



Enhancing Cognitive Skills in Early Childhood Autism through Visual Interactive Media

Peningkatan Keterampilan Kognitif pada Anak Autis Usia Dini Melalui Media Visual Interaktif

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ARTICLE INFO

Keywords:

Autism Spectrum Disorder, early childhood, visual interactive media

ABSTRACT

Autism Spectrum Disorder (ASD) is a complex neurodevelopmental condition characterized by impairments in social communication, restricted interests, and repetitive behaviors. Children with ASD often face challenges in the development of cognitive skills, which play a crucial role in academic achievement, adaptive functioning, and overall quality of life. This study introduces an innovative approach to aid early childhood individuals diagnosed with ASD in recognizing their daily routines by means of a visual interactive board game. The developed visual interactive board game, although the design is simple, is meticulously structured to foster and enhance cognitive skills, specifically focusing on language development and improvement in adaptive behavior. The efficacy of this medium was examined through a single-case method utilizing the Single Subject Research (SSR) experimental approach. The research involved three children aged 4-5 years with an ASD diagnosis, employing a patterned B1-I-B2 design. The results of this study underline the potential of interactive board games as an engaging tool for fostering cognitive skills in early childhood autism.

INFO ARTIKEL

Kata kunci:

Gangguan Spektrum Autisme, anak usia dini, media visual interaktif

ABSTRAK

Gangguan Spektrum Autisme (GSA) adalah kondisi neurodevelopmental kompleks yang ditandai oleh gangguan dalam komunikasi sosial, minat terbatas, dan perilaku berulang. Anak-anak dengan GSA sering menghadapi tantangan dalam pengembangan keterampilan kognitif, yang memainkan peran penting dalam pencapaian akademis, fungsi adaptif, dan kualitas hidup secara keseluruhan. Penelitian ini memperkenalkan pendekatan inovatif untuk membantu individu anak usia dini yang didiagnosis mengalami GSA dalam mengenali rutinitas harian melalui permainan papan interaktif visual. Permainan papan interaktif visual dikembangkan dengan desain yang sederhana serta dirancang dengan cermat untuk membantu dan meningkatkan keterampilan kognitif dengan fokus khusus pada perkembangan bahasa dan peningkatan perilaku

adaptif. Efektivitas media ini diuji melalui metode kasus tunggal dengan menggunakan pendekatan eksperimental penelitian subjek tunggal. Penelitian ini melibatkan tiga anak berusia 4-5 tahun yang diagnosis GSA dengan menggunakan desain B1-I-B2 yang terstruktur. Hasil penelitian ini menyoroti potensi permainan papan interaktif sebagai alat yang menarik untuk meningkatkan keterampilan kognitif pada autisme usia dini.

<https://doi.org/10.5614/sostek.itbj.2024.23.2.3>

Submitted: November 21, 2023 Accepted: June 11, 2024 Published: July 31, 2024

Introduction

In 1943, Dr. Leo Kraner introduced the term "autism" for the first time. Autism Spectrum Disorder (ASD) is a complex neurodevelopmental disorder that affects social interaction, communication, and behavior. Communication difficulties in early childhood autism are characterized by a lack of eye contact, delayed or absent speech, and, in some cases, struggles with vowel pronunciation. These children may find it challenging to initiate conversations, exhibit repetitive word patterns, and struggle to comprehend others' speech. Early childhood is a crucial period for intervention, as cognitive development during this phase forms the foundation for future learning and adaptation. Children with ASD often face challenges in understanding and following daily routines, which impacts their overall cognitive and adaptive functioning (Chui, 2020; Kidder & McDonnell, 2017).

