

INCREASING COUNTING BACKWARDS ABILITY IN AUTISTIC STUDENTS USING NUMBER CARD MEDIA

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ABSTRACT

The purpose of this study was to investigate the improvement of the ability to count backwards from 10 to 1 in students with autism using number card media. This research employed a quantitative approach with a Single Subject Research (SSR) experimental design, specifically the A-B-A design. The subject of the study was an autistic student in grade IV. Data collection was done through tests and observations. The data obtained were analyzed statistically and presented in tables and graphs. The results showed an improvement in the ability to count backwards from 10 to 1 in the student with autism after the intervention using number card media. The average score in baseline-2 showed a significant improvement compared to baseline-1 before the intervention. This result indicates that number card media can be used as a variation in learning in schools and can be beneficial for students with autism.

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1. INTRODUCTION

All individuals have the right to receive proper education, including students with special needs. One of the educational services for special needs students is the education provided for students with autism. The education typically provided in formal institutions like schools tends to focus on enhancing cognitive abilities. Cognitive domain includes the students' ability to recall or restate concepts or principles that have been learned during the learning process. One of the learning areas in the cognitive domain is mathematics, including counting, geometry, and time. Counting is an essential part of mathematics necessary for developing arithmetic skills, especially the number concepts that form the foundation for developing mathematical abilities and readiness for further education (Depdiknas, 2007).

Based on initial interviews with the class teacher at School A, one of the students in grade 4 with autism faces challenges in learning mathematics. The student is able to understand and arrange the numbers from 1 to 20 in sequence and perform addition using concrete objects. However, the difficulty the student experiences is in counting backwards and performing subtraction. According to KD 4.3 of SDLB Autis Grade 1, which states "Arranging numbers up to 10 in descending or ascending order using a set of concrete objects," the student in grade 4 should already be able to perform this task.

In school practice, the teacher still uses memorization methods and only uses the blackboard as the medium for delivering the material. The teaching method and media used are less effective as they make the student only memorize numbers from 1 to 20 without understanding the concept of greater and lesser numbers. Based on the observations, a solution was proposed to address the issue of backward counting for autistic students by using number cards and pom-poms as learning media. The choice of number cards was based on the following considerations: First, the number cards have an attractive display with images and colored number symbols, making them visually appealing, as students with autism have strong visual abilities. Second, number cards make it easier for students to understand number concepts in sequence.

The use of number card media has been previously researched by Dwi Fitriyono. His research showed that number card media could improve counting abilities in a group of students. Additionally, Sabaruddin et al. also researched the use of number card media, finding that it was effective in introducing numeracy to children with autism. Based on the background and focus of the research, the research problem is formulated as follows: "Can the Use of Number Card Media Improve the Ability to Count Backwards from 10 to 1 in Students with Autism?".

2. METHOD

This research is quantitative with a Single Subject Research method. Single Subject Research is a design that focuses on data from individuals as research samples (Juang Sunanto, 2006). Research in single subject design measures the target behavior that needs to be changed by applying a specific intervention (Juang Sunanto, 2006). Measuring the target variable or behavior in the single subject design is done repeatedly over a certain period, such as weekly, daily, or hourly. In this study, the target variable was the ability to count backwards from 10 to 1 in the student. The tools used in this research were number cards, pom-poms, and stationery. The research was conducted on a male autistic student in grade 4 at Cinderia Jiwa Homeschooling. The research was carried out at Cinderia Jiwa Homeschooling from February to April in the second semester of the 2022/2023 academic year. The target behavior (target behavior) in this research was the ability to count backwards from 10 to 1 in the student.

This research uses the A-B-A design, where measurement is done by comparing baseline-1 (A-1) conditions at a certain period with intervention (B) conditions at a different period, followed by remeasurement at baseline-2 (A-2) conditions at a different period. The first baseline stage (A-1) is to measure and collect target behavior data to assess the student's initial mathematical ability. This stage is done continuously for four sessions. The intervention stage (B) is where the ability to count backwards from 10 to 1 is addressed using the intervention for a period. This intervention stage was conducted continuously for 10 sessions until stable. The second baseline stage (A-2) is a repetition or addition of conditions to draw conclusions from the previous intervention. This stage was carried out continuously for four sessions until the data trends stabilized. The research instrument was created to measure the success of the subject in improving the ability to count backwards from 10 to 1. The instrument used test techniques with items on each level of counting and score recording.

