| 10  | Melo et al. (2017) [37]                             | Searching for Preferences of Autistic Children to Support the Design of User Interfaces                                           | Case study and observation to identify interface patterns for children with autism.              | Simpósio Brasileiro sobre Fatores Humanos em Sistemas Computacionais       |
| 11  | Neto et al. (2017) [56]                             | Cotidiano: um software para auxiliar crianças autistas em suas atividades diárias                                                 | Educational intervention model for developing an app for children with autism.                   | Simpósio Brasileiro de Informática na Educação                             |

Table 12. Cont.

| No. | Authors                                | Title                                                                                                                                                                                | Methods/Techniques/Models                                                                                                          | Journal/Conference/Book                                                     |
|-----|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| 12  | Moita et al. (2017) [57]               | Design e desenvolvimento de um game assistivo para autistas                                                                                                                          | Qualitative approach to developing an assistive game for children with autism.                                                     | Simpósio Brasileiro de Informática na Educação                              |
| 13  | Cibrian et al. (2018) [40]             | A Step Towards Identifying the Sound Preferences of Children with Autism                                                                                                             | Direct observation with the help of health professionals to identify sound preferences in children with autism.                    | International Conference on Pervasive Computing Technologies for Healthcare |
| 14  | Rosa, Silva, and Aymone (2018) [46]    | Design inclusivo: processo de desenvolvimento de prancha de comunicação alternativa e aumentativa para crianças com transtorno do espectro do autismo utilizando realidade aumentada | Case study, experiments, and direct observation through design and augmented reality to aid communication in children with autism. | Biblioteca Digital Brasileira de Teses e Dissertações                       |
| 15  | Leite et al. (2019) [54]               | Graphic design of interactive tools for people with autistic spectrum disorders                                                                                                      | The systematic analysis of an ergonomic and inclusive study to create a graphic environment for children with autism.              | In book: Advances in Design for Inclusion                                   |
| 16  | Sofian, Hashin, and Sarlan (2021) [25] | Multimedia Elements in Designing Mobile App Interface for Autistic Children: Proxy User Perspective                                                                                  | Interface design from the perspective of proxies in app development for children with autism.                                      | International Conference on Computer & Information Sciences                 |
| 17  | Mubin et al. (2021) [26]               | A Gamification Design Framework for Supporting ASD Children Social Skills                                                                                                            | Design techniques applied in the development of a gamification framework for children with autism.                                 | International Conference on Developments in eSystems Engineering            |
| 18  | Pinheiro and Marques (2021) [43]       | Accessibility-oriented design with a focus on autism aspects: designing a mobile application for autistic children's daily routine                                                   | UserX stories, proto-personas, and prototyping applied to the design of an application for children with autism.                   | Simpósio Brasileiro de Qualidade de Software                                |
| 19  | Pereira et al. (2023) [49]             | Utilizando Design Thinking no design de aplicativos educacionais para crianças autistas                                                                                              | Collaborative design thinking approach applied to interface design for children with autism.                                       | Computer on the Beach                                                       |
| 20  | Rodrigues et al. (2023) [48]           | Um Processo de Design de Interface com foco em Usuários com Transtorno do Espectro Autista: Uma Experiência Prática                                                                  | Practical experience designing interfaces for children with autism.                                                                | Computer on the Beach                                                       |

Analyzing Tables 10–12, we see a diversity of places where research was published, 25 in total. Among the locations are magazines, conferences, book chapters, and theses. We highlight the most representative ones: Interaction Design and Children (four in total), International Conference on Universal Access in Human–Computer Interaction (three in total), Brazilian Symposium on Informatics in Education (three in total), Brazilian Symposium on Human Factors in Computing Systems (two in total), and Computer on the Beach (two in total). It is also important to highlight that among the publication locations, two are related to the area of IT and health and two are related to IT and education.

## 5. Conclusions

As the development of computational tools continues to advance, it is crucial to consider how these resources can be effectively utilized by all users, including those with physical or neurological disabilities. This challenge becomes particularly complex when we need a comprehensive understanding of the needs and preferences of these user groups. A potential solution is to involve the users in the development process, gathering valuable insights into their requirements. However, this approach is not without its challenges, especially when it comes to engaging users with neurodevelopmental conditions, such as children with autism. This paper presents the results of a systematic review process, a critical step in our journey to gather information on current research focused on the development of participatory, inclusive, and adaptive design models through universal design (UD) for children with autism.