Recent data indicates that autism spectrum disorder (ASD) affects at least 1 in 88 individuals in the population. Although the number of individuals with autism has shown an increasing trend in recent years, public awareness of autism can be considered limited. In the past 5-10 years, the United States and the United Kingdom have made intensive efforts to raise autism awareness among the general public. However, in some Southeast Asian countries, such as Indonesia and Malaysia, the handling of individuals with autism is still suboptimal (Dillenburger et al., 2017; Holton, 2013; Huang & Wheeler, 2007). This is due to the limited information highlighting the importance of public awareness and understanding of autism. The limited knowledge and awareness of the community regarding autism can lead to several issues, including the emergence of stigma and discrimination, a lack of social support for individuals with autism, limited access to educational services, a dearth of employment opportunities, and a lack of policy support (Hinshaw, 2007; Holton, 2013). Stigma or negative evaluations of individuals with disabilities pose a significant barrier to achieving social inclusion.

Inclusive education represents an initiative to ensure that every individual, including those with ASD, can access and participate in an educational environment that is supportive. However, the success of inclusive education is not solely contingent upon institutional efforts. Support and understanding from the surrounding community, including parents, educators, and community members, play a pivotal role (Arsli, 2006; Dillenburger et al., 2017; Ogretir & Ulutas, 2009; Rochmani & Ramdhani, 2021). Prior to designing intervention activities for autism, a sufficient understanding from the community about the importance of knowledge and awareness regarding autism is indispensable. Given that social and educational inclusion for individuals with ASD necessitates collective support, educational and informational measures aimed at enhancing community understanding of the autism spectrum become paramount in creating a genuinely inclusive environment that fosters the development of children with ASD (Dillenburger et al., 2013).

Early intervention plays a pivotal role in ameliorating cognitive and behavioral difficulties in children with ASD. However, the limited availability of interventions catering to the cognitive development of early childhood individuals with ASD remains a concern. In Indonesia, interventions for early childhood autism are limited. The research addresses this gap by proposing an innovative solution—a simple yet measuredly designed interactive board game. This intervention aims to assist early childhood individuals with ASD in recognizing their daily routines and developing cognitive skills. The rationale behind this endeavor is the lack of engaging and culturally familiar interventions for early childhood ASD in

Indonesia (Holton, 2013). The research team conducted a preliminary study that focused on the various types of media that were previously designed for early learning purposes in children with ASD. Through the preliminary study, it was found that the availability of interactive visual media specifically designed for early-age autistic children is relatively limited. In cases where such media exists, it often originates from foreign developers. Consequently, visual elements, including character design and depicted activities in these existing media, may not align with the lives and experiences of autistic children in Indonesia. This misalignment underscores the crucial need to develop media that corresponds to the characteristics and requirements of autistic children. Our investigation into existing media further emphasizes the imperative to create content that aligns with the unique characteristics of the Indonesian context, ensuring a more meaningful and easily applicable learning experience.

The study focuses on two key cognitive domains: language development and adaptive behavior. Cognitive development encompasses various mental processes, including attention, memory, problem-solving, and language acquisition. Individuals with ASD often exhibit variations in their cognitive profiles, with some demonstrating strengths in specific areas while facing difficulties in others. Language development, a crucial aspect of cognition, tends to be delayed or impaired in many children with ASD. This deficit in language acquisition can hinder their ability to comprehend and engage in everyday routines effectively. Adaptive behavior, on the other hand, involves the skills that are necessary for independent functioning in daily life, such as self-care, communication, and social interactions. Children with ASD frequently encounter challenges in adaptive behavior, which can further hinder their ability to engage in routines (Sterponi et al., 2015).

Joint attention is a fundamental cognitive skill involving the shared focus of attention between an individual and an object, event, or another person. In the context of early childhood autism education, joint attention plays a pivotal role as it encompasses the ability to coordinate attention, communication, and social engagement. The primary objective of fostering joint attention skills in children with autism is to enhance their capacity to engage with their environment and facilitate effective communication and interaction with peers and teachers. This skill empowers them to share experiences, intentions, and emotions with others, thereby laying the foundation for the development of more complex social skills (P. Mundy et al., 1990; P. Mundy & Newell, 2007).

