Impact of Braille System Intervention on Reading Skills and Satisfaction: A Study on Visually Impaired Participants

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Abstract
The study investigated the impact of a Braille system intervention on reading skills and satisfaction among visually impaired individuals, with a total of 86 participants. Employing a mixed-methods approach, the research integrated quantitative assessments of reading competence with qualitative exploration of participant experiences. Visually impaired individuals aged 18 and above, with limited or no proficiency in Braille, were recruited from specialized schools, rehabilitation centers, and support groups. Pre- and post-intervention assessments measured changes in reading comprehension, speed, and accuracy, revealing statistically significant improvements across all metrics following the Braille intervention. Moreover, participants expressed high levels of satisfaction with the Braille instruction provided. Challenges reported in learning Braille included tactile sensitivity and memorization of Braille codes. However, participants perceived numerous benefits from Braille literacy, including enhanced access to information, increased confidence, and improved independence, irrespective of their educational background. These findings underscore the importance of Braille literacy in empowering visually impaired individuals and highlight the need for tailored interventions to address specific learning challenges. Overall, the study contributes robust empirical evidence supporting the efficacy of the Braille system in enhancing reading skills and satisfaction among visually impaired individuals, offering insights for educators, policymakers, and practitioners working in the field of visual impairment and rehabilitation.
Keywords: *Braille system, visually impaired, Reading skills, Intervention, Satisfaction, process innovation, product innovation, inclusive education*

Introduction

Visually impaired individuals face unique challenges in accessing written information and developing essential literacy skills compared to their sighted counterparts. Among the various methods developed to address these challenges, the Braille system stands out as a crucial tool for promoting literacy and

independence among the visually impaired community. Braille, a tactile writing system composed of raised dots, enables individuals with visual impairments to read and write proficiently. However, despite its proven efficacy, many visually impaired individuals still lack adequate proficiency in Braille, which significantly hinders their educational and professional opportunities.

This study aims to investigate the impact of a Braille system intervention on reading skills and satisfaction among visually impaired individuals. By assessing both quantitative measures of reading competence and qualitative insights into participant experiences, this research seeks to provide a comprehensive understanding of the effectiveness of Braille instruction programs. Understanding the effectiveness of such interventions is vital for informing educational strategies, rehabilitation programs, and policy decisions aimed at enhancing the literacy and quality of life for visually impaired individuals.

The significance of this study lies in its potential to contribute empirical evidence supporting the efficacy of Braille literacy interventions in improving reading skills and overall satisfaction among visually impaired individuals. By evaluating changes in reading comprehension, speed, and accuracy, this research aims to quantify the tangible benefits of Braille instruction programs. Additionally, by exploring participants' perceptions, experiences, and challenges related to learning and using the Braille system, this study seeks to uncover valuable insights that can inform the development of more effective and tailored interventions.

The findings of this study have implications for educational institutions, rehabilitation centers, and policymakers involved in providing services for visually impaired individuals. By demonstrating the positive impact of Braille instruction on reading skills and satisfaction, this research may advocate for increased resources and support for Braille literacy programs. Ultimately, enhancing Braille proficiency among visually impaired individuals can lead to greater educational and employment opportunities, improved independence, and enhanced quality of life.

This study addresses a critical gap in the literature by investigating the impact of Braille system interventions on reading skills and satisfaction among visually impaired individuals. Through a mixed-methods research design, this research aims to provide robust empirical evidence supporting the efficacy of Braille instruction programs and offer insights for improving educational and rehabilitation practices for the visually impaired community.

Related Literature

The study by Jeraldine, Fonesto, and Beltran (2022) offers insights into the efficacy of Braille intervention in enhancing reading skills among visually impaired individuals. Their investigation delves into the impact of Braille literacy on reading competence and satisfaction, catering to a crucial aspect of education and rehabilitation for the visually impaired. The findings contribute to the existing

body of literature by providing empirical evidence supporting the positive effects of Braille instruction on reading comprehension, speed, and accuracy. Additionally, the study highlights the satisfaction levels of participants with the Braille intervention, indicating a favorable response towards this mode of learning.

Nur, Fadhilah, Tisnawati, Yuliati, and Endang Purbaningrum (2022) explore the utilization of innovative Braille technology in educational settings for individuals with visual impairments. This research underscores the significance of incorporating technological advancements into Braille education, thereby facilitating a more engaging and effective learning experience. By integrating technology into the teaching and learning process, educators can tailor interventions to suit the diverse needs of visually impaired learners, ultimately enhancing their educational outcomes and overall well-being.

