



Development and Evaluation of Medication Braille font Aid Slate Adaptation (BASA) in the Community Pharmacy among Visually Impaired (VI) in General Santos City and Koronadal, South Cotabato



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ABSTRACT

Introduction: Vision impairment imposes a massive financial burden on the global economy with the annual global costs of productivity losses (WHO, 2020). A visually impaired person faces numerous challenges in daily activities for instance, medication identification which compromises their safety and efficacy (Almukainzi, et. al 2020). This study was conducted to develop and evaluate a braille font aid slate adaptation to help visually challenged individuals to be independent, minimize the occurrence of medication-related problems, and improve patient compliance.

Methods: The study utilized the pre-experimental design, specifically the one-group pre-test and post-test design. Non-randomized, self-selection sampling (volunteer sampling) was used in this study.

Results: Based on the findings, the BASA has proven to be highly effective in enhancing knowledge levels, with a percentage of 91.30%. Survey results indicated that most of the participants suffered with cough (86.7%), and fever (73.3%) at the time. Results revealed that the level of problems faced among participants is found at a low level with a mean value of 2.47, which means that the problems presented were slightly experienced by the visually impaired participants. Based on the statistical test, results revealed a significant difference ($p > 0.05$) on the level of perception before and after the BASA intervention.

Conclusion: The researchers concluded that there is a significant difference between visually impaired patients before and after BASA intervention. This implicated that BASA was effective in terms of addressing the important issues concerning the management of conditions among patients.

Keywords: *Braille writing, Community Pharmacy, Visually Impaired*

INTRODUCTION

Visual impairment (VI) is a term used to describe a condition in which a person has a decrease in their ability to see clearly or a narrowing of their field of vision which cannot be addressed by wearing glasses or contact lenses (Gilles, 2021). The projected number of individuals affected by this condition is 285 million, with 39 million of them experiencing blindness. An estimated 285 million individuals are affected, with 39 million being blind. In the study of Ongtango, et al (2018) entitled Quality of Life of

Visually Impaired Adolescents, it was stated that visual impairment can impact functional mobility, which can limit functional ability and may restrict their movement affecting their participation in activities such as self-care, education, and school. The majority of visually impaired had no access to basic services for improving their quality of life (Riewpaiboon, 2008).

According to Almukainzi, et al (2020) visually impaired people face numerous challenges in daily activities for instance, medication identification which compromises their safety and efficacy. In addition, they stated that the existing regulations and

methods for dispensing medications to the visually impaired people in Saudi Arabia do not adequately address their need for health information. Ling et al (2017), on the other hand, stressed in their study about the challenges in medication handling of the visually impaired population that among their participants, 89% of them were unable to read the prescription labels, 75% of participants were unaware of the expiration date of their medication, and 58% of participants did not know the name of the medicine arriving to the conclusion that people with visual impairment failed to adhere to their medication and they are prone to medication errors. These conclusions corroborated with the findings of the study conducted with older people in Australia of McCan et. al (2012), that while older people with and without VI achieve similar levels of medication adherence, those with VI require and receive significantly more support in medication self-management: they were more than twice as likely to require help and four times as likely to receive support from a community pharmacist. From the mentioned research studies, it is evident that the medicines were mainly acquired in drugstores purchasing over-the-counter (OTC) medicines for minor illnesses (Riewpaiboon, 2008; Ling et al, 2017). To the best knowledge of researchers, there were no published studies regarding the medication utilization of visually impaired adults on the national and local level and no interventions were imposed in the pharmacy setting.

While there were several efforts undertaken by both the central and state governments that prioritize the prevention and treatment of blindness such as Administrative Order No. 179 s.2004 implementation of the National Prevention of Blindness Program and Proclamation No. 40 (Sight Saving Month) , there are currently no initiatives in place to specifically address the issue of creating access and empowering those with blindness. Consequently, a considerable segment of the visually impaired populace may be more prone to engaging in unsafe practices related to medication management (Shetty, Sunita & Shetty, 2021).