The board game exhibits substantial potential for augmenting joint attention abilities in early childhood individuals with autism. Through its interactive and visually engaging nature, the board game effectively captures and sustains the child's attention, facilitating the establishment of a shared focus on a common object or activity. By actively participating in board game activities that demand coordinated attention to visual elements, children with autism gradually acquire the skills that are necessary to simultaneously attend to external stimuli and interpersonal interactions. This process fosters the development of joint attention, allowing children to navigate social situations more effectively, engage in meaningful communication, and forge connections with others. Furthermore, the structured and repetitive nature of board game interactions provides ample opportunities for consistent practice, contributing to the consolidation and generalization of joint attention skills beyond the immediate context of the game. As such, the board game emerges as a promising tool for fostering joint attention and promoting the overall cognitive and social development of young children with autism (Hayes et al., 2010; Kidder & McDonnell, 2017; Lok et al., 2022).

The developed interactive visual board game adapts the traditional "Snakes and Ladders" game into a simplified format known as "Stop and Tell." Within this board game framework, children are afforded the opportunity to pause at designated points and articulate the activities that are depicted on the board game. Additionally, this interactive session can be further enriched by integrating joint attention components. In this context, both the child and the teacher engaged in a collaborative exploration of the visual illustrations and subsequently engaged in discussions about the narrative, effectively promoting shared attention and facilitating enhanced communication between the child and the teacher.

Method

In the development of interactive visual learning media in the form of a board game, two main methods are employed in this research: the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) method for the media development process and the Single Subject Research (SSR) method for media testing. Firstly, the ADDIE method provides a structured framework to manage the entire process of developing learning media. The analysis phase helps media developers understand the needs and characteristics of the audience, while the design phase details the design and structure of the media. Development is the phase of implementing the design, followed by the implementation phase involving the use of media in real-life learning situations. Finally, the evaluation phase assesses the effectiveness of the media and provides feedback for further improvements (Ranuharja et al., 2021; Plesner & Phillips, 2014).

Secondly, the Single Subject Research (SSR) method was used to specifically test the learning medium with an experimental approach. This approach involves carefully monitoring individual subjects or learning participants in controlled learning situations. Single Subject Research (SSR) is an experimental research method conducted on one or more individual subjects with the aim of determining the magnitude of the influence of interventions that are repeatedly administered to alter specific behaviors within a specified timeframe. SSR helps to identify the impact of learning media on each individual, allowing for in-depth statistical analysis of specific variables. This approach ensures that the data obtained comes from one subject at a time, enabling developers to assess the effectiveness of the media more specifically and in detail (Gast & Ledford, 2009; Horner et al., 2005). The study employed a single-case methodology, specifically the Single Subject Research (SSR) approach, utilizing a B1-I-B2 design.

Three participants aged 4-5 years, diagnosed with ASD, were chosen as subjects. An explanation of the diagnosis and inclusion criteria is given in the following table of study subject characteristics.

Table I Characteristics of Research Subjects and Inclusion Criteria

Subject	Diagnosis	Inclusion Criteria
Child 1	Diagnosis of autism spectrum disorder (ASD) based on a clinical assessment by a psychologist and pediatrician.	A boy aged 4 years who has a diagnosis of ASD, has limited communication skills, and has a history of therapy or special education for children with autism.
Child 2	Diagnosis of autism spectrum disorder (ASD) based on evaluation from a child psychiatrist and observation of behavior by a trained medical team.	A boy aged 5 who has been diagnosed with ASD, shows difficulty in social interactions, and has no significant physical health problems.
Child 3	The diagnosis of autism spectrum disorder (ASD) is enforced through evaluations from psychologists, development specialists, and clinical behavioral observations.	A boy aged 4 who has a diagnosis of ASD, exhibits repetitive behavior, has limited language skills, and has never received special intervention before.

