



American Journal of Human Psychology (AJHP)

ISSN: 2994-8878 (ONLINE)

VOLUME 3 ISSUE 1 (2025)

PUBLISHED BY
E-PALLI PUBLISHERS, DELAWARE, USA

Comparing Writing Speed and Quantity with Sign Pens and Ballpoint Pens: An Experimental Analysis

Chris Shantana Siton^{1*}, Shaenly Christell Bao¹, Angel Micah Rejas¹, Bea Athena Cabang¹, Claire Lynn B. Culajara¹

Article Information

Received: December 09, 2024

Accepted: January 11, 2025

Published: January 31, 2025

Keywords

Ballpoint Pen, Quantity, Sign Pen, Speed, Writing

ABSTRACT

This study investigated the impact of sign pens and ballpoint pens on writing performance, with a focus on writing speed and quantity. Participants of the study were 20 college students who took part in a within-subject experiment, rewriting a 587-word story under controlled conditions with both pen types. Writing speed was assessed in words per minute, and the total quantity of words was recorded as well. Statistical tools, such as paired sample t-test and Wilcoxon rank test in which results show for speed of writing is that sign pens significantly outperformed the ballpoint pen ($p = 0.004$, $d = 0.740$) as well as for the quantity of writing which also revealed great amount of effect ($p = 0.020$, $d = 1.00$). Both writing speed and quantity revealed significant difference when using sign pens than ballpoint pens. These finding are beneficial for students, educators, and pen makers, highlighting the significance of ergonomic and effective pen designs in academic fields. Future studies should look into additional variables including grip comfort, hand fatigue, and writing clarity to better understand the function of writing tools in academic performance.

INTRODUCTION

The right pen is more than simply a choice; it is the engine that drives your writing performance. The impacts of writing tools on performances seem to be the area of interest in lots of educational studies. While the choice of pen might be that insignificant, current studies that were conducted indicated that there are some considerable impacts on writing speed and quantity of writing among individuals. Those types of pens also hold an important impact in writing performance. High-quality writing develops not only through mastery of writing, but also from clear structure and meaning. Effective writing expresses the author's intended meaning and is appropriate for the target audience and environment (Graham, 2021). The choice of writing tools can influence that clarity as well as accuracy of information. A suitable pen improves the comprehension of the writing, making the intended message more accessible and compelling for the audience. In contrast, an inappropriate pen could hinder the flexibility and readability of the writing, influencing how well the meaning is conveyed.

It was considered that the writing performance of a pen was assessed not only by the pen design but also by the tip and ink components. An inappropriate pen especially those pens that have a poor ink-flow, can hinder writing performance by having a negative impact on the writing experiences (Hase, 2022). In such languages that need intricate strokes, particularly in writing Chinese, the shape, size and weight of writing speed comfort affects writing efficiency of it (Micunovic, 2020). Pen designs specifically in the grip section, it keeps the pen stable and under control while writing, and the ink type, which helps to keep the ink from smudging and enables the user to move quickly across the page (Peter Warrior: Pen

& Pencil Expert, 2023). These features are essential to those individuals who are engaging in extended writing task, as a well-designed grip reduces hand fatigue and provides more significant handwriting consistency. This emphasizes that it stands out for their unique qualities and versatility that both serve the same fundamental purpose which brings distinct personalities to the act of writing. In some cases, the writing style of the ballpoint pen and the ink's rheology differ from those of the sign pen. The study revealed that certain pen designs, specifically those with a cross-section, were chosen by the participants mainly because of their comfort and speed leading to a more effective writing. On the other hand, those pens that had a triangular design were less comfortable to use. It was concluded that pen designs really have a relevant factor that adds to the writing proficiency of an individual (Hase, 2022).