Therefore, the results point out the categorizations for the works selected by the systematic review process. Of the total of 2026 articles returned from the databases, applying the exclusion criteria, 467 were selected in the initial selection phase. In the preliminary selection phase, filters were applied by reading the titles, abstracts, introductions, and conclusions of the articles, and 192 articles were selected. Finally, in the final selection phase, based on the inclusion criteria, 34 articles were accepted in total, 27 in English and 7 in Portuguese.

Among the main limitations of the research, it was evident that the term “young people with autism” was not clear enough to define an exact and common age among the works found in this SLR, being different for each of them. In the research carried out here, the main focus is around “children with autism” and, therefore, it was necessary to determine age to restrict the selection of the works that had the participation of these users and not allow including the works that used users of an older age. Thus, to avoid the “risk of bias” [72], in the analysis and selection of the works, parameters related to the research questions were adopted, to be analyzed and discussed. Therefore, the analysis allowed the inclusion of children with autism ranging from 4 to 10 years old, which was not enough to guarantee complete accuracy during the selection as some research did not inform the profile of the participating children with autism.

The selected articles offer valuable recommendations for developing adaptive hardware for children with autism, emphasizing inclusive and universal design processes. A critical aspect of these recommendations is the active involvement of children in participatory design (PD) processes, extending their participation throughout the entire research and development phase. By leveraging the insights from these articles, we can address the researched concepts more systematically, enhancing developer support and understanding of the complexities involved in building computational tools adapted for autistic audiences.

**Author Contributions:** All authors worked fully on the research. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research was funded by Government of the State of Amazonas and the Secretariat of Economic Development, Science, Technology and Innovation, with resources from the Amazonas State Research Support Foundation—FAPEAM through EDITAL No. 003/2018 of the Program to Support the Training of Human Resources for the Interior of the State of Amazonas—PROINT/AM; This research, as provided for in Article 48 of decree No. 6008/2006, was partially financed by Samsung Eletrônica da Amazônia Ltda, under the terms of Federal Law No. 8387/1991, through agreement No. 003/2019, signed with ICOMP/UFAM; This study was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior-Brazil (CAPES-PROEX)-Finance Code 001. This work was partially supported by Amazonas State Research Support Foundation-FAPEAM-through the POSGRAD project 2024/2025. Universidade Federal do Amazonas (UFAM).