Table 1. *Instrument Blueprint*

No	Aspect Evaluated
1	Decrease one number in sequence using concrete objects
2	Determine the previous number for a specific number
3	Compare two numbers and determine the largest number using concrete objects
4	Arrange the number of objects from largest to smallest
5	Arrange number symbols 10-1

Data analysis in this research aims to assess the target behavior. Generally, in single subject research, data analysis techniques used are visual analysis within conditions. The components of condition analysis include (1) condition length, (2) direction trend, (3) stability level, (4) change level, (5) data trace, and (6) range. After calculating the results from the six components, a summary format or table can be created for summarizing the results, which can be used to describe the research findings. The researcher can then draw conclusions regarding the functional relationship between the independent and dependent variables.

3. RESULT AND DISCUSSION

3.1 Baseline 1 Results

The first step in this research was the measurement of backward counting ability before intervention. In the baseline-1 phase (A-1), the measurements were conducted at school for 30 minutes over 4 days. The results obtained from baseline-1 (A-1) were as follows.

Table 2. *Baseline 1 Data*

No	Session	Maximum Score	Score Achieved	Percentage
1	1	15	3	20%
2	2	15	4	27%
3	3	15	4	27%
4	4	15	4	27%

The table above shows that during the baseline-1 phase (A-1), the lowest score achieved was 3 (20%) and the highest score was 4 (27%). In this phase, the subject (MEG) was only able to subtract one number sequentially using concrete objects and still required minimal assistance. The subject was also able to compare two numbers and determine the largest number using concrete objects for significantly different numbers, such as 3 and 9. However, the subject was unable to arrange the number of objects from largest to smallest and did not understand the previous number concept. The data from baseline-1 (A-1) was presented in the following graph.

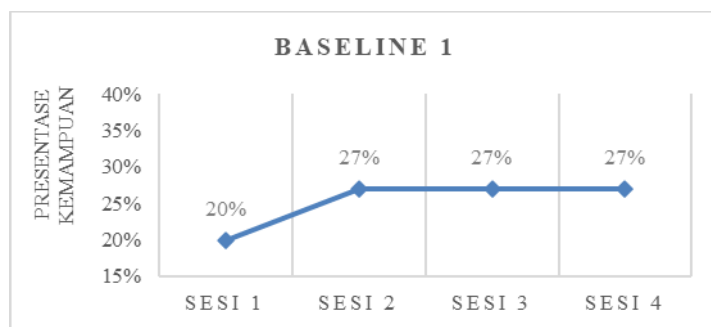


Figure 1. Baseline 1 Data

Based on Graph 1, it can be seen that in four sessions, the subject's average score was 25.25%. Sessions 2, 3, and 4 consistently showed scores of 27%. This result reflects the initial condition of counting backwards in the subject before the intervention.

3.2 Intervention Results

The intervention in this study used number cards and pom-poms to assess the ability to count backwards from 10 to 1. During the intervention phase (B), measurements were conducted at school for 60 minutes over 10 sessions. Each intervention session was divided into three learning periods: 30 minutes, 20 minutes, and 10 minutes. The first and second periods were used for introducing the concept and doing assisted tests, while the third period was used for independent tests. The results of the intervention (B) are as follows.

Table 3. Intervention Data

No	Session	Maximum Score	Score Achieved	Percentage
1	5	15	5	33%
2	6	15	6	40%
3	7	15	7	47%
4	8	15	8	53%
5	9	15	9	60%
6	10	15	9	60%
7	11	15	10	67%
8	12	15	12	80%
9	13	15	12	80%
10	14	15	12	80%

The table above shows that during the intervention (B) phase, the lowest score was 5 (33%), and the highest score was 12 (80%). By the end of this phase, the subject (MEG) had understood the concept of the previous number and was able to identify the previous number for a specific number, although sometimes required extra time to think. The subject was also able to compare two numbers and determine the largest number using concrete objects and number cards for significantly different numbers, such as 8 and 9. The subject could arrange the numbers backwards, both using concrete objects and number symbols, but occasionally made errors and needed minimal assistance. The intervention data (B) was presented in the following graph.