To address these problems, the Braille writing system that has been in widespread use over the years made an impact in a variety of fields, including medicine. In fact, some pharmaceutical companies used Braille writings on their medication packaging to represent the drug's name, strength, dosage form, and so on. The European Union started the trend by implementing European Directives. Furthermore, the Braille writing system can be used in medication containers such as pill boxes. Villanueva et al. (2020) conducted a study in the Philippines in which they created a pill box with engraved Braille writings along with an audio reminder, which aimed to help visually impaired patients be independent in taking medications for self-medication and monitoring of adherence, however, there were no existing studies regarding the intervention of a community pharmacy for the visually impaired patients.

Presently, there is a lack of usage and application of braille writing in pharmacy settings in the Philippines. Thus, this study was conducted to develop and evaluate a braille font aid slate adaptation to help visually challenged individuals to be independent, minimize the occurrence of medication-related problems, and improve patient compliance. Furthermore, this study attempted to fill the gaps from international to local initiatives about the enactment of independence to visually impaired persons that is to remove practical obstacles for people

who are partially and totally blind or those who have vision impairment in general. This study aspired to stretch the patient care given to visually impaired citizens given that they have limited access to the information resources as such the level of health literacy and planned to be disseminated through research forums and implementing agencies.

RESEARCH METHODOLOGY

Study Design

The study utilized the pre-experimental design, specifically the one-group pre-test and post-test design. According to Voxco (2021), it is a class of pre-experimental design in which the research requires only a single group, which means it does not have a controlled group. Therefore, the single group went to a pre-test before undergoing the intervention, and went to a post-test after the intervention. Moreover, Choueiry (2021) stated that using the results from the pre-test and post-test allowed the measurement of the effect of the intervention. The researchers chose the aforementioned study design, as stated in the scope and limitation, due to financial constraints. Child Care & Early Education Research Connections stressed that pre-experimental was a cost-effective option to perceive if the study's results were not able to facilitate another investigation.

Population and Sampling Technique

The participants of the study were visually impaired individuals without other disabilities aged 18 and above staying in General Santos City and Koronadal City. The said participants are capable of reading braille. Non-randomized, volunteer sampling design was the sampling technique used in this study as it relies on participants who voluntarily agree to participate in the research. Moreover, the study needed participants that can fit a certain criterion which is being visually impaired, aged 18 years old and above, and capable of braille reading. Volunteer sampling is applicable to a study that looks for participants with a particular disease or condition. Screening is a must to get the suitable traits that the researchers need for the study (Canada Statistics, 2021). According to Cohen, et. al (2007), at least fifteen (15) participants were required in an experimental study. Standard guidelines in implementing said intervention were validated and approved by the research adviser, professor, and validators.

Instruments

The researchers utilized validated survey questionnaires for pre-test, and post-test evaluation adapted and modified from the study of Zhi-Han, et. al (2017) and Naik, et. al (2018). Braille and stylus were the main instruments for embossing the codes and printed templates of braille for ease of encoding.

Data Collection

The study was conducted in four phases to gather the needed data. First phase was to secure the consent form wherein the researchers inform the ideal participants regarding the objective of the study and their choice to participate. The researchers filled out the forms of the participants which was being witnessed by

government officials who have expertise on vision impaired patients. Afterwards, the participants marked the consent form with their thumb marks. Second stage involved the survey and pre-test conducted by the researchers to the recruited participants gathering their demographic profile. A verified braille test sample by the braille teacher was given to the participants to test their prior knowledge in terms of braille reading and the difficulties they have encountered in taking medications. The participants underwent field test implementation of the developed Medication Braille font Aid Slate Adaptation (BASA) by the researchers, together with a representative from the Persons with Disability Affairs Office (PDAO), in the pharmacy setting. The researchers conducted the final stage through post-test questionnaires and evaluation.

Data Analysis

The statistical analysis plans used in the study were: percentage, mean, frequency and Paired T-Test. The percentage was used to determine if the visually impaired participants were qualified for the study. According to Hague (2018), 80-100% means Good, 60-79% means Moderate/Fair, and less than 60% means Poor.

Ethical Considerations

Social Value

Visual impairment is not a new disability confirming that 1.98% of the Philippine population suffers in that condition (Philippine Eye Disease Study, 2018), with and without being braille literate. This study figured the desire of some visually impaired individuals to be independent in their medication management and the intervention of braille system inside the pharmacy is one of the supported initiatives. The Council for International Organizations of Medical Sciences (2016), states that social value is the produced data of a study that can improve the health of the society and positively impact the life of individuals. Furthermore, the researchers propose to disseminate the obtained results of intervention, including but not limited, to the Persons with Disability Affairs Office (PDAO) and a group of blind people in areas of Polomolok for them to use as a reference to see the potential benefit of the intervention, such as addressing the issue regarding the difficulties of visually impaired person in terms of their medication, and in the community wherever permissible. Implementing the said intervention can increase independency and deep understanding regarding their medicines as it can improve the quality of their lives.

