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Effect of the GASING Method on Addition Speed in Students with Visual Impairments: A Single-Subject A-B-A Study

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Abstract: Children with visual impairments often face challenges in mastering basic mathematics. This study aimed to examine the effect of the GASING Method in improving addition calculation speed among these students. Adopting a quantitative approach, a Single Subject Research (SSR) design with an A-B-A design was used. This study involved one subject, a 6th-grade elementary school student. The instrument was a worksheet consisting of 30 addition problems, presented in Braille format. Data were analyzed visually, including trends, levels, stability, and overlap percentages between phases. The research results indicated a significant effect of the GASING Method intervention. This was particularly evident from the very low percentage of data overlap: 17 percent between Phase A1 (Baseline) and Phase B (Intervention), and 0 percent between Phase B and Phase A2 (Withdrawal). The intervention successfully reduced the subject's average calculation time from 3.0 seconds in the A1 phase to 2.2 seconds in the B phase, further improving to 1.6 seconds in the A2 phase. This represents a significant overall reduction in completion time. Thus, it is concluded that the GASING Method is effective in improving the addition calculation speed of children with visual impairments.

Keywords: *children with visual impairments, GASING method, mathematics, mental arithmetic*

I. Introduction

Mathematics is a fundamental discipline, fostering various essential skills such as problem-solving, creativity, and reasoning capacity (Sharma, 2021). Although often perceived as a difficult topic, mathematical literacy is actually closely intertwined with many aspects of contemporary culture, including daily activities, financial management, and critical thinking (Serin, 2023). These critical and analytical thinking skills are crucial for addressing challenges in everyday life (Wijiasih et al., 2022). However, challenges in mathematics learning become much more complex for children with visual impairments. The main obstacles they face include difficulties in developing concepts and problem-solving without visual support, the use of inappropriate teaching methods, and teachers' views that sometimes reflect stereotypes and low expectations of their potential (Ookeditse & Garegae, 2024; Landim et al., 2025). These factors collectively hinder the optimal realization of their mathematical understanding potential.

Despite facing these barriers, children with visual impairments possess significant potential in mathematics learning. As an adaptation to visual limitations, they are known to have stronger memory abilities, specifically verbal and auditory working memory (Rindermann et al., 2020). This memory advantage plays a vital role in supporting the development and achievement of their mathematical abilities (Caviola et al., 2018). Research even suggests that children with visual impairments can develop numerical abilities equivalent to or even surpass those of children without disabilities, despite representing numbers in a qualitatively different format (Crollen & Collignon, 2020). To overcome these obstacles and optimize this potential, an innovative and adaptive learning method is necessary.

The GASING Method presents itself as a potential solution to these problems. This method is an acronym for Gampang, Asyik, dan Menyenangkan, which is translated as easy, fun and enjoyable (Surya in Rahayu, 2024), and is specifically designed to make mathematics learning easier, more enjoyable, and engaging for students. The method is implemented through three main stages: the Concrete Stage, which introduces concepts using real or tactile objects; the Abstract Stage, which introduces mathematical symbols; and the Mental Calculation Stage, which encourages students to perform calculations without aids (Kusuma, 2014). The GASING Method prioritizes mastering addition through a progressive system illustrated as a mastery ladder (Kaszch, 2021). The emphasis of GASING on mental arithmetic aligns closely with the strengths of the verbal and auditory working memory in children with visual impairments.

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Based on field identification, the research subject understands basic addition concepts, but their ability is hindered by dependency on finger counting for problems with results greater than five. Figure 1 visualizes the GASING mastery ladder, guiding progression from Level 1 to Level 11. The identification results showed the subject was at Level 2 (addition with a result of 6), confirming the urgent need for the structured quick calculation training offered by GASING, as mastering basic quick calculation is the foundation for solving more complex problems (Kaszch, 2021). Although the effectiveness of the GASING Method has been extensively studied in general contexts (Qur'ani et al., 2025; Leiwakabessy et al., 2021), no in-depth study has yet been found that specifically examines its application and effectiveness in children with visual impairments. Therefore, this study aims to investigate the effect of the GASING Method (Intervention) on improving the speed of addition calculation (Dependent Variable) in a child with visual impairments (Subject) using a Single Subject Research (SSR) A-B-A design.