**Data Availability Statement:** Data are contained within the article.

**Conflicts of Interest:** The authors declare no conflicts of interest.

## References

1. Benton, L.; Vasalou, A.; Khaled, R.; Johnson, H.; Gooch, D. Diversity for design: A framework for involving neurodiverse children in the technology design process. In Proceedings of the SIGCHI conference on Human Factors in Computing Systems, Toronto, ON, Canada, 26 April–1 May 2014; pp. 3747–3756. [CrossRef]
2. Lucke, U.; Castro, T. The Process of Inclusive Design. In Proceedings of the IEEE 16th International Conference on Advanced Learning Technologies (ICALT), Austin, TX, USA, 25–28 July 2016; pp. 446–447. [CrossRef]
3. Moreno, G.C.; Collazos, C.; Bautista, S.; Moreira, F. FRIDA, a Framework for Software Design, Applied in the Treatment of Children with Autistic Disorder. *Sustainability* **2022**, *14*, 14560. [CrossRef]
4. Braz, L.M. Design Para Todos e Educação Inclusiva: Envolvendo Professores na Criação de Tecnologias. Master's Thesis, Universidade Estadual de Campinas, São Paulo, Brazil, 2017; 120p. Available online: <https://www.unicamp.br/unicamp/teses/2017/11/22/design-para-todos-e-educacao-inclusiva-envolvendo-professores-na-criacao-de> (accessed on 15 May 2021).
5. Marins, S.C.F. Design Universal, Acessibilidade e Tecnologia Assistiva: A Formação Profissional do Terapeuta Ocupacional na Perspectiva da Equidade. Ph.D Thesis, Universidade Federal de São Carlos, São Paulo, Brazil, 2011. Available online: <https://repositorio.ufscar.br/handle/ufscar/2875?show=full> (accessed on 15 July 2023).
6. Lowy, R.; Gao, L.; Hall, K.; Kim, J.G. Toward Inclusive Mindsets: Design Opportunities to Represent Neurodivergent Work Experiences to Neurotypical Co-Workers in Virtual Reality. In Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems (CHI '23), Hamburg, Germany, 23–28 April 2023; Association for Computing Machinery: New York, NY, USA, 2023. Article 783. pp. 1–17. [CrossRef]
7. Sobel, K. Interactive Technology for Inclusive Play. In Proceedings of the 2016 CHI Conference Extended Abstracts on Human Factors in Computing Systems (CHI EA '16), San Jose, CA, USA, 7–12 May 2016; ACM: New York, NY, USA, 2016; pp. 249–254. [CrossRef]
8. Umanski, D.; Avni, Y.; Rinott, M. Sonora: Inclusive voice play for children with various abilities. In *Extended Abstracts Publication of the Annual Symposium on Computer-Human Interaction in Play*; ACM: New York, NY, USA, 2017; pp. 369–374. [CrossRef]
9. Jaramillo-Alcázar, A.; Arias, J.; Albornoz, I.; Alvarado, A.; Luján-Mora, S. Method for the Development of Accessible Mobile Serious Games for Children with Autism Spectrum Disorder. *Int. J. Environ. Res. Public Health* **2022**, *19*, 3844. [CrossRef] [PubMed] [PubMed Central]
10. Center for Universal Design. State University NC. 1995. Available online: [https://projects.ncsu.edu/ncsu/design/cud/about\\_ud/about\\_ud.htm](https://projects.ncsu.edu/ncsu/design/cud/about_ud/about_ud.htm) (accessed on 10 December 2019).
11. Alzahrani, M.; Uitdenbogerd, A.L.; Spichkova, M. Impact of animated objects on autistic and non-autistic users. In Proceedings of the 2022 ACM/IEEE 44th International Conference on Software Engineering: Software Engineering in Society (ICSE-SEIS '22), Pittsburgh, PA, USA, 21–29 May 2022; Association for Computing Machinery: New York, NY, USA, 2022; pp. 102–112. [CrossRef]
12. Britto, T.C.P.; Pizzolato, E.B. Gaia: Uma proposta de um guia de recomendações de acessibilidade de interfaces web com foco em aspectos do autismo. In *V Congresso Brasileiro de Informática na Educação (CBIE 2016)*; Sociedade Brasileira de Computação (Realizadora): Porto Alegre, Brazil, 2016; p. 816, ISSN 2316-6533. [CrossRef]
13. Perez, C.L.R.; Mcmeekin, D.A.; Falkmer, M.; Tan, T. Holistic Approach for Sustainable Adaptable User Interfaces for People with Autism Spectrum Disorder. In Proceedings of the 26th International Conference on World Wide Web Companion (WWW '17 Companion), Perth, Australia, 3–7 April 2017; International World Wide Web Conferences Steering Committee, Republic and Canton of Geneva, Switzerland: Geneva, Switzerland, 2017; pp. 1553–1556. [CrossRef]
14. Sobel, K.; Rector, K.; Evans, S.; Kientz, J.A. Incloodle: Evaluating an Interactive Application for Young Children with Mixed Abilities. In Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems (CHI '16), San Jose, CA, USA, 7–12 May 2016; ACM: New York, NY, USA, 2016; pp. 165–176. [CrossRef]
15. Hijab, M.H.F.; Al-Thani, D. En Route to Co-designing Inclusive Play with and For Autistic Children. In Proceedings of the 2022 9th International Conference on Behavioural and Social Computing (BESC), Matsuyama, Japan, 29–31 October 2022; pp. 1–4. [CrossRef]
16. Satterfield, D.; Fabri, M. User Participatory Methods for Inclusive Design and Research in Autism: A Case Study in Teaching UX Design. In *International Conference of Design, User Experience, and Usability*; Springer: Berlin/Heidelberg, Germany, 2017; pp. 186–197. [CrossRef]
17. Firsanova, V. Towards Building a Mobile App for People on the Spectrum. In Proceedings of the Companion Proceedings of the ACM Web Conference 2023 (WWW '23 Companion), Austin, TX, USA, 30 April–4 May 2023; Association for Computing Machinery: New York, NY, USA, 2023; pp. 555–559. [CrossRef]
18. Kitchenham, B.; Charters, S. Guidelines for Performing Systematic Literature Reviews in Software Engineering. 2007. Available online: <https://www.cs.auckland.ac.nz/~norsaremah/2007%20Guidelines%20for%20performing%20SLR%20in%20SE%20v2.3.pdf> (accessed on 11 August 2023).
19. Peters, M.; Godfrey, C.; Mcinerney, P.; Khalil, H.; Larsen, P.; Marnie, C.; Pollock, D.; Tricco, A.; Munn, Z. Best practice guidance and reporting items for the development of scoping review protocols. *JBI Evid. Synth.* **2022**, *20*, 953–968. [CrossRef] [PubMed]
20. Page, M.J.; McKenzie, J.E.; Bossuyt, P.M.; Boutron, I.; Hoffmann, T.C.; Mulrow, C.D.; Shamseer, L.; Tetzlaff, J.M.; Akl, E.A.; Brennan, S.E.; et al. The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ* **2021**, *372*, n71. [CrossRef] [PubMed]