The baseline-1 (B-1) phase involved observing participants' understanding of routines without intervention. The intervention (I) phase incorporated the utilization of the interactive board game to assist the children in understanding and following daily routines, while the baseline-2 (B-2) phase observed the participants' understanding of routines post-intervention. The effectiveness of the intervention was measured through direct observation, data recording, and analysis of cognitive skills and adaptive behavior improvements.

Overall, the ADDIE method provides a holistic framework for media development, while the Single Subject Research method offers a deep experimental approach to test media that is more focused and detailed at the individual level. The combination of these two methods ensures the interactive visual learning of media in the form of a board game is well-developed and thoroughly tested to achieve optimal learning objectives.

Visual Interactive Board Games

The visual interactive board game developed for this study was designed with the objective of visually representing daily routines. By utilizing visual cues and interactive elements, the board game aims to assist children in understanding the sequence of activities from morning preparation to bedtime. The simplicity of the design is deliberate, focusing on engaging children with autism effectively. The choice of interactive board games as a medium is rooted in their potential to capture the attention of children with autism. Visual stimuli have been shown to be particularly effective in supporting learning and comprehension in this population (Gauvreau & Schwartz, 2013; Hayes et al., 2010; Kidder & McDonnell, 2017). The board game's interactive nature also promotes active engagement, enhancing the likelihood of skill acquisition and retention.

The development of this visual interactive board game involves three main phases: pre-production, production, and post-production. These stages cover the entire process of developing the board game. The pre-production phase is preliminary research and development. This phase commences with an in-depth study and analysis of existing media designed for early-age autism intervention. The purpose of this preliminary research is to establish a solid foundation for the subsequent development process. By examining the strengths and weaknesses of prior media interventions, the research team gains valuable insights that inform the design and content creation for the new interactive visual board game.

The production phase constitutes the actual creation of the interactive visual board game. The board game was visually designed with careful consideration of color composition, character depiction, and visual hierarchy to create ideal readability. It begins with the conceptualization and sketching of the board game's components, including characters, activities, and visual elements. Firstly, the sketches serve as the foundational design, guiding the subsequent steps in the production process. Following the sketching phase, digitalization takes place, where the hand-drawn sketches are translated into digital formats. This step involves refining details, adding color, and ensuring visual clarity. Color composition holds significance in capturing the attention of children with autism. Optimal color choices involve dominant primary colors like red, blue, and yellow, as these are often more visually appealing and comprehensible to individuals on the autism spectrum (Grandgeorge & Masataka, 2016; Meindl & Cannella-Malone, 2011). Contrast in color composition is also crucial, which can facilitate distinct separation between visual elements and aid in the differentiation of key information. Moreover, muted backgrounds with vivid foreground elements help direct focus and reduce visual overload, promoting a conducive learning environment.