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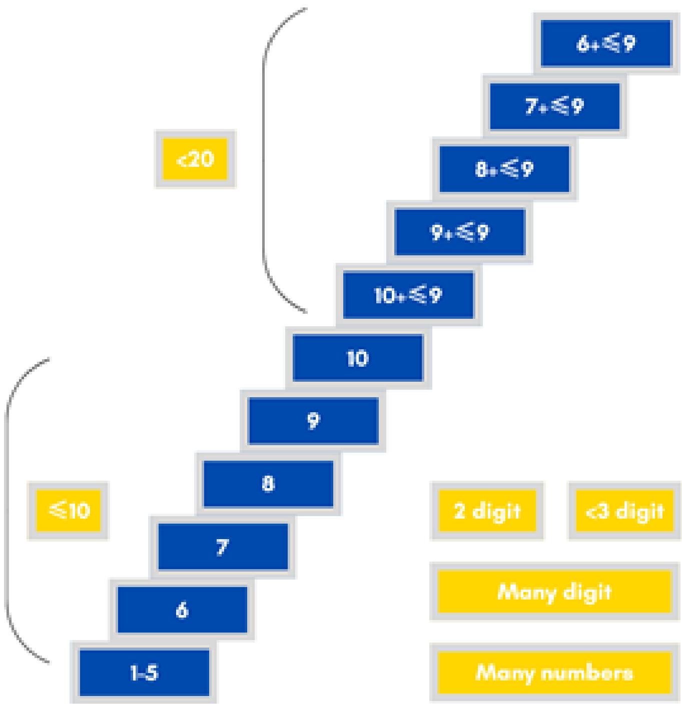


Figure 1. Addition skill levels ladder (source: Surya)

II. Method

A. Research Design

This study employed a quantitative experimental approach utilizing a SSR strategy to systematically test and analyze the effect of the independent variable, the GASING Method, on the dependent variable, which is calculation speed for addition. The experimental method was selected to observe this effect under controlled conditions (Sugiyono, 2023). SSR is a research strategy that focuses on systematically documenting behavioral change in a single participant (Marlina, 2023). The specific design applied was the A-B-A reversal design, a component of the reversal design, which includes three phases: Phase A1 (Initial Baseline), Phase B (Intervention), and Phase A2 (Second Baseline/Withdrawal) (Neuman & McCornnick, in Prahmana, 2021). This design allows for the repeated measurement of the target response until data stability is achieved. The A-B-A design utilized in this study is visually represented in Figure 2.