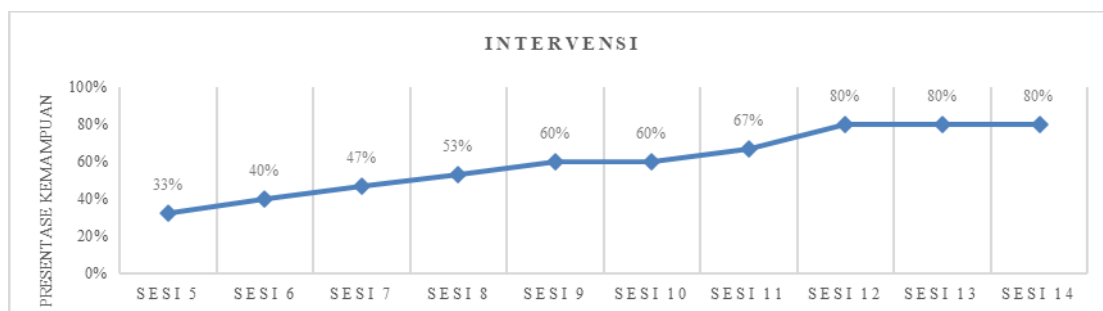


Figure 2. Intervention Data

Based on Graph 2, it can be seen that in 10 sessions, the subject's average score was 60%. The data shows an increasing trend compared to the baseline-1 phase.

3.3 Baseline 2 Results

The final phase of this research was the data collection after the intervention, used to measure the success of the intervention. The measurements were conducted in four sessions. The results obtained from baseline-2 (A-2) were as follows.

Table 4. Baseline-2 Data (A-2)

No	Session	Maximum Score	Score Achieved	Percentage
1	15	15	12	80%
2	16	15	12	80%
3	17	15	12	80%
4	18	15	13	87%

The table above shows that during the baseline-2 phase (A-2), the lowest score achieved was 12 (80%) and the highest score was 13 (87%). In the baseline-2 phase (A-2), the subject (MEG) showed consistent results based on the data from the intervention phase (B). The subject was able to arrange the number of objects from largest to smallest, recognize the concept of previous numbers, and arrange the number symbols from 10-1. In the last session, the subject also showed improved ability to arrange numbers from largest to smallest using concrete objects. The subject could arrange the number symbols 10-1 independently, with minor mistakes. The data from baseline-2 (A-2) was presented in the following graph.

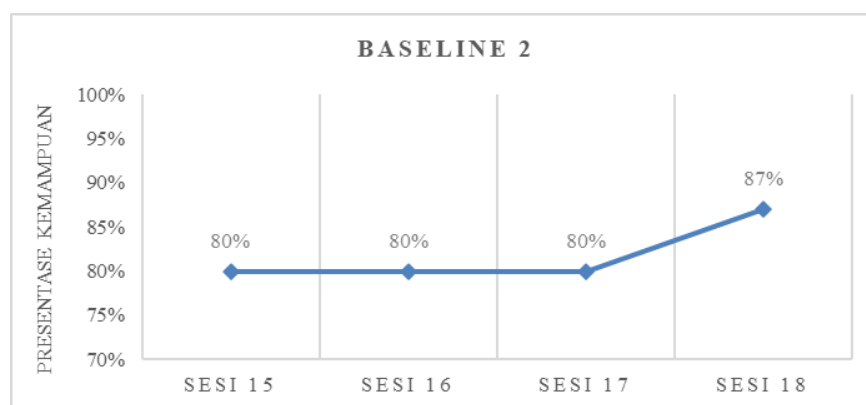


Figure 3. Baseline-2 Data (A-2)

Based on Graph 3, it can be seen that in four sessions, the subject's average score was 81.25%. This result shows a significant improvement compared to baseline-1 (A-1). The ability to count backwards from 10-1 improved after the intervention with number card media.

This study aimed to explore the effectiveness of using number card media in enhancing the ability of an autistic student to count backwards from 10 to 1. The results of the study indicated that number card media significantly improved the subject's performance, as evidenced by the substantial increase in the ability to count backwards after the intervention. In this discussion, the findings are analyzed in the context of prior

research and theoretical frameworks, highlighting the implications for teaching students with autism and the limitations of the study.

The key finding of this study was the significant improvement in the subject's ability to count backwards from 10 to 1. In the baseline phase (A-1), the subject's performance was minimal, with an average score of 25.25%, indicating difficulty in counting backwards. However, during the intervention phase (B), the subject's performance improved to an average score of 60%, and this improvement was sustained in the baseline-2 phase (A-2), where the subject achieved an average score of 81.25%. This finding aligns with the theory that concrete, visual aids can significantly improve mathematical abilities in children with autism.