21. Cohen, J. Weighted kappa: Nominal scale agreement with provision for scaled disagreement or partial credit. *Psychol. Bull.* **1968**, *70*, 213–220. [CrossRef] [PubMed]
22. Stern, C.; Lizarondo, L.; Carrier, J.; Godfrey, C.; Reiger, K.; Salmond, S.; Apostolo, J.; Kirkpatrick, P.; Loveday, H. Methodological guidance for the conduct of mixed methods systematic reviews. *JBIM Evid. Synth.* **2020**, *18*, 2108–2118. [CrossRef] [PubMed]
23. Okoli, C. A guide to conducting a standalone systematic literature review. *Commun. Assoc. Inf. Syst.* **2015**, *37*, 43. [CrossRef]
24. Aromataris, E.; Munn, Z. (Eds.) JBI Reviewer's Manual. *JBIM*. 2020. Available online: [https://www.researchgate.net/publication/342595638\\_Chapter\\_1\\_JBI\\_Systematic\\_Reviews](https://www.researchgate.net/publication/342595638_Chapter_1_JBI_Systematic_Reviews) (accessed on 10 October 2023). [CrossRef]
25. Sofian, N.M.; Sobri, Hashim, A.; Sarlan, A. Multimedia Elements in Designing Mobile App Interface for Autistic Children: Proxy User Perspective. In Proceedings of the International Conference on Computer & Information Sciences (ICCOINS), Kuching, Malaysia, 13–15 July 2021; pp. 96–101. [CrossRef]
26. Mubin, S.A.; Poh, M.W.A.; Rohizan, R.; Abidin, A.Z.Z.; Wei, W.C. A Gamification Design Framework for Supporting ASD Children Social Skills. In Proceedings of the 14th International Conference on Developments in eSystems Engineering (DeSE), Sharjah, United Arab Emirates, 7–10 December 2021; pp. 114–117. [CrossRef]
27. Cesário, V.; Rodrigues, J.; Li, H.; Wu, I.; Nisi, V. Crescendo: Routine Learning App for Children with Autism Spectrum Disorders. In Proceedings of the 15th International Conference on Interaction Design and Children (IDC '16), Manchester, UK, 21–24 June 2016; ACM: New York, NY, USA, 2016; pp. 571–576. [CrossRef]
28. Tang, T.Y. Helping Neuro-typical Individuals to “Read” the Emotion of Children with Autism Spectrum Disorder: An Internet-of-Things Approach. In Proceedings of the 15th International Conference on Interaction Design and Children (IDC '16), Manchester, UK, 21–24 June 2016; ACM: New York, NY, USA, 2016; pp. 666–671. [CrossRef]
29. Leal, A.; Teixeira, A.; Silva, S. *On the Creation of a Persona to Support the Development of Technologies for Children with Autism Spectrum Disorder*; Springer: Berlin/Heidelberg, Germany, 2016; Volume 9739, pp. 213–223. [CrossRef]
30. Zheng, C.; Zhang, C.; Li, X.; Li, B.; Zhang, F.; Liu, X.; Yao, C.; Zhao, Y.; Ying, F. An EEG-based Adaptive Training System for ASD Children. In Proceedings of the Adjunct Publication of the 30th Annual ACM Symposium on User Interface Software and Technology (UIST '17), Québec City, QC, Canada, 22–25 October 2017; ACM: New York, NY, USA, 2017; pp. 197–199. [CrossRef]
31. Frauenberger, C.; Makhaeva, J.; Spiel, K. Blending Methods: Developing Participatory Design Sessions for Autistic Children. In Proceedings of the 2017 Conference on Interaction Design and Children (IDC '17), Stanford, CA, USA, 27–30 June 2017; ACM: New York, NY, USA, 2017; pp. 39–49. [CrossRef]