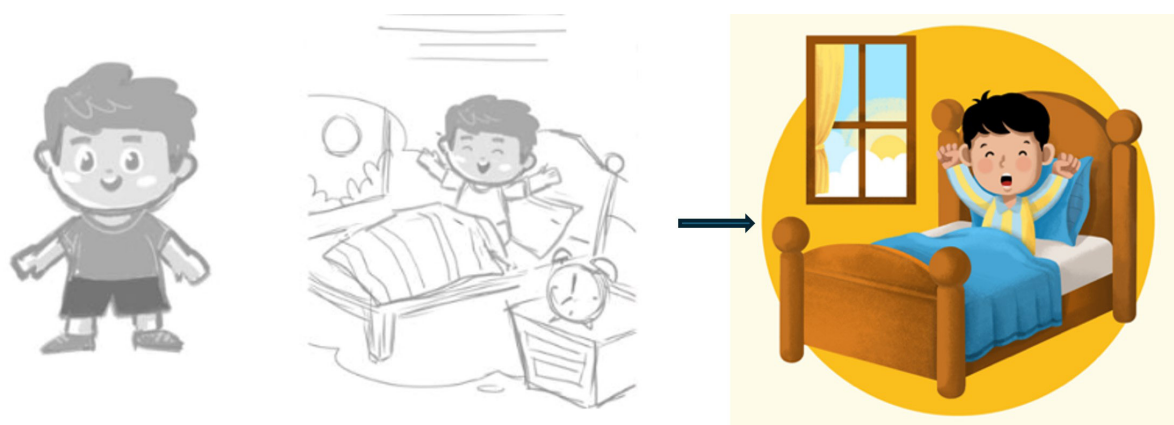


Figure 1 The sketching process to the digitization of character designs

Source: Personal documentation, 2023

Character depiction plays an essential role in connecting children with autism to the visual content. Characters should be relatable and reminiscent of familiar surroundings, ensuring relevance to the child's experiences. Visual simplicity is key, as intricate details can lead to distraction and hinder the child's ability

to focus on the main message. Additionally, characters' facial expressions and body language should be accurately depicted to convey emotions and intentions clearly, aiding in communication comprehension.



Figure 2 The character design utilized in the interactive visual board game
Source: Personal documentation, 2023

Subsequently, the layout design integrates these digital components into a cohesive and engaging visual board game. Throughout the production phase, close attention is paid to maintaining consistency in design elements and aligning them with the educational objectives of the media. Visual readability entails the arrangement and organization of visual elements to enhance information processing. Clear and concise visual hierarchies guide the child's attention and aid in the extraction of meaningful information. Ample spacing between elements prevents visual clutter and can reduce sensory overload. Typeface selection with optimal font size and readability ensures that text-based information is accessible and comprehensible.



Figure 3 The layout of visual interactive gameboard

The development of visual interactive board game media involves cognitive elements and functions aimed at increasing joint attention (Kasari et al., 2008; P. Mundy et al., 1990). The relationship between cognitive elements and functions is described through Table II.

Table II Cognitive Elements and Its Functions That Are Accommodated Through Media

Cognitive element	Function
Visual Aid	Visual support can serve as an anchor for joint attention and facilitate certain kinds of communication. Pictures can be used to direct children's attention to certain activities (Hayes et al., 2010; Suarez-Rivera et al., 2019).
Synchronized Activity	Interactive games are activities that inherently require children and adults to focus on a common task, this can foster joint attention (Nugrahani, 2007).
Modelling	Model joint attention behavior by consistently demonstrating how to shift focus between objects and other people. For example, when playing with a toy, alternate between looking at the toy and making eye contact with the child.
Sensory Engagement	Sensory involvement will be a stimulus to capture the child's interest. Using textures on gameboards can stimulate children to touch surfaces with different sensations.
Narrative Interaction	Involving children to listen to and understand a condition through interesting narratives and visual aids can increase joint attention. Expressive movements and facial expressions are also needed to encourage children's attention and participation in understanding the narrative (Freeman, 2012).

As previously stated, this board game adapts the pattern of the game "Snake and Ladders." Game elements, such as dice and pieces, have also been added. This board game can be played by one to three players with one teacher or caregiver. Players will alternately get their turn to roll the dice and run the pieces according to the numbers printed on the dice. Every time they stopped at a certain box, they were asked to explain what activity happened in the picture, demonstrate it, and make simple sentences describing the activity in the picture.

Test Results for an Interactive Visual Board Game

In this study, researchers attempted to increase the joint attention of early autistic children by carrying out daily routines as a game topic. The types of initiation of joint attention that are the focus of this game include alternating eye gaze, pointing, showing, and commenting (Meindl & Cannella-Malone, 2011; Rao & Gagic, 2006). In detail, the definition of the initiation of joint attention and the expected response are explained in the following table.