Informed Consent

The researchers build rapport to potential participants through self-introduction and informing them the purpose of the research study. Other information such as the name and location of the institution, the reasons for considering the individual suitable for the study, the procedures, duration of

intervention, expected benefit of the study to the community and to scientific knowledge. The participants have the choice to participate or not in the study. After the participant voluntarily decided to join the study, they shall sign a consent form indicating that their privacy and safety are the most priority of the researchers. In case that a participant is incapable of personal consent, a legally authorized representative can intervene to give assistance. The researchers have given participants options whether to guide them to affix their signature to the consent form or utilize thumbmark press in lieu of handwritten signatures. The obtain informed consent were done in a manner that manifest respect for dignity, autonomy, without having been subjected to coercion, undue influence, or inducement. Moreso, the researchers convey the information in ritual recitation in a language and manner that suits the capacity and level of understanding of the participants. The researchers ensured that the prospective participant has adequately understood the information. The researcher gave each participants the full opportunity to ask questions, and should answer them honestly, promptly, and completely.

Vulnerability of Research Participants

The researchers acknowledge the vulnerability of the visually impaired participants of the study. They are prone to different risks such as, falls, fractures, injuries, poor mental health, cognitive deficits, and social isolation. (Welp A, et. al, 2017) The participants were ushered safely through private vehicle transportation provided by the researchers. A representative of Persons with Disability Affairs Office (PDAO) accompanied the researchers during the conduct of protocols.

Risk, Benefits, and Safety

The use of Braille writing in prescription labels can provide significant benefits for individuals with visual impairments, allowing them to read and understand the information on their medication labels independently. However, there are also potential risks associated with the use of braille writing in prescription labels that need to be considered.

Braille labels allow individuals with visual impairments to read and understand prescription information on their own, reducing the need for assistance from others, increasing the independence of the visually impaired person. Braille labels can help ensure that individuals with visual impairments take the correct medication and dosage, reducing the risk of medication errors resulting to improved safety. Braille labels can help maintain the privacy of individuals with visual impairments, as they can read and understand their medication labels without having to rely on others enhancing privacy. Also, not all pharmacies have the capability to produce braille labels, limiting accessibility for individuals with visual impairments.

On the other hand, Braille transcription errors can occur, resulting in incorrect or inconsistent information being presented on prescription labels, compromising

accuracy and consistency. Braille literacy rates are relatively low, which may limit the understanding of prescription information by individuals with visual impairments that did not undergo braille learning.

Overall, the use of braille writing in prescription labels can provide significant benefits for individuals with visual impairments, but care must be taken to ensure accuracy and consistency in transcription, availability of braille labels, and understanding of the information presented.

Privacy and Confidentiality of Information

In line with Republic Act No. 10173, commonly known as the Data Privacy Act of 2012, the researchers were sensitive, careful, and respected the privacy and confidentiality of the participants. Therefore, their personal data were not revealed in the research paper unless the participants gave their permission to use it. A duly authorized officer was present every session to ensure appropriate intervention. The researchers emphasized the right of the participants to withdraw from the study or withdraw his or her data, and to refuse to answer any question. Initials of the respondents were used as an identifier for the raw collected data.

Justice

Maintaining the principles of justice required the researchers to provide equal access to healthcare services for every individual, irrespective of their abilities or limitations. This was accomplished by putting accessibility barriers into practice. Braille prescriptions were implemented in line with these ethical requirements by providing equitable access to prescription information and responding to the particular requirements of patients who are blind or visually impaired. This method promoted equality and participation in healthcare delivery by guaranteeing that all patients, regardless of their visual abilities, could comprehend and control their healthcare needs. Therefore, the researchers put justice and openness by taking into account the needs of patients who are blind or visually impaired, making sure that access is equal, and keeping lines of communication open creates accountability and confidence.