32. Wilson, C.; Brereton, M.; Ploderer, B.; Sitbon, L.; Saggars, B. Digital Strategies for Supporting Strengths- and Interests-based Learning with Children with Autism. In Proceedings of the 19th International ACM SIGACCESS Conference on Computers and Accessibility (ASSETS '17), Baltimore, MD, USA, 20 October–1 November 2017; ACM: New York, NY, USA, 2017; pp. 52–61. [CrossRef]
33. Kolakowska, A.; Landowska, A.; Karpieńko, K. Gyroscope-Based Game Revealing Progress of Children with Autism. In Proceedings of the 2017 International Conference on Machine Learning and Soft Computing (ICMLSC '17), Ho Chi Minh City, Vietnam, 13–16 January 2017; ACM: New York, NY, USA, 2017; pp. 19–24. [CrossRef]
34. Dickstein-Fischer, L.A.; Pereira, R.H.; Gandomi, K.Y.; Fathima, A.T.; Fischer, G.S. Interactive Tracking for Robot-Assisted Autism Therapy. In Proceedings of the Companion of the 2017 ACM/IEEE International Conference on Human-Robot Interaction (HRI '17), Vienna, Austria, 6–9 March 2017; ACM: New York, NY, USA, 2017; pp. 107–108. [CrossRef]
35. Abdullah, M.H.L.; Brereton, M. Mycalendar: Supporting children on the autism spectrum to learn language and appropriate behaviour. In Proceedings of the 29th Australian Conference on Computer-Human Interaction (OZCHI '17), Brisbane, Australia, 28 November–1 December 2017; ACM: New York, NY, USA, 2017; pp. 201–209. [CrossRef]
36. Spiel, K.; Malinverni, L.; Good, J.; Frauenberger, C. Participatory Evaluation with Autistic Children. In Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems (CHI '17), Denver, CO, USA, 6–11 May 2017; ACM: New York, NY, USA, 2017; pp. 5755–5766. [CrossRef]
37. Melo, Á.; Santos, J.; Rivero, L.; Barreto, R. Searching for Preferences of Autistic Children to Support the Design of User Interfaces. In Proceedings of the XVI Brazilian Symposium on Human Factors in Computing Systems (IHC 2017), Joinville, Brazil, 23–27 October 2017; ACM: New York, NY, USA, 2017. Article 45. [CrossRef]
38. Johnson, K.T.; Picard, R.W. SPRING: Customizable, Motivation-Driven Technology for Children with Autism or Neurodevelopmental Differences. In Proceedings of the 2017 Conference on Interaction Design and Children (IDC '17), Stanford, CA, USA, 27–30 June 2017; ACM: New York, NY, USA, 2017; pp. 149–158.
39. Chen, C.H.; Wang, C.P.; Su, C.C. The effectiveness of using auto organizational menu to communicate with classmates: A case study of autism spectrum disorders. In Proceedings of the 6th International Conference on Software and Computer Applications (ICSCA '17), Bangkok, Thailand, 26–28 February 2017; ACM: New York, NY, USA, 2017; pp. 304–309. [CrossRef]
40. Cibrian, F.L.; Mercado, J.; Escobedo, L.; Tentori, M. A Step towards Identifying the Sound Preferences of Children with Autism. In Proceedings of the 12th EAI International Conference on Pervasive Computing Technologies for Healthcare (Pervasive Health '18), New York, NY, USA, 21–24 May 2018; ACM: New York, NY, USA, 2018; pp. 158–167. [CrossRef]
41. Zhu, R.; Hardy, D.; Myers, T. Co-designing with Adolescents with Autism Spectrum Disorder: From Ideation to Implementation. In Proceedings of the 31st Australian Conference on Human-Computer-Interaction (Ozchi'19), Fremantle, WA, Australia, 2–5 December 2019; ACM: New York, NY, USA, 2019. [CrossRef]