In selecting a pen for fast handwriting, the most essential factors are smooth ink flow and quick drying times. Ballpoint pens usually have a thicker, oil-based ink that dries fast but requires more pressure to write. Primarily due to ballpoint's simple design, it does not cost that much which is why it is commonly used in educational settings, but it requires a lot of effort and pressure that leads to fatigue when writing. Inexpensive ballpoint pens may have inconsistent ink flow, making writing unpleasant and uncomfortable while they perform best on smoother paper. Gel pens, on the other hand, employ water-based ink that is smoother and more fluid to write with. Gel pens' ink dries faster than ballpoint ink, increasing speed and reducing smearing, making it an excellent alternative for those who need to write quickly (Reynolds, 2024).

The various kinds of pens have been widely connected with educational purposes. To compare their writing

¹ University of Mindanao Digos College, Philippines

* Corresponding author's e-mail: chrisshantanason@gmail.com

performance, particularly the cost and efficiency of sign pens with ballpoint pens, it is necessary to investigate how these two universal writing tools are used. Ballpoint pens have grown in popularity among customers since they are substantially less expensive than sign pens and use less air pressure to transfer ink onto paper (Lee *et al.*, 2023). However, since its introduction in 1984, gel pens have grown in popularity due to qualities like a smooth writing experience, quick-drying ink, ecologically friendly components, and brilliant, long-lasting color (Ni *et al.*, 2020). Sign pens remain widespread due to their smooth ink flow and ability to produce clear, bold lines. Their practical application and professional design make them essential instruments in both educational and professional settings, influencing writing efficiency and overall performance.

There are studies that tend to believe that it is all about gripping force in a pen, however, children who have been shown to have obvious gripping issues from a kinematic standpoint may be candidates for direct grip intervention. Children may be asked to modify their manipulation and grip manner as needed (Lin *et al.*, 2022). Many individuals have different ways to grip in handwriting performance. Researchers have proposed the use of various parameters, such as grip-to-grip ratio, which refers to the pattern of force applied from the grip and pen tip, and variations in the amount of force, which represent the stability of the force applied over time, in addition to directly using force to describe the amount of force applied to the act of writing. These parameters aim to demonstrate how force behave when applied by digits (Lin *et al.*, 2022). Other studies focus on another aspect, such as gripping, that can affect the writing skills of an individual. However, this study focuses on another aspect, such as how the type of writing can affect the writing speed and quantity.

Writing tools have significant effects on students' academic performance for a reason that they affect how quick and effective human finish writing tasks. Some studies shown that writing performance sometimes vary in different types of pen that is used during the task. Some scholars believe that because of new technological advancements and creative instructional methods that are constantly changing instruction, education in the twenty-first century is more dynamic than it was in the past (Mokhetsengoane & Pallai, 2023). Knowing how various pen kinds affect writing performance is essential as it enables students to choose appropriate tools for the task at hand. Students are given a variety of assessments to determine their comprehension of the subjects and ideas covered in the lessons they must study and write, as well as to help teachers enhance their methods and materials for the teaching-learning process. For this reason, educators keep searching for efficient methods to gauge their students' performance (Cristobal, 2022). This study aims to highlight how pen choice affects writing speed and quantity, providing valuable insights for educators, students, pen manufacturers, and future researchers in fostering improved academic outcomes.

Research Objectives

This study examines college students who use ballpoint pens to those who use other types of pens to determine the speed and quantity of words they have written. Using the data collected from 20 college students, this research aims to answer these following questions:

- 1) Does the type of pen influence the writing speed among college students?
- 2) Does the type of pen affect the quantity of writing among students?
- 3) Is there a significant difference in writing performance between two types of pens?

MATERIALS AND METHODS

The participants of this study were college students (N=20). All of the participants are First-Year students of a school in Davao Region. All of the participants that are convenient at the scheduled time of the experiment have experienced both of the experimental variable. The participants are mixed male and female that ages 18-23 years old.

Instrument

A story posted in Brainly, an educational website, was used for the participants to rewrite using both sign pens and ballpoint pens. All of the participants rewrite the same story in order to have consistency and uniformity in writing, in order to minimize the variability in the data that is being collected for both pens. The participants were given 10-minutes to rewrite a 5-paragraph story that consist of 587 words.