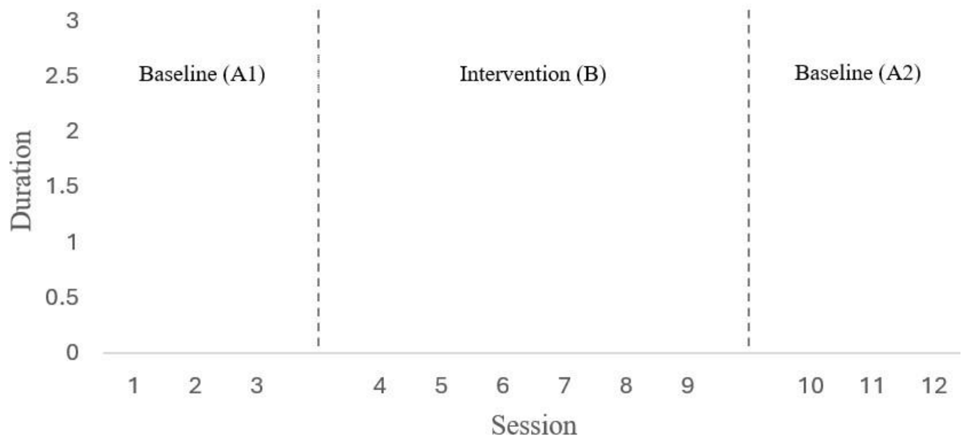


Figure 2. A-B-A Research Design

B. Participant

The participant in this study was a 12-year-old male 6th-grade elementary school student categorized as totally blind. The participant was selected based on the following inclusion criteria: (1) The participant possesses adequate Braille literacy for reading numbers; and (2) The participant demonstrates a dependency on finger counting for solving addition problems with results greater than five. These criteria were established to ensure the participant was the appropriate target for the GASING Method intervention, which specifically focuses on transitioning from concrete counting to mental arithmetic. Ethical approval for this research was obtained from the student's mother and the student's classroom teacher. All research sessions were conducted at the student's home and in the student's classroom.

C. Measures and Materials

The primary instrument utilized was a worksheet containing 30 addition problems. These problems were presented in both Braille format and large print (text awas) and were specifically developed based on the quick addition material level of the GASING Method. The detailed breakdown and composition of the questions are presented in Table 1. Instrument validity was ensured through an expert judgment process conducted by a lecturer from the Special Education Study Program, after which the instrument was refined for final use. The time measuring device used was the digital stopwatch available on the researcher's mobile phone. The final calculation speed results of the participant were recorded on paper for subsequent data documentation.

Table 1. Blueprint for Measuring Addition Speed

Aspect	Sub-aspect	Indicators	Number of Question	Code
Addition with results from 1 to 10	Addition with results from 1 to 5	Able to quickly answer addition questions with results ranging from 1 to 5.	-	-
	Addition with a result of 6	Able to quickly answer addition questions with a result of 6.	2	A1
	Addition with a result of 7	Able to quickly answer addition questions with a result of 7.	3	A2
	Addition with a result of 8	Able to quickly answer addition questions with a result of 8.	2	A3
	Addition with a result of 9	Able to quickly answer addition questions with a result of 9.	3/4	A4
	Addition with a result of 10	Able to quickly answer addition questions with a result of 10.	3/4	A5

Addition with number combinations 6-10 + numbers ≤10	Addition with a combination of numbers 10 + numbers ≤ 10	Able to quickly answer addition problems involving combinations of 10 + numbers ≤ 10.	4	B1
	Addition with a combination of numbers 9 + numbers ≤ 10	Able to quickly answer addition problems involving combinations of 9 + numbers ≤ 10.	3	B2
	Addition with a combination of numbers 8 + numbers ≤ 10	Able to quickly answer addition problems involving combinations of 8 + numbers ≤ 10.	3	B3
	Addition with a combination of numbers 7 + numbers ≤ 10	Able to quickly answer addition problems involving combinations of 7 + numbers ≤ 10.	4	B4
	Addition with a combination of numbers 6 + numbers ≤ 10	Able to quickly answer addition problems involving combinations of 6 + numbers ≤ 10.	2	B5

D. Research Procedures

The intervention was conducted across 12 sessions in total, with an average duration of approximately 30 minutes, structured into three distinct phases. Phase A1 was conducted over three sessions, where the participant was asked to complete the worksheets without any prior GASING intervention or training. The researcher recorded the time taken to complete each problem to establish the initial performance baseline. Phase B, spanning six sessions, involved the active implementation of the GASING Method, focusing on mental arithmetic training. The applied strategy involved repeated guessing of target numbers to hone addition. Finally, Phase A2, conducted over three sessions, saw the withdrawal of the intervention. Participants again completed math problems without prior intervention, allowing for an assessment of the maintenance effect on the calculation speed achieved during Phase B.