42. Jhonson, K.; Narain, J.; Ferguson, C.; Picard, R.; Maes, P. The ECHOS Platform to Enhance Communication for Nonverbal Children with Autism: A Case Study. In Proceedings of the CHI '20: CHI Conference on Human Factors in Computing Systems, Honolulu, HI, USA, 25–30 April 2020; pp. 1–8. [\[CrossRef\]](#)
43. Pinheiro, V.; Marques, A.B. Accessibility-oriented design with a focus on autism aspects: Designing a mobile application for autistic children's daily routine. In Proceedings of the XIX Brazilian Symposium on Software Quality (SBQS '20), Honolulu, HI, USA, 25–30 April 2020; Association for Computing Machinery: New York, NY, USA, 2021. Article 27. pp. 1–10. [\[CrossRef\]](#)
44. Kamaruzaman, M.F.; Rani, N.M.; Nor, H.M.; Azahari, M.H.H. Developing User Interface Design Application for Children with Autism. *Procedia-Soc. Behav. Sci.* **2016**, *217*, 887–894. [\[CrossRef\]](#)
45. Braz, P.; David, V.; Raposo, A.; Barbosa, S.; de Souza, C. *An Alternative Design Perspective for Technology Supporting Youngsters with Autism*; Springer: Berlin/Heidelberg, Germany, 2014; pp. 279–287. [\[CrossRef\]](#)
46. Rosa, V.I.; Silva, R.P.; Aymone, J.L.F. Design inclusivo: Processo de desenvolvimento de prancha de comunicação alternativa e aumentativa para crianças com transtorno do espectro do autismo utilizando realidade aumentada. *Des. E Tecnol.* **2018**, *8*, 51–67. [\[CrossRef\]](#)
47. Magkafa, D.; Newbutt, N. Implementing Co-Design Practices for the Development of a Museum Interface for Autistic Children. In *Recent Advances in Technologies for Inclusive Well-Being*; Springer: Berlin/Heidelberg, Germany, 2021; pp. 421–443. [\[CrossRef\]](#)
48. Rodrigues, M.E.; Oliveira, A.; Damian, A.; Vasconcelos, P.; Marques, A.B. Um Processo de Design de Interface com foco em Usuários com Transtorno do Espectro Autista: Uma Experiência Prática. *Comput. Beach* **2023**, *14*, 240–247. [\[CrossRef\]](#)
49. Pereira, V.; Rodrigues, M.E.; Vasconcelos, P.; Marques, A.B. Utilizando Design Thinking no design de aplicativos educacionais para crianças autistas. *Comput. Beach* **2023**, *37*, 280–287. [\[CrossRef\]](#)
50. Castro, T.; Castro, A.; Lima, D. A Playground Model to Stimulate Social Interaction in Autistic Children. In Proceedings of the 15th Brazilian Symposium on Human Factors in Computing Systems (IHC '16), São Paulo, Brazil, 4–7 October 2016; ACM: New York, NY, USA, 2016. Article 57. [\[CrossRef\]](#)
51. Malinverni, L.; Mora-Guiard, J.; Padillo, V.; Valero, L.; Hervás, A.; Pares, N. An inclusive design approach for developing video games for children with autism spectrum disorder. *Comput. Hum. Behav.* **2016**, *71*, 535–549. [\[CrossRef\]](#)
52. Santos, M.I.; Breda, A.; Almeida, A.M. Learning Environment for Autism Spectrum Disorders: A universal approach to the promotion of mathematical reasoning. In Proceedings of the 7th International Conference on Software Development and Technologies for Enhancing Accessibility and Fighting Info-exclusion (DSAI 2016), Vila Real, Portugal, 1–3 December 2016; ACM: New York, NY, USA, 2016; pp. 162–169. [\[CrossRef\]](#)
53. Castro, T.; Lima, D. Designing for Children Using the RtD and HCD Approaches. In *Universal Access in Human–Computer Interaction (UAHCI). Design and Development Approaches and Methods, Proceedings of the 11th International Conference, UAHCI 2017, Vancouver, BC, Canada, 9–14 July 2017*; Antona, M., Stephanidis, C., Eds.; Springer: Berlin/Heidelberg, Germany, 2017; ISSN 0302-9743. [\[CrossRef\]](#)