The work of Edgar Encalada, Cristina del Rocío Jordán, Verónica Elizabeth Chicaiza, and Sarah Jacqueline Iza Pazmiño (2022) presents a preliminary investigation into the enhancement of reading competence through Braille literacy. This study lays the groundwork for understanding the potential of Braille instruction in improving reading skills among visually impaired individuals. Through their research, they shed light on the initial outcomes of Braille interventions, paving the way for further exploration and development in this area.

Dayeon Lee and Jinsoo Cho (2022) introduce an automatic object detection algorithm-based Braille image generation system, focusing on real-life obstacle recognition for visually impaired individuals. This innovative approach addresses the practical challenges faced by visually impaired individuals in navigating their surroundings. By leveraging technology to detect and interpret real-life obstacles, this system has the potential to significantly enhance the mobility and independence of visually impaired individuals, thus improving their overall quality of life.

Filiz Dalip, Kazim Yildiz, E. E. Ülkü, and Büşra Büyüktanir (2022) propose Raspbraille, a system that converts text to Braille using optical character recognition and voice recognition algorithms. This technological innovation streamlines the process of converting textual information into Braille format, thereby improving accessibility for visually impaired individuals. By harnessing the power of machine learning and voice recognition technology, Raspbraille offers a more efficient and user-friendly solution for Braille literacy education and accessibility.

Elizabeth Hoskin, Morag K. Coyne, Michael J. White, Stephan C. D. Dobri, T. Claire Davies, and Shane D. Pinder (2022) conduct a systematic review on the effectiveness of technology in Braille literacy education for children. Their comprehensive review provides valuable insights into the various technological interventions employed in Braille education and their impact on children's literacy outcomes. By synthesizing existing research, this study informs educators and

policymakers about the potential benefits of incorporating technology into Braille literacy education programs for children with visual impairments.

Hytham N. Fageeh, Manawar A. Mansour, Hussam M. Muyidi, Abu Bakr Ahmed, Sameer J. Ogayshi, and Reghunathan S. Preethanath (2021) investigate the impact of verbal and Braille text oral hygiene instructions on visually impaired individuals through a randomized clinical trial. This study highlights the importance of adapting instructional materials to accommodate the specific needs of visually impaired individuals in various domains, including healthcare. By comparing the effectiveness of verbal and Braille text instructions, this research informs healthcare practitioners about the most effective methods for communicating oral hygiene instructions to visually impaired patients, ultimately improving their oral health outcomes.

Methodology

Research Design

The study utilized a mixed-methods research design, incorporating both quantitative and qualitative approaches to provide a comprehensive understanding of the effectiveness of the Braille system in enhancing reading competence among visually impaired individuals. The quantitative component involved pre- and post-intervention assessments to measure changes in reading comprehension, speed, and accuracy. The qualitative component involved in-depth interviews with participants to explore their experiences, perceptions, and challenges related to learning and using the Braille system.

Participants

There are 86 participants in this study included visually impaired individuals aged 18 and above who had limited or no proficiency in the Braille system. Participants were recruited through specialized schools for the visually impaired, rehabilitation centers, and relevant support groups. Informed consent was obtained from all participants prior to their involvement in the study.

Measures/Materials

Pre- and Post-Intervention Assessments

Reading Comprehension Tests - Standardized tests designed to assess participants' comprehension of written passages in Braille.

Reading Speed Tests - Timed assessments to measure participants' reading speed in Braille characters per minute (CPM).

Accuracy Checks - Evaluation of participants' accuracy in reading Braille passages.

In-depth Interview Guide

Semi-structured interview questions were used to explore participants' experiences, perceptions, and challenges with learning and using the Braille system.

Questions covered topics such as motivation, barriers to learning, satisfaction with Braille instruction, and perceived benefits of Braille literacy.

Data Gathering Tools

Braille Reading Materials

Standardized passages and texts in Braille format were provided for the pre- and post-intervention assessments.

Additional reading materials were provided for participants to practice and enhance their Braille skills during the intervention period.

Interview Recording Equipment

Audio recording devices were used to capture participants' responses during the in-depth interviews.

Transcription software was employed for transcribing recorded interviews into text format for analysis.

Data Analysis

Quantitative Data Analysis

Descriptive Statistics - Calculation of means, standard deviations, and frequencies to describe participants' baseline characteristics and changes in reading competence pre- and post-intervention.

Inferential Statistics - Paired samples t-tests or non-parametric tests (depending on data distribution) were utilized to compare pre- and post-intervention reading comprehension scores, reading speed, and accuracy.

Qualitative Data Analysis

Thematic Analysis - Systematic coding and categorization of interview transcripts was conducted to identify recurring themes related to participants' experiences, perceptions, and challenges with the Braille system.

Interpretation and Integration Quantitative and qualitative findings were integrated to provide a comprehensive understanding of the effectiveness of the Braille system in enhancing reading competence among visually impaired individuals.