The writing speed was measured by the quotient of how many words the participants rewrote per minute and how long the participants took the task (number of words/ minutes). The writing speed was measured by scale that is based on how many words they have rewritten on a given time; 1 (Very Slow) if the participants rewrite only 0-60 words, 2 (Slow) if the participants rewrite 61-120 words, 3 (Neutral) if 121-180 words were rewritten, 4 (Fast) if 181-240 words, and 5 (Very Fast) if 241-587 were finished.

The data collected for writing speed and quantity of writing that was written using sign pens and ballpoints was compared using the Paired Sample T-Test since both of the data collected using sign pens and ballpoint pens came from the same participants. In data analysis, Cohen's D was used for measuring writing speed for both pens since the data that is collected was normal. However, for the quantity of writing, the data shows that it deviates from the normal distribution. Therefore, the Wilcoxon Rank was utilized.

Procedure and Design

This study has two independent variables: sign pen and ballpoint pen. It utilizes a within-subject design. All of the participants will experience both pens when rewriting the story. Participants are asked to rewrite words from the story provided by the researchers. The data collected for

sign pens and ballpoint pens are analyzed using a Paired Sample T-test to compare the difference between them. In the first part of the experiment, the participants are ensured that they have enough space and are comfortable in their writing area. It is also ensured that the testing environment was well-ventilated and is free from noise. After ensuring the participants comfortability, the researchers then proceed on introducing the study's purpose and objectives. They were also notified about the things they need to do, and that they have to rewrite within 10-minutes per pen.

Next, in the second part, after ensuring that the participants understand the things they need to do, the 10-minutes timer started. The participants then proceed to rewriting the words that is indicated in the provided story using the ballpoint pen first. Then after the timer goes off the participants are given enough time to rest their hands to minimize the error that might occur due to the participants worn-out hands.

In the final part of the experiment, the participants were then rewriting the content of the story using the sign pen with the same environmental condition, that is comfortable and noise free. After the 10-minutes, the sheets that participants rewrite on were collected to compare the results of sign pens and ballpoint pens.

This study uses quasi-experimental research design with a within-subject research approach to assess the difference between sign pens and ballpoint pens in terms of writing speed and quantity. This study utilizes quasi-experimental

research design considering that participants are not randomly selected for what condition they are assigned to. Quasi-experimental research design is used to assess the impact of an intervention in settings when random assignment is not feasible. While it incorporates comparison groups to evaluate outcomes, the absence of randomization presents limitation in controlling for potential errors (Handley *et al.*, 2018). Additionally, all of the participants make use of the same condition at the same time. Along with this, a within-subjects approach is also utilized, where each participant experience both of the pens this is to reduce variability in the results collected. This approach is used for smaller participants which allow researcher to control individual differences and reduced the cost while conducting the study (Simply Psychology, 2023). Combination of the two allow the results to reduce its variability and possible errors that may occur for it enables the participants to experience all of the condition, experiencing sign pens as well as for ballpoint pens, at the same moment of time with the same environmental condition.

RESULTS AND DISCUSSIONS

Speed of Writing

Table 1 shows the normality of the data for writing speed. It was assessed using a Shapiro-Wilk test. The test results showed no significant departure from normality, $W=0.974$, $p=0.834$. The results indicates that the assumptions of normality were not violated for this variable.

Table 1: Normality Test (Shapiro-Wilk)

	W	P
Speed of Sign Pen – Speed of Ballpoint Pen	0.974	0.834

Table 2 shows the descriptive statistics for speed of writing that revealed higher mean of sign pen $M=20.5$ ($SD=4.52$, $SE=1.011$) than in ballpoint pens $M=19.3$ ($SD=3.99$, 0.892). The results indicates that

the participants wrote faster when using sign pens. This suggests that the sign pens speed up the writing compared to the ballpoint pens. Each condition has 20 participants ($N=20$).