Table III Cognitive Elements and Its Functions That Are Accommodated Through Media

Type of joint attention	Definition
Eye gaze alternation	Child looks between object and teacher/caregiver in conjunction with positive affection (e.g. eye contact, smiling)
Pointing	Child extends finger toward object in conjunction with gaze alternation and positive affection to teacher/caregiver
Showing	Child holds activated object in hand and extends it toward teacher/caregiver/peer in conjunction with gaze alternation and positive affection.
Commenting	Child vocalize word or words about the object in conjunction with eye contact and positive affection

Three distinct stages are undertaken by the teacher or caregiver when implementing the media intervention. These stages encompass:

1. Preparation Stage

At the preparatory stage for the media trial, children are informed of the upcoming activities. The teacher or caregiver as facilitator offers a succinct exposition concerning the interactive visual attributes of the board game, delineating the rules, permissible interactions, and constraints pertinent to the gameplay. Participants are encouraged to direct their attention towards the board game, engage with auxiliary tools such as dice and playing pieces, and acclimate themselves to the mechanics of the game. This phase is designed to cultivate an ambiance of comfort and allure for the participants, thereby ensuring their sense of ease and readiness for engaging with the media.

2. Media Utilization Stage

In the implementation phase, participants are actively immersed in interactive visual media. The educator or caregiver undertakes the role of guiding the participants through game-based activities, urging the educator or caregiver to interact while he or she prioritizes four distinct modes of joint attention, such as alternating eye gaze, pointing, showing, and commenting. Participants are prompted to respond to cues, engage with peers, instructors, and the board game, and express their observations or viewpoints. To sustain the child's engagement and motivation, positive reinforcement and support are provided by the educator or caregiver. The treatment phase aims to observe the participants' interaction patterns with the media, including joint attention behaviors, verbal responsiveness, and the extent of involvement.

3. Post-Treatment Stage

After the implementation phase, a post-treatment assessment is conducted. This evaluation is aimed at gauging the participants' experiences and acquired learning outcomes. Dialogues are initiated by the educator or caregiver with the participants, involving open-ended inquiries regarding interactions, preferences, and challenges encountered during the intervention.

Collectively, these instructions serve as a compass, navigating participants and facilitators through the sequence of media experimentation stages and ensuring a structured and systematic approach to evaluate the effectiveness of interactive visual media in increasing shared attention and enhancing the learning experience.

The following presents the detailed outcomes of the interactive visual board game trial involving three children with autism, employing specifically the Single Subject Research (SSR) approach and utilizing a B1-I-B2 design, as elucidated in Table IV.

Table IV Media Trial

Subject	B1 (Baseline 1)	I (Intervention)	B2 (Baseline 2)
C1	C1 had shown limitations in interacting with drawing objects on the board game. He tended to focus on other things around him, not involving eye contact with the instructor.	C1 had shown increased engagement with drawing objects on the board game. He had started to stop at a certain picture, looked at the instructor, pointed at the picture, and tried to follow the game, although after a while, his attention was divided by his surroundings. But C1 could name at least three activities contained in the image.	C1 still showed new skills acquired during the intervention. He was still able to pause on the picture for a moment, focused on the teacher, and passed the dice to a friend when it was explained that it was his friend's turn to roll the dice.
C2	C2 had shown disinterest in drawing objects on the board game and was more likely to focus on repetitive behavior. Eye contact with the instructor was very limited.	C2 had begun to show increased interest when the teacher demonstrated the activities in the pictures. C2 looked at the teacher but could not fully do what was asked. C2 had not been able to participate in the game and only responded when the teacher imitated the activity in the picture.	C2 had shown progress in paying attention to the flow of games carried out by peers and teachers. However, the level of eye contact still required further attention.

C3	C3 had shown limited interest in drawing objects and a lack of involvement with the board game. Eye contact with the teacher was also rare.	C3 has shown an increase in interest in image objects and a more active engagement with the media. He was able to stop at a particular image and described the activity associated with it more confidently.	C3 continued to demonstrate skills acquired during the intervention. Her engagement with the media remained high, and eye contact had increased, indicating developments in attention-sharing skills.
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The results of the media trial observations indicated that children with autism encountered inherent challenges during the initial phases of media engagement. Specifically, these challenges manifested as difficulties related to active participation. In response, teachers and caregivers found it necessary to incorporate additional stimuli to facilitate the children's comprehension and engagement. This supplementary support often involved hands-on demonstrations of the activities portrayed in the visual content, aiming to enhance the children's understanding and promote active involvement.