E. Data Analysis Procedures

Quantitative data analysis in this SSR study was conducted through three main stages: graphing, the use of descriptive statistics, and visual analysis (Yuwono, 2020). Visual analysis serves as the primary method utilized to measure changes in the subject's behavior across phases. This visual analysis includes several key indicators: Trend (the direction of data changes), Level (the average score magnitude), Stability (the variability of data within a phase), and the percentage of data overlap. The percentage of overlap is a non-parametric measure used to assess the effectiveness of the intervention. The analysis is performed by comparing data between Phase A1 and Phase B, as well as Phase B and Phase A2. The criteria for intervention success are based on the principle that the smaller the percentage of data overlap, the better the influence of the intervention on the target behavior (Prahmana, 2021). The intervention is considered effective if the percentage of overlap demonstrates a low percentage, indicating a significant shift in performance after the intervention was delivered.

III. Results and Discussion

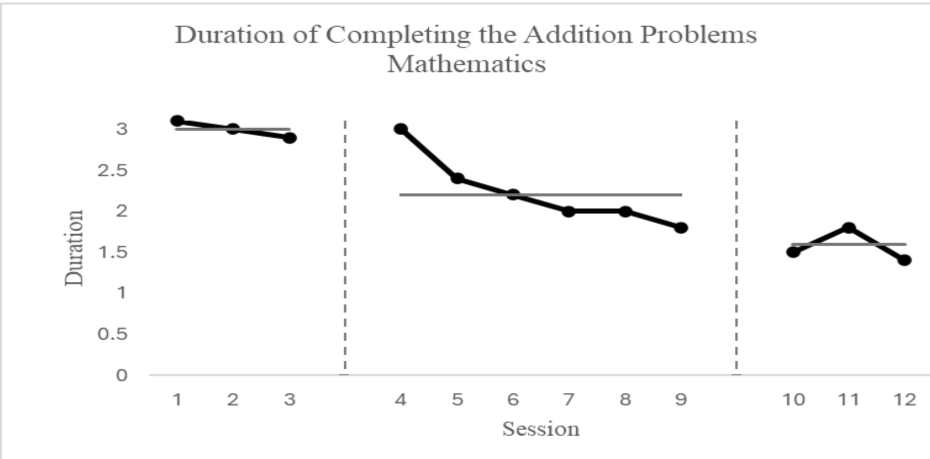
This study was conducted in 12 sessions to test the effect of the GASING Method on the speed of addition calculations. The specific session distribution and corresponding average completion times across phases are detailed in Table 2. In Phase A1, the subject's reliance on finger counting resulted in an average calculation time of 3.0 seconds. Upon entering Phase B, the application of the GASING Method, which utilized counting chips and emphasized enjoyable learning, successfully reduced the average duration to 2.2 seconds. Subsequently, in Phase A2, the average duration decreased further to 1.6 seconds, demonstrating a sustained and improved calculation speed.

Table 1. Duration of Mathematics Addition Problems

Phase	Session	Duration (Seconds)
Baseline 1 (A1)	1	3,1
	2	3
	3	2,9
Intervensi (B)	4	3
	5	2,4
	6	2,2
	7	2
	8	2
	9	1,8
Baseline 1 (A2)	10	1,5
	11	1,8
	I2	1,4

The level of data stability indicates the degree of variation or range of data in a given condition. Data is considered stable if the level of variation is low, i.e., when 80% to 90% of the data falls within a 15% range above and below the mean (Yuwono, 2016). In this study, stability analysis confirmed that Phase A1 data (3.1; 3; and 2.9) were within the stability range. Upon entering Phase B, the data showed a downward trend, indicating a change in the subject's calculation duration immediately following the intervention. Then, in Phase A2, the data (1.5; 1.8; and 1.4) showed a return to stability, confirming the study could be terminated. These measurement results and the shifts between phases are visually represented in Graph 1.

Graph 1. Research Data in Phases A1, B, and A2



A. Results of Analysis in Conditions

Analysis in conditions is a method for analyzing changes in data that occur within a specific condition, such as baseline or intervention phases (Prahmana, 2021). This visual analysis utilizes six main components to describe data characteristics: condition length, directional trend estimation, stability trend, data trace, stability level and range, and change level (Yuwono, 2016). The detailed findings of this within-condition analysis for each phase (A1, B, and A2) are summarized in Table 3, supporting the observed trend shifts in Graph 1.