Table 2: Descriptives of Writing Speed

	N	Mean	Median	SD	SE
Speed of Sign Pen	20	20.5	19.9	4.52	1.011
Speed of Ballpoint Pen	20	19.3	18.6	3.99	0.892

Table 3 shows the result for Paired Sample T-Test that was used to determine if there are difference in terms of speed of writing between sign pen and ballpoint pen. Results revealed that the writing speed using sign pen ($M=20.5$, $SD=4.52$) was significantly higher compared to the scores obtained of the ballpoint pen ($M=19.3$, $SD=3.99$, $t(19)$

$= 3.31$ $p=0.004$, $d=0.74$). With these results, it can be argued that the sign pen may have a significant and considerable impact on the speed of writing within a span of ten minutes. In which, the decision was made to reject the null hypothesis.

Table 3: Paired Samples T-Test

			Statistic	df	p		Effect Size
Speed of Sign Pen	Speed of Ballpoint Pen	Student's t	3.31	19.0	0.004	Cohen's d	0.740

Quantity of Words Written

Table 4 shows the normality test for quantity of words

written. In which the Shapiro-Wilk test was conducted to find the normality of the data. For the quantity of words

written, the results revealed a significant deviation from normality, $W=0.580$, $p<.001$. The results indicates that

the assumption of normality deviates significantly from normal distribution.

Table 4: Normality Test (Shapiro-Wilk)

	W	P
Quantity of Sign Pen – Quantity of Ballpoint Pen	0.580	<.001

Table 5 shows the descriptive statistics of quantity of words written, which revealed that the mean of sign pens was $M=3.90$ ($SD=0.788$, $SE=0.176$), while the mean for the ballpoint pens was $M=3.60$ ($SD=0.681$, $SE=0.152$). The results indicate that the participants wrote a greater

quantity of words when using the sign pen compared to the ballpoint pen. This highlights that the sign pen can produce a greater quantity of words written than ballpoint pen. All of the data collected from both of the condition gathered from 20 participants ($N=20$).

Table 5: Descriptives of Quantity of Words Written

	N	Mean	Median	SD	SE
Quantity of Sign Pen	20	3.90	4.00	0.788	0.176
Quantity of Ballpoint Pen	20	3.60	3.50	0.681	0.152

Table 6 shows the results of Paired Sample T-Test, which aimed to investigate whether there is a difference in the quantity of words written between using sign pen and ballpoint pen. The findings indicated that the quantity of words written using sign pen ($M=3.90$, $SD=0.788$) was significantly higher than that with the ballpoint pen

($M=3.60$, $SD=0.681$, $W=21.0$ $p=0.020$, $d=1.00$). These results suggest that the use of a sign pen could have a considerable and notable effect on the quantity of words written within a ten-minute frame. The decision was made to reject the null hypothesis.

Table 6: Paired Sample T-Test

Quantity of Sign Pen	Quantity of Ballpoint Pen	Wilcoxon W	Statistic	df	p	Effect Size
			21.0	a	0.020	Rank biserial correlation 1.00

Discussion

The objective of this study is to identify if sign pens differ from the ballpoint pens in terms of writing speed and quantity of words written. Along with the controlled environment and a with-in subject design, the result reveals significant difference ($p=0.004$; $ES= 0.740$) which signifies almost large difference in speed between both pens. Additionally, it also reveals the significant the significant difference in the quantity of writing ($p= 0.020$, $ES = 1.00$) with large effect size. One of the reasons is because the ink streak texture of the ballpoint pen is not as smooth as the sign pens (Lee *et al.*, 2023b). Sign pens quality differs from the ballpoint pens, in cases of ink stroke, comfortability, light weight and ink quality. In a study conducted by Moore and Buzzini (2020), about analyzing the difference between strokes of pens that it reveals that it is hard to identify which of those strokes are sign pens and ballpoint pens, showing little to no difference between sign pens and ballpoint pens. However, Participants who used sign pens wrote at a faster pace and with more than those who used ballpoint pens. This is in line with previous studies, which found that gel pens and sign pens provide smoother and faster writing due to their fluid ink flow and lower resistance compared to ballpoint pens' thicker ink (Peter Warrior: Pen & Pencil Expert, 2023). Furthermore, another study

found that pens with faster ink flow gave a far smoother writing experience by significantly minimizing hand fatigue, making them helpful for tasks, particularly long writing work (Lee *et al.*, 2023). Similarly, another study shown that ink composition and flow have a considerable impact on writing performance, with smoother ink types lowering hand fatigue during long-term writing jobs. These findings support the premises that, due to their design and ink qualities, sign pens are better suited for long-term and high-pressure writing tasks (Linc_Seo, 2024). These studies show evidence that sign pens are more comfortable and efficient in writing compared to ballpoint pens due to their physical qualities and smooth stroke when using.