54. Leite, J.; Maia, I.; Ferreirada, A.; Rosa, L. Graphic Design of Interactive Tools for People with Autistic Spectrum Disorders. In *Advances in Design for Inclusion. Proceedings of the AHFE 2018—Advances in Intelligent Systems and Computing, Orlando, FL, USA, 21–25 July 2018*; Springer: Cham, Switzerland, 2019; Volume 776. [\[CrossRef\]](#)
55. Passerino, L.; Rosângela Bez, M.; Carlos Gluz, J.; García, E.; Miguel Ramirez, J.; Lozano, C.D.C. SCALA e Siesta Cloud: Uma Integração Para Aplicações Homeschooling Visando a Inclusão. In *Anais do II Congresso Brasileiro de Informática na Educação (CBIE 2013), Proceedings of the XXIV Simpósio Brasileiro de Informática na Educação (SBIE 2013)*; 2013. Available online: [https://www.researchgate.net/publication/299667036\\_SCALA\\_e\\_Siesta\\_Cloud\\_uma\\_integracao\\_para\\_aplicacoes\\_homeschooling\\_visando\\_a\\_inclusao](https://www.researchgate.net/publication/299667036_SCALA_e_Siesta_Cloud_uma_integracao_para_aplicacoes_homeschooling_visando_a_inclusao) (accessed on 2 November 2023). [\[CrossRef\]](#)
56. Neto, A.F.O.; Rufino, H.L.P.; Nakamoto, P.T.; Palis, R.B.; Beira, D.G. Cotidiano: Um Software Para Auxiliar Crianças Autistas em Suas Atividades Diárias. In *Anais do VI Congresso Brasileiro de Informática na Educação (CBIE 2017), Proceedings of the XXVIII Simpósio Brasileiro de Informática na Educação (SBIE 2017)*; 2017. Available online: [https://www.researchgate.net/publication/320993676\\_Cotidiano\\_um\\_software\\_para\\_auxiliar\\_crianças\\_autistas\\_em\\_suas\\_atividades\\_diárias](https://www.researchgate.net/publication/320993676_Cotidiano_um_software_para_auxiliar_crianças_autistas_em_suas_atividades_diárias) (accessed on 22 July 2023). [\[CrossRef\]](#)
57. Moita, F.M.G.S.C.; Viana, L.H.; Medeiros, F.M.; Candido, V.M.A. Design e Desenvolvimento de um Game Assistivo Para Autistas. In *Anais do VI Congresso Brasileiro de Informática na Educação (CBIE 2017), Proceedings of the XXVIII Simpósio Brasileiro de Informática na Educação (SBIE 2017)*; 2017. Available online: [https://www.researchgate.net/publication/320994636\\_Design\\_e\\_desenvolvimento\\_de\\_um\\_game\\_assistivo\\_para\\_autistas](https://www.researchgate.net/publication/320994636_Design_e_desenvolvimento_de_um_game_assistivo_para_autistas) (accessed on 2 November 2023). [\[CrossRef\]](#)
58. Raja, K.S.S.; Balaji, V.; Kiruthika, S.U.; Raman, C.J. An IoT-Based System for Supporting Children with Autism Spectrum Disorder. In Proceedings of the Innovations in Power and Advanced Computing Technologies (i-PACT), Kuala Lumpur, Malaysia, 27–29 November 2021; pp. 1–5. [\[CrossRef\]](#)
59. Gunathilake, Y.A.G.U.T.R.F.; Fasliya, R.D.A.R.; Premarathne, D.; Pasan Kalhara, A.; Karunasena; Bandara, P.S. A technological intervention for improving cognitive abilities based on the preferences of Autistic children. In Proceedings of the International Conference on Engineering and Emerging Technologies (ICEET), Istanbul, Turkey, 27–28 October 2021; pp. 1–6.
60. Chung, S.J.; Ghinea, G. Towards developing digital interventions supporting empathic ability for children with autism spectrum disorder. *Univers. Access Inf. Soc.* **2022**, *21*, 275–294. [\[CrossRef\]](#)