Previous studies have emphasized the importance of using visual and concrete materials to support learning in children with autism. As noted by Hallahan and Kauffman (2009), children with autism tend to excel in visual learning environments. In this study, the use of colorful number cards provided a visual, concrete representation of the counting process, which likely helped the subject to understand the sequence of numbers and the concept of counting backwards. Sabaruddin (2019) also found that number card media significantly improved numeracy skills in children with autism, supporting the effectiveness of visual aids in autism education.

Furthermore, Dwi Fitriyono (2014) found that number cards could improve counting abilities in early learners. The current study extends this finding by showing that number cards are also effective for autistic children, especially in teaching complex tasks like counting backwards. The visual appeal of the number cards, which included images and numbers, made the learning process more engaging for the student, which may have contributed to the improvement in counting skills.

The use of concrete materials, such as pom-poms, to support the counting process is another significant factor contributing to the success of this intervention. According to Depdiknas (2007), concrete materials are essential in helping children understand abstract concepts, such as numbers and counting. By using tangible objects, the subject was able to manipulate and visualize the counting process, which reinforced the learning of number sequences.

Research by Sunanto et al. (2006) and Soendari (2021) indicates that children with autism benefit from tangible, hands-on learning experiences. Concrete materials not only make learning more interactive but also help students build a stronger connection between abstract concepts and real-world applications. In this study, the use of pom-poms alongside number cards allowed the student to physically interact with numbers, making the learning process more meaningful and memorable. Additionally, the combination of visual aids and concrete materials in this study provided a multisensory learning environment, which is particularly effective for children with autism (Bernard, 2015). By engaging multiple senses, the intervention supported the subject in developing a deeper understanding of counting, which likely contributed to the significant improvement observed in the study.

The A-B-A design used in this study was highly effective in evaluating the impact of the intervention. The results from the baseline-1 (A-1) phase indicated that the subject's ability to count backwards was limited, while the intervention phase (B) led to a significant improvement. This improvement was maintained in the baseline-2 (A-2) phase, providing evidence that the number card media had a lasting effect on the subject's counting ability. The A-B-A design, which alternates between baseline and intervention phases, is well-suited for single-subject research because it allows for a clear comparison between pre- and post-intervention performance (Juang Sunanto, 2006). The stability of the results in the baseline-2 phase suggests that the intervention had a lasting effect on the subject's ability to count backwards. This finding aligns with previous research that has demonstrated the effectiveness of single-subject designs in measuring the impact of interventions for children with autism (Soendari, 2021).

The findings of this study have several important implications for educators working with students with autism. First, the results suggest that number card media can be an effective tool for teaching counting and other mathematical concepts to children with autism. Teachers should consider incorporating number cards and other visual aids into their teaching practices to make learning more engaging and accessible for students with autism. The use of visually stimulating and concrete learning materials is particularly beneficial for students with autism, as it aligns with their strengths in visual learning (Hallahan & Kauffman, 2009). Second, the study highlights the importance of using hands-on learning materials, such as pom-poms, to support the development of mathematical skills. Concrete materials provide students with a tangible way to engage with abstract concepts, making them easier to understand. Educators should explore the use of similar hands-on materials to enhance the learning experience for students with autism.

Despite the promising results, this study has several limitations. First, the study involved only one subject, which limits the generalizability of the findings. Future research should involve a larger sample size to assess the effectiveness of number card media in a broader context. Including a more diverse group of students with autism would provide a more comprehensive understanding of the intervention's effectiveness across different individuals. Second, the duration of the intervention was relatively short, lasting only a few

months. It is possible that longer interventions may lead to even greater improvements in counting ability. Future studies could examine the long-term effects of number card media by conducting follow-up assessments after the intervention has been completed. This would help determine whether the improvements observed in this study are sustained over time. Finally, while the study focused on measuring the student's ability to count backwards, it did not assess other cognitive or behavioral changes that may have occurred as a result of the intervention. Future research could explore the broader impacts of using number card media, including its effects on the student's social skills, engagement, and overall learning behavior.