The study's findings are consistent with the findings of other studies, which stated that rollerball pens with similar ink flow to sign pens outperformed ballpoint pens in terms of writing speed as well as satisfaction among users. However, there are some discrepancies in the endurance and dependability of ballpoint pens compared smoother ink types in adverse conditions such as rough surfaces or extreme temperatures. The study revealed that the advantages of sign pens may be context-dependent, favoring smooth surfaces and regulated situations (Sharif *et al.*, 2019). However, in this study researchers conducted the experiment providing the participants smooth table

and comfortable space for writing, with similar pen each and a paper to write on, reducing the extraneous variables affecting the experiment's result. The better quality of sign pens made the difference between ballpoint grow large in terms of writing speed and quantity of words written.

This study has some limitation that can affect or change the result of this experiment if implemented. First, the time that the experiment has been done, since this experiment uses within-subject design it is possible that on the second condition, which is the sign pen, the participants are already experiencing fatigue and hand numbness due to exhaustion in which if it does not cause any errors the differences between sign pens and ballpoint pens grew larger. Second, the use of pens is limited only in writing, researchers does not explore the application of pens in other writing surfaces or task, such as in artistic work or in note-taking. Lastly, the researchers only use two specific brand of pen, other brands may also produce different kind of results.

The result highlights the large difference between sign pens and ballpoint pens in terms of writing speed and quantity. This is beneficial to the writers for their preference in terms of writing tool to provide efficiency and productivity. This could also provide teachers and students a choice of pen when they are task to write long phrases that is needed to be done at a short period of time for a reason that sign pens are able to make the work done faster and more efficient compared to the ballpoint pens. It can also help pen manufacturers to decide which type of pen they will produce more in order to satisfy the costumers need for efficient and productive type of pen. It is also suggested for future researchers to look beyond the physical aspect of the pens, and analyze and study emotional and physical comfort the pens brings to the user that make them write faster in sign pens compared to ballpoint pens. It is also advised to broaden the range of the participants to find out if the result of this study is applicable to all.

CONCLUSION

The study's objective is to identify if there is a significant difference between sign pens and ballpoint pens in terms of writing speed and quantity of words written within the given time. After the experiment and analyzing the result, this study found out that sign pens can be distinguished from ballpoint pens performance in writing. This shows that sign pens are more efficient and provide productivity to the users for the reason that sign pens have more smooth strokes than ballpoint pens. This only proves that type of pen contributes to writing efficiency, such as writing speed and quantity.

When doing a writing task, it is important to have writing tools that will lessen your time taken on completing it. This research will help users decide on which type of pen they need to use on the task that they are responsible. Teachers, students, and writers can make this study beneficial to them in understanding the difference

between sign pens and ballpoint pens and the efficiency of both pens brings.

Acknowledgements

The completion of the research could not have been accomplished without the participation and cooperation of the people who willingly help us to be able to complete this research. Our deepest gratitude to our family, friends, participants, adviser, institution and partner for their unending support and guidance in making this research experiment.