Moreover, it is crucial to note that the varying conditions of each child contributed significantly to the challenges observed during the early phases of media trials. Each child has a unique profile, especially concerning joint attention abilities, necessitating personalized treatment approaches to ensure effective engagement in activities initiated by the teacher. Recognizing and addressing these individual differences played a crucial role in customizing interventions to meet the specific needs of each child. This approach aimed to enhance the effectiveness of media-based educational initiatives for children with autism.

In the domain of educating children with autism spectrum disorder (ASD), a nuanced comprehension of joint attention responses is imperative. Particularly, the manifestation of affective participation, although it is not always overtly demonstrated by teachers or caregivers during the utilization of the developed media, requires careful consideration. Upon closer inspection, the interactive visual board game stands out as an effective stimulant for capturing the attention of these children.

A detailed examination of the responses elicited during the engagement with the visual board game reveals a spectrum of expressions that go beyond mere visual attention. Notably, the children exhibit a range of affective responses, including expressions of interest, excitement, and curiosity. These observable behaviors represent positive developments in the realm of joint attention, indicating an intrinsic reinforcement process that holds significance in their developmental journey.

Conclusion

The developed interactive visual board game holds the potential to enhance children's joint attention skills. Through its interactive and visually engaging features, the media captures and sustains children's focus on shared objects or activities, facilitating joint attention. This can significantly contribute to the improvement of their ability to simultaneously attend to both stimuli and interpersonal interactions.

However, while the media demonstrates promise in augmenting joint attention skills, it is imperative to underscore the importance of maintaining consistency, repetition, and continuous media evolution. Consistency in utilizing the media ensures that children have ample opportunities to practice and reinforce their newly acquired joint attention abilities. Repetition, on the other hand, solidifies their learning and promotes the generalization of these skills in various contexts.

Furthermore, the ongoing development of the media is essential for two key reasons. First, a diverse range of content can sustain children's engagement and enthusiasm, preventing monotony and ensuring continued interest in utilizing the media. Second, broadening the scope of the media's functionalities beyond joint attention can facilitate the enhancement of other competencies, such as communication, problem-solving, and fine motor skills. This expanded utility ensures that the media remains a versatile and effective tool for nurturing holistic developmental progress.

Acknowledgements

The authors would like to extend their sincere gratitude to Universitas Negeri Semarang for providing the financial support for this research, with contract number: 331.12.4/UN37/PPK.10/2023. This support has been invaluable in facilitating the execution of the study and contributing to its successful completion.