61. Ferreira, R.S.; Castro, T.H.C. Uma Abordagem Participativa para Identificação de Preferências de Design de Crianças Autistas. In Proceedings of the Simpósio Brasileiro de Informática na Educação (SBIE), Brazil, 2019; pp. 1311–1320. Available online: <http://milanesa.ime.usp.br/rbie/index.php/sbie/article/view/8863> (accessed on 22 November 2023). [CrossRef]
62. Böckle, M.; Micheel, I.; Bick, M. A design framework for adaptive gamification applications. In Proceedings of the 51st Hawaii International Conference on System Sciences (HICSS), Hilton Waikoloa Village, HI, USA, 3–6 January 2018; pp. 1227–1236. [CrossRef]
63. Melo, Á.; Cabrejos, L.; Santos, J.; Barreto, R. PersonAut: A Personas Model for People with Autism Spectrum Disorder. In Proceedings of the Anais do XIX Simpósio Brasileiro sobre Fatores Humanos em Sistemas Computacionais, Evento Online, 26–30 October 2020; pp. 466–471. Available online: <https://dl.acm.org/doi/10.1145/3424953.3426651> (accessed on 13 August 2023). [CrossRef]
64. Liu, L.; Meng, J.; Wu, X.; Chen, J. Avatarizing Children with Autism Spectrum Disorder into Serious Games for Social Communication Skill Intervention. In Proceedings of the Tenth International Conference of Educational Innovation through Technology (EITT), Chongqing, China, 16–20 December 2021; pp. 299–303. [CrossRef]
65. Ribu, K.; Patel, T. Developing a User-Centred Planning Tool for Young Adults with Development Disorders: A Research-Based Teaching Project. *Stud. Health Technol. Inform.* **2016**, *229*, 283–286. [PubMed]
66. Choudhary, S.; Kaur, S.; Sharma, A.; Chandna, S. An e-Learning Application for Children Suffering from Autism. In *Learning and Collaboration Technologies (HCII 2023), Proceedings of the 10th International Conference, LCT 2023, Held as Part of the 25th HCI International Conference, HCII 2023, Copenhagen, Denmark, 23–28 July 2023*; Zaphiris, P., Ioannou, A., Eds.; Springer: Cham, Switzerland, 2023; Volume 14040. Available online: [https://link.springer.com/chapter/10.1007/978-3-031-34411-4\\_3](https://link.springer.com/chapter/10.1007/978-3-031-34411-4_3) (accessed on 8 December 2023). [CrossRef]
67. Chien, M.E.; Jheng, C.M.; Lin, N.M.; Tang, H.H.; Taelle, P.; Tseng, W.S.; Chen, M.Y. iCAN: A tablet based pedagogical system for improving communication skills of children with autism. *Int. J. Hum. Comput. Stud.* **2014**, *73*, 79–90. [CrossRef]
68. Ragone, G. Designing Embodied Musical Interaction for Children with Autism. In Proceedings of the 22nd International ACM SIGACCESS Conference on Computers and Accessibility (ASSETS '20), Virtual Event/Greece, 26–28 October 2020; Association for Computing Machinery: New York, NY, USA, 2020. Article 104. pp. 1–4. [CrossRef]
69. Farhan, S.A.; Rahman, K.M.N.; Swaron, M.R.; Saha, S.R.N.; Islam, M.M.; Razzak, M.A. Improvement of Verbal and Non-Verbal Communication Skills of Children with Autism Spectrum Disorder using Human Robot Interaction. In Proceedings of the IEEE World AI IoT Congress (AIIoT), Seattle, WA, USA, 10–13 May 2021; pp. 356–359. [CrossRef]
70. Ferreira, W.; Cordeiro, R.; Aguiar, Y.; Saraiva, J.; Tardif, C.; Galy, E. Panorama das Publicações Nacionais sobre Autismo, Educação e Tecnologia. In *Simpósio Brasileiro de Informática na Educação (SBIE)*; Fortaleza, Brazil, 2018; pp. 913–922. Available online: [https://www.researchgate.net/publication/328735888\\_Panorama\\_das\\_Publicacoes\\_Nacionais\\_sobre\\_Autismo\\_Educacao\\_e\\_Tecnologia](https://www.researchgate.net/publication/328735888_Panorama_das_Publicacoes_Nacionais_sobre_Autismo_Educacao_e_Tecnologia) (accessed on 15 October 2023). [CrossRef]
71. Ilchenco, A.; Ribas, L. Características interacionais do brincar em crianças com suspeita do Transtorno do Espectro Autista. *Distúrbios Comun.* **2022**, *34*, e52065. [CrossRef]
72. Stone, J.; Barker, T.; Aromataris, E.; Ritskes-Hoitinga, M.; Sears, K.; Klugar, M.; Leonardi-Be, J.; Munn, Z. From critical appraisal to risk of bias assessment: Clarifying the terminology for study evaluation in JBI systematic reviews. *JBI Evid. Synth.* **2023**, *21*, 472–477. [CrossRef]

**Disclaimer/Publisher's Note:** The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.