REFERENCES

- Cristobal, J. (2022). Test construction principles violated in selected summative tests in English. *American Journal of Arts and Human Science*, 1(2), 33–39. <https://doi.org/10.54536/ajahs.v1i2.317>
- Graham, S. (2021). A walk through the landscape of writing: Insights from a program of writing research. *Educational Psychologist*, 57(2), 55–72. <https://doi.org/10.1080/00461520.2021.1951734>
- Handley, M. A., Lyles, C. R., McCulloch, C., & Cattamanchi, A. (2018). Selecting and improving quasi-experimental designs in effectiveness and implementation research. *Annual Review of Public Health*, 39(1), 5–25. <https://doi.org/10.1146/annurev-publhealth-040617-014128>
- Hase, A. (2022). Evaluation of writing performance for different types of ballpoint pen ink by acoustic emission sensing. *Lubricants*, 10(3), 44. <https://doi.org/10.3390/lubricants10030044>
- Lee, J., Murad, S., & Nikolov, A. (2023). Ballpoint/rollerball pens: Writing performance and evaluation. *Colloids and Interfaces*, 7(2), 29. <https://doi.org/10.3390/colloids7020029>
- Lin, Y.-C., Hsu, C.-H., Lin, C.-F., Hsu, H.-Y., Liu, J.-W., Yeh, C.-H., & Kuo, L.-C. (2022). Pen-grip kinetics in children with and without handwriting difficulties. *PLOS ONE*, 17(6), e0270466. <https://doi.org/10.1371/journal.pone.0270466>
- Linc_Seo. (2024). Ball pens: Grip comfort, ink color, and writing style. *Linc*. https://linclimited.com/blog/ball-pens-grip-comfort-ink-color-and-writing-style/?utm_source=chatgpt.com&fbclid=IwY2xjawHVrXZleHRuA2FlbQIxMQABHbu1PYVD-bVPmqsQ12AEWzHu7TQZCHUZUQ4xqxCNWFrOC59ikE4fxL3qKw_aem_XQC4hHule95uHURj0nWlbw
- Micunovic, I. (2020, September 24). *The art of Chinese calligraphy*. Meer. <https://www.meer.com/en/63496-the-art-of-chinese-calligraphy>
- Mokhetsengoane, S. J., & Pallai, P. (2023). Effective teaching in the 21st century: Investigating barriers and solutions from one university in Assam, India. *American Journal of Arts and Human Science*, 2(1), 19–25. <https://doi.org/10.54536/ajahs.v2i1.1390>
- Moore, C., & Buzzini, P. (2020). A review on porous-tipped writing instruments: Current market trends, properties, and analytical methodologies. *Journal of*

- the American Society of Questioned Document Examiners. https://journal.asqde.org/articles/267?_rsc=khg8o
- Ni, Y., He, N., Lü, Y., Zou, N., Song, H., Li, H., & Zhao, P. (2020). Study of ink aging: Targeting triethylene glycol in carbon-based black gel ink strokes on paper. *Forensic Science International*, 311, 110296. <https://doi.org/10.1016/j.forsciint.2020.110296>
- Warrior, P. (2023). *Speed writing essentials: Choosing the perfect pen* (2024). Pen Vibe. <https://penvibe.com/speed-writing-essentials-choosing-the-perfect-pen/>
- Warrior, P. (2023). *The best 3 pens for fast handwriting*. Pen Vibe. <https://penvibe.com/the-best-3-pens-for-fast-handwriting/>
- Reynolds. (2024). *The best gel pen for smooth, fast, and smudge-free writing*. Reynolds. https://www.reynolds-pens.com/blogs/the-best-choice-for-smooth-fast-and-smudge-free-writing-reynolds-racer-gel/?fbclid=IwZXh0bgNhZW0CMTEAAR3b7hGy9ISNghAx2pt7u9CvEGSJi5aLu5jerSHs4akvUH8bH4kn8iXw46Y_aem_x9x4u7HClvoxkEMlf5vRQw
- Sharif, M., Batool, M., Chand, S., Farooqi, Z. H., Tirmazi, S. A. A. S., & Athar, M. (2019). Forensic discrimination potential of blue, black, green, and red colored fountain pen inks commercially used in Pakistan, by UV/visible spectroscopy, thin layer chromatography, and Fourier transform infrared spectroscopy. *International Journal of Analytical Chemistry*, 2019, 1–10. <https://doi.org/10.1155/2019/5980967>
- Simply Psychology. (2023). *Within-subjects design: Examples, pros & cons*. <https://www.simplypsychology.org/within-subjects-design.html>
- Statistics Solutions. (2024). *Paired sample t-test*. Statistics Solutions. <https://www.statisticssolutions.com/free-resources/directory-of-statistical-analyses/paired-sample-t-test>