Table 2. Summary of Analysis Results in Subject Conditions

No	Condition	A1	B	A2
1.	Length Condition	3	6	3
2.	Trend Estimation	(-)	(-)	(-)
3.	Stability Trends	Stable (100%)	Variable (67%)	Stable (100%)
4.	Data Trail	(-)	(-)	(-)
5.	Stability Level and Range	Stable 3,1 – 2,9	Variable 3 – 1,8	Stable 1,5 – 1,4
6.	Level Changes	0,2 (+)	1,2 (+)	0,1 (+)

B. Results of Onalysis between Conditions

Inter-condition analysis is a comparison across adjacent conditions during research (Gast & Tawney; J. D. Lane & Gast, in Marlina, 2023). Researchers utilize this method to assess intervention effectiveness by considering the overlap of data points across conditions (Marlina, 2023). The five main components utilized for visual inter-condition analysis include: the number of variables changed, changes in trends and their effects, changes in stability, changes in levels, and data overlap (Yuwono, 2020). The critical findings from this inter-condition analysis, including the percentage of data overlap, are summarized in Table 4.

Table 3. Summary of analysis results between subject conditions

No	Condition	A1	B	A2
1.	Length Condition	3	6	3
2.	Trend Estimation	(-)	(-)	(-)
3.	Stability Trends	Stable (100%)	Variable (67%)	Stable (100%)
4.	Data Trail	(-)	(-)	(-)
5.	Stability Level and Range	Stable 3,1 – 2,9	Variable 3 – 1,8	Stable 1,5 – 1,4
6.	Level Changes	0,2 (+)	1,2 (+)	0,1 (+)

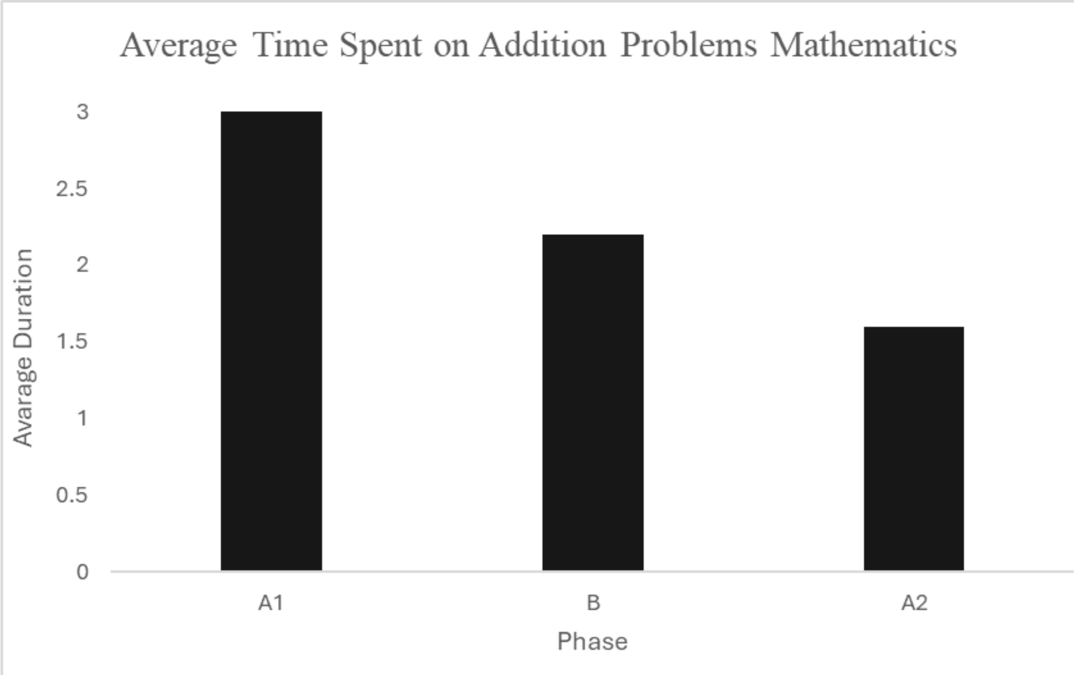
This study aims to examine the effect of the GASING Method on improving the speed of addition calculations in children with visual impairments. The intervention was carried out through the concrete stage of the GASING Method, using games that involved tactile media in the form of counting chips. These games aimed to strengthen the subject's understanding of the concept of addition. The game procedure began with the researcher providing a number of coins as the initial number. The subject was then asked to complete the remaining coins until they reached the predetermined target number. The game was conducted repeatedly and gradually, starting with simple addition resulting in the number 6, then continuing with more complex addition up to the number 6 plus other numbers with results less than or equal to 9.