References

- Arsli, A. O. (2006). *Penerimaan orangtua yang memiliki anak Autis*.
- Chui, L. N. (2020). *A literature review of how visual aids promote behavioral change for children with autism*. University of Oslo.
- Dillenburger, K., Jordan, J. A. J., McKerr, L., Devine, P., & Keenan, M. (2013). Awareness and knowledge of autism and autism interventions: A general population survey. *Research in Autism Spectrum Disorders*, 7(12), 1558–1567.
- Dillenburger, K., Jordan, J. A., Lloyd, K., & Schubotz, D. (2017). Autism awareness in children and young people: surveys of two populations. *Journal of Intellectual Disability Research*, 61, 766–777.
- Freeman, W. (n.d.). Why board games are making a comeback. www.theguardian.com/lifeandstyle/2012/dec/09/board-games-come%0Aback-freeman%0A
- Gast D. L., & Ledford J. R. (2009). *Single subject research methodology in behavioral sciences*. NY: Routledge.
- Gauvreau, A., & Schwartz, I. (2013). Using visual supports to increase the appropriate behavior of young children with autism. *Young Exceptional Child Monograph*, 18.
- Grandgeorge, M., & Masataka, N. (2016). Atypical color preference in children with autism spectrum disorder. *Frontiers in Psychology*, 7, 1976.
- Hayes, G., Hirano, S., Marcu, G., Monibi, M., & Yeganyan, M. (2010). Interactive visual support for children with autism. *Personal and Ubiquitous Computing*, 14, 663–680.
- Hinshaw, S. P. (2007). *The mark of shame: stigma of mental illness and an agenda for change*. Oxford University Press.
- Holton, A. E. (2013). What's wrong with max? Parenthood and the portrayal of autism spectrum disorders. *Journal of Communication Inquiry*, 37(1), 45–63.
- Horner RH, Carr EG, Halle J, McGee G, Odom S, W. M., & Odom S, W. M. (2005). The use of single-subject research to identify evidence-based practice in special education. *Exceptional Children*. 2005 Jan;71(2):165-79., 71(2), 165–179.
- Huang, A. X., & Wheeler, J. J. (2007). Promoting the development of educational programs for children with autism in southeast asian countries. *International Journal of Special Education*, 22, 78–88.
- Kasari, C., Paparella, T., Freeman, S. , & Jahromi, L. B. (2008). Language outcome in autism: randomized comparison of joint attention and play interventions. *Journal of Consulting and Clinical Psychology*, 76(1), 125.
- Kidder, J. E., & McDonnell, A. P. (2017). Visual aids for positive behavior support of young children with autism spectrum disorders. *Young Exceptional Children*, 20(3), 103–116.
- Lok, K. I., Chiang, H.-M., Lin, Y.-H., & Jiang, C. (2022). Trying a board game intervention on children with autism spectrum disorder in Macau: how do they react? *International Journal of Developmental Disabilities*, 1–9.
- Meindl, J. N., & Cannella-Malone, H. I. (2011). Initiating and responding to joint attention bids in children with autism: A review of the literature. . *Research in Developmental Disabilities*, 32(5), 14411454.
- Mundy, P., Sigman, M., & Kasari, C. (1990). A longitudinal study of joint attention and language development in autistic children. *Journal of Autism and Developmental Disorders*, 20(1), 115–128.

- Mundy, P., & Newell, L. (2007). Attention, joint attention, and social cognition. *Current Directions in Psychological Science*, 16(5), 269–274.
- Nugrahani, R. (2007). Media pembelajaran berbasis visual berbentuk permainan ular tangga untuk meningkatkan kualitas belajar mengajar di sekolah dasar. *Lembaran Ilmu Kependidikan*, 36(1).
- Ogretir, A., & Ulutas, I. (2009). The study of the effects of the mother support education program on the parental acceptance and rejection levels of the Turkish mothers. *Humanity and Social Science Journal*, 4(1), 12–19.
- Plesner, U., & Phillips, L. (2014). *Researching virtual worlds: Methodologies for studying emergent practices*. Routledge.
- Ranuharja, F., Ganefri, G., Fajri, BR., Prasetya, F., & Samala, A. (2021). Development of interactive learning media edugame using ADDIE model. *Jurnal Teknologi Informasi dan Pendidikan*, 14(1), 53–59.
- Rao, S. M., & Gagie, B. (2006). Learning through seeing and doing: Visual support for children with autism. *Teaching Exceptional Children*, 38(6), 26–33.
- Rochmani, K. W., & Ramdhani, N. (2021). Literasi *online* untuk meningkatkan pengetahuan ibu dari anak autisme. *Prosiding Seminar Nasional Fakultas Psikologi UMBY*, 80–95.
- Sterponi, L., de Kirby, K., & ShankeyView, J. (2015). Rethinking language in autism. *Autism*, Pages 517-526(5), 517–526.
- Suarez-Rivera, C., Smith, L. B., & Yu, C. (2019). Multimodal parent behaviors within joint attention support sustained attention in infants. *Developmental Psychology*, 55(1), 96.