4. CONCLUSION

This study demonstrated that number card media can significantly improve the ability of students with autism to count backwards from 10 to 1. The results showed a marked improvement in the subject's performance, with a noticeable increase in the average score from 25.25% in the baseline-1 phase to 81.25% in the baseline-2 phase. This indicates that the use of number card media, along with concrete materials such as pom-poms, provided an effective learning strategy for teaching counting skills to the autistic student. The combination of visual aids and concrete materials facilitated a multisensory learning experience, which capitalized on the subject's visual strengths. This approach enabled the student to better understand and engage with abstract concepts such as number sequences and counting backwards. The study affirms the effectiveness of using visual learning tools in autism education, as children with autism often respond well to visual and hands-on materials that provide concrete representations of abstract concepts. The findings of this study have important implications for educators working with students with autism. It emphasizes the importance of incorporating visual aids and tangible materials in teaching, as they can enhance engagement and improve the understanding of mathematical concepts. Number card media, in particular, can be a valuable tool for teachers, offering a simple yet effective strategy to support the cognitive development of students with autism and improve their learning outcomes.

REFERENCES

- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders: DSM-5*.
Bernard, A. (2015). 11 autism teaching strategies. *Autismag*.
Copley, J. V. (2001). *The young child and mathematics*. Washington, DC: National Association for the Education of Young Children.
Departemen Pendidikan Nasional. (2007). *Pedoman pembelajaran permainan berhitung permulaan di taman kanak-kanak*. Jakarta: Departemen Pendidikan Nasional.
Desiningrum, D. R. (2017). *Psikologi anak berkebutuhan khusus*. Yogyakarta: Psikosain.
Fitriyono, D. (2014). *Upaya meningkatkan kemampuan berhitung menggunakan media permainan kartu angka bergambar di Desa Gonilan Surakarta Tahun Ajaran 2013/2014*. Surakarta: FKIP UMS.
Dhieni, N., & Fidani, L. (2007). *Metode pengembangan matematika untuk anak*. Semarang: IKIP Veteran.
Hamalik, O. (2001). *Proses belajar mengajar*. Jakarta: Bumi Aksara.
Hallahan, D. P., & Kauffman, J. M. (2009). *Exceptional learners: An introduction to special education*. USA: Pearson Education.
Hartati, S. (2005). *Perkembangan belajar pada anak usia dini*. Jakarta: Depdiknas.
Herman, T. (1999). *Mengajarkan konsep prabilangan di sekolah dasar*. Bandung: Universitas Pendidikan Indonesia.
Komariyah, S., & Soeparno. (2010). *Pengaruh pemanfaatan media kartu hitung*. *Jurnal Pendidikan*.
Lestari, K. W. (2011). *Konsep dasar matematika untuk anak usia dini*. Jakarta: Kementerian Pendidikan Nasional.
Negoro, & Harahap, B. (1998). *Ensiklopedia matematika*. Jakarta: Ghalia.
Rahman, H. S. (2002). *Konsep dasar pendidikan anak usia dini*. Yogyakarta: Galah.
Ratnawati, S. (2001). *Mencetak anak cerdas dan kreatif*. Jakarta: Gramedia Pustaka.
Sadiman, A. S. (2003). *Media pendidikan: Pengertian, pengembangan, dan pemanfaatannya*. Jakarta: Raja Grafindo Persada.
Sabaruddin, S. (2019). *Penggunaan media kartu angka untuk peningkatan kemampuan pengenalan numerik pada anak autis*. *Jurnal Bidang Pendidikan Dasar*.
Siswati, E. (1996). *Pengaruh penggunaan media kartu bergambar terhadap motivasi belajar untuk meningkatkan penguasaan kosakata bahasa Inggris*. Yogyakarta: Program Studi Teknologi Pendidikan FIP IKIP.
Siswono, T. Y. E. (n.d.). *Belajar dan mengajar matematika anak usia dini*. Retrieved from http://www.academia.edu/4069396/Belajar_dan_Mengajar_Matematika_Anak_Usia_Dini
Soendari, T. (2021). *Penelitian dengan subyek tunggal*.
Sunanto, J., et al. (2006). *Penelitian dengan subyek tunggal*. Bandung: UPI Press.

- Tadjudin. Pembelajaran mengenal bilangan 1-10 melalui investasi bermain tata angka. Retrieved from <https://www.bpkpenabur.or.id/files/20Bilangan%20Manipulatif>
- Untoro, J. (2008). Buku pintar matematika SD. Jakarta: Wahyu Meda.
- World Health Organization. (2016). ICD-10: International statistical classification of diseases and related health problems. WHO Library Cataloguing.
- Yanti, M. P. (2019). Pengembangan kemampuan membilang melalui kegiatan bermain dengan benda-benda konkret di PAUD Muara Indah di Kecamatan Selebar. Bengkulu: Institut Agama Islam Negeri Bengkulu