This research methodology aimed to provide robust empirical evidence on the impact of the Braille system on reading competence among visually impaired individuals, combining quantitative assessments with qualitative insights to offer a holistic understanding of the phenomenon under investigation.

Result and Discussion

Table 1. Participant Demographics

Demographic	Frequency	Percentage
Age (years)		
Mean (SD)	35.2 (8.7)	
Gender		
Male	42	48.8%
Female	44	51.2%
Education Level		
High School	25	29.1%
Bachelor's Degree	38	44.2%
Master's Degree	23	26.7%

Table 1 presents the demographic characteristics of the participants. The mean age of the participants was 35.2 years (SD = 8.7). The sample comprised of 42 (48.8%) male and 44 (51.2%) female participants. Regarding education level, 25 (29.1%) had completed high school, 38 (44.2%) held a bachelor's degree, and 23 (26.7%) had a master's degree.

Table 2. Pre- and Post-Intervention Reading Comprehension Scores

Time Point	Mean Score (SD)
Pre-Intervention	67.3 (10.2)
Post-Intervention	78.6 (9.4)

Table 2 displays the mean reading comprehension scores of participants before and after the intervention. The pre-intervention mean score was 67.3 (SD = 10.2), while the post-intervention mean score significantly increased to 78.6 (SD = 9.4), indicating a statistically significant improvement in reading comprehension following the Braille system intervention ($p < 0.001$).

Table 3. Pre- and Post-Intervention Reading Speed (CPM)

Time Point	Mean Speed (SD)
Pre-Intervention	35.9 (6.8)
Post-Intervention	48.2 (7.5)

Table 3 illustrates the mean reading speed (characters per minute, CPM) of participants before and after the intervention. The pre-intervention mean speed was 35.9 CPM (SD = 6.8), while the post-intervention mean speed increased significantly to 48.2 CPM (SD = 7.5), indicating a statistically significant improvement in reading speed following the Braille system intervention ($p < 0.001$).

Table 4. Pre- and Post-Intervention Reading Accuracy

Time Point	Mean Accuracy (%)
Pre-Intervention	78.5 (9.1)
Post-Intervention	86.2 (7.3)

Table 4 presents the mean reading accuracy of participants before and after the intervention. The pre-intervention mean accuracy was 78.5% (SD = 9.1), while the post-intervention mean accuracy significantly increased to 86.2% (SD = 7.3), indicating a statistically significant improvement in reading accuracy following the Braille system intervention ($p < 0.001$).

Table 5. Comparison of Pre- and Post-Intervention Scores by Gender

Time Point	Male (n=42)	Female (n=44)
Pre-Intervention	65.8 (9.5)	68.7 (10.7)
Post-Intervention	77.2 (8.7)	80.1 (9.9)

Table 4 compares the pre- and post-intervention reading comprehension scores by gender. Both male and female participants demonstrated significant improvements in reading comprehension following the Braille system intervention. However, there were no statistically significant differences in the magnitude of improvement between male and female participants.

Table 5. Participant Satisfaction with Braille Instruction

Satisfaction Level	Frequency	Percentage
Highly Satisfied	30	34.9%
Moderately Satisfied	45	52.3%
Slightly Satisfied	11	12.8%
Not Satisfied	0	0%

Table 5 displays participants' satisfaction levels with Braille instruction. The majority of participants reported being either highly satisfied (34.9%) or moderately satisfied (52.3%) with the Braille instruction provided, indicating a positive perception of the intervention program.

Table 6. Types of Challenges Faced in Learning Braille

Challenge Type	Frequency	Percentage
Tactile Sensitivity	27	31.4%
Memorization of Braille Codes	20	23.3%
Reading Speed Improvement	18	20.9%
Lack of Resources	15	17.4%
Other	6	7.0%

Table 6 outlines the types of challenges reported by participants in learning Braille. The most commonly reported challenges included tactile sensitivity (31.4%) and memorization of Braille codes (23.3%). Understanding these challenges is crucial for designing targeted interventions to address the specific needs of visually impaired individuals learning the Braille system.

Table 7. Perceived Benefits of Braille Literacy by Education Level

Perceived Benefit	High School (n=25)	Bachelor's (n=38)	Master's (n=23)
Enhanced Access to Info	18 (72.0%)	32 (84.2%)	21 (91.3%)
Increased Confidence	20 (80.0%)	34 (89.5%)	20 (87.0%)
Improved Independence	15 (60.0%)	28 (73.7%)	19 (82.6%)

Table 7 examines the perceived benefits of Braille literacy across different education levels. Participants across all education levels reported high levels of perceived benefits, including enhanced access to information, increased confidence, and improved independence. These findings underscore the universal value of Braille literacy in empowering visually impaired individuals, regardless of their educational background.

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