Based on the research results, there is a significant effect of the application of the GASING method in improving the speed of addition calculations in the subject. This finding is supported by visual analysis showing changes in data patterns that occur in each phase of the research. In Phase A1, the data showed stable conditions, but after the GASING method intervention was applied in Phase B, there was a significant change in pattern, marked by a downward trend. Inter-condition analysis further reinforces these findings; the intervention's effect is indicated by the low percentage of data overlap. Between phases A1 and B, the data overlap was only 17%, indicating that the intervention had an effect on the subject. Notably, between phases B and A2, the overlap was 0%. These results confirm that the subject not only experienced an increase in speed but also maintained and even significantly improved their ability, even after the intervention was discontinued.

This strong effectiveness is substantially supported by the multisensory approach adopted by the GASING Method in its concrete phase. For children with visual impairments, numeracy comprehension relies heavily on accessible media and multisensory learning experiences, as standard verbal and visual communication are often inadequate, posing a significant challenge in mathematics instruction (Oyebanji & Idiong, 2021). The use of *counting chips* and repeated tactile number games aligns with pedagogical principles that utilize concrete tactile objects to facilitate information processing. This method effectively accommodates the subject's sensory needs by activating the tactile and auditory channels, thus allowing addition concepts to be absorbed without reliance on finger counting. This principle of accommodation is consistent with the necessity of adapting instructional materials and methods to integrate touchable objects (Milakis et al., 2025). This effectiveness is consistent with descriptive studies by Devi (2024) and Matahelumual & Yohamintin (2025), which also showed an improvement in calculation speed and the strengthening of mathematical logic through the GASING Method.

Overall, the data analysis shows that the GASING Method significantly improved the subject's addition calculation speed. This improvement is evident from the consistent decrease in the average problem-solving time, from 3.0 seconds in Phase A1 to 2.2 seconds in Phase B, and reaching 1.6 seconds in Phase A2. These average changes across the three phases are visually summarized in Diagram 1. Nevertheless, this study has several explicit methodological limitations that must be noted. The primary limitation is the use of a SSR design with n=1, which inherently means the findings cannot be generalized to the broader population of children with visual impairments. Other limitations involved time recording issues influenced by the verbal repetition of questions by the researcher and the subject, as well as limitations of the research instrument used. Based on these limitations, future research is highly recommended to pay more attention to the instrument and data collection procedures from the outset and conduct replication studies with a larger number of subjects to enhance generalization. Furthermore, subsequent research could focus on an in-depth analysis of the affected cognitive variables, such as the impact of the GASING Method on the development of auditory working memory or numerical reasoning in children with visual impairments.

Diagram 1 Average Duration in Phases A1, B, A2



IV. Conclusion and Suggestion

This study demonstrates that the GASING Method is proven effective and significant in improving the subject's addition calculation speed, evidenced by the reduction in average time and minimal data overlap (17% and 0%). This finding underscores the potential of multisensory-tactile methods to accommodate the learning needs of children with visual impairments and optimize their numerical potential.

Based on these findings, it is recommended that (1) the GASING Method be considered the primary teaching method in mathematics classrooms, making the learning process more enjoyable and effective. Furthermore, (2) academic instruction must be emphasized because children with visual impairments possess academic potential, provided they are given appropriate methods and media.

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