Transparency

The researchers maintain transparent communication with the participants regarding Braille prescription availability, accessibility, and possible barriers or limitations during the implementation process. By keeping all parties concerned informed and updated about the use of Braille prescriptions on a regular basis through regular reports of interventions development. The researchers promoted responsible decision-making and accountability by extending transparency to all parties involved in the intervention, this was achieved through regular dissemination of information, updates, and reports regarding the implementation. Researchers used open communication strategies to make sure participants had easy access to and understanding of all pertinent information about the use of Braille prescriptions. Furthermore, the research instrument was validated by an expert to ensure that the content of the

questionnaires will be in line with the statement of the problem (Lai, 2013). The questionnaire was adapted from the study of Zhi-Han, Hui-Yin, Bakry, 2017, and Naik to ensure reliability and validity of the content of the questionnaire. From their study, the researchers extracted some information, especially the difficulties of visually impaired people, and the researchers modified it to make it suitable for the study.

RESULTS

Test Variables	Mean	SD	Remarks*
Knowledge	91.3	12.46	Good

*Level of knowledge base on the study of Hague, M. 2018 (80-100% - Good; 60-79% - Moderate/Fair: <60 – Poor)

Table 1. Overall Percentage Level of Knowledge among participants on the Developed Medication Braille Writing Aid Slate Application (BASA)

CURRENT/PAST MEDICAL CONDITIONS	FREQUENCY	% Distribution
COUGH	13	86.7
FEVER	11	73.3
ALLERGY	8	53.3
COLD	7	46.7
DIARRHEA	5	33.3
URINARY TRACT INFECTION	3	20.0
FLU	3	33.3
HYPERTENSION	1	6.7
DIABETES	1	6.7
PAIN (ALL FORMS)	1	6.7
DIZZINESS	1	6.7
ANEMIC	1	6.7

Table 2a. Summary of Medical Conditions among participants

Items	Problems Encountered	
	Mean	Description
Difficulty of reading labels on medication packaging	3.88	Very high
Difficulty in determining expiration date	3.83	Very high
Do not know the correct dose	2.60	High
Forgot to take medication on time	2.19	Low
Missed dose/doses	2.13	Low
Having a hard time following pharmacist instruction	1.82	Low
Difficulty of remembering when to take medicine	1.77	Low
Had taken the wrong medicine	1.53	Very low
Overall mean	2.47±0.91	Low

Table 2b. Overall Mean Problems Faced with Medication among participants

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Test variables		Mean	SD	T/F value	P value	Remarks*
Perception	Before	2.03	0.96	5.1372	0.0013	Significant
	After	3.15	0.12			

*Calculation was performed at 0.05 level of significance

Table 4. Testing the Significant Difference among Respondents on BASA before and after Intervention

DISCUSSION

Assessing the understanding of the user is crucial in determining the effectiveness of assistive devices. This allowed for the evaluation of users' understanding and application of the provided information (John et al., 2012). Based on the study's findings, the BASA has proven to be highly effective in enhancing users' knowledge levels, with an impressive percentage of 91.30%. The "Good" rating indicates that the application effectively communicates medication information to individuals with visual impairments. The positive knowledge outcome suggests that the BASA application has successfully addressed the accessibility gap, providing visually impaired individuals with crucial medication-related information. This aligns with the main goals discussed in previous research, emphasizing the importance of assistive technologies in enhancing the quality of life for individuals with visual impairments (Hayawaka et al (2013); World Health Organization (2019)). In their study, Hayawaka et. Al (2013), highlighted the importance of smartphone-based technology in providing automated medication adherence for individuals. The findings of this study supported the idea, emphasizing how effective the BASA application was in promoting independence and self-sufficiency among its users.

In addition, people with visual impairments often encountered challenges when it comes to accessing information about their medications. This can lead to issues like medication errors and non-compliance, which can have serious consequences (Smith et al (2006); World Health Organization (2019)). The study's findings suggested that BASA is an essential tool for tackling these issues, providing a practical solution for accessing and understanding pharmaceutical information. In their study, Smith et al (2006) highlighted the importance of incorporating prescribing safety alerts into electronic medical records to improve medication safety. While their focus was on a different aspect of drug administration, the shared goal of enhancing safety aligns with the positive outcomes mentioned in the BASA application.

The impressive accomplishment of the BASA application, with its knowledge level reaching an impressive 91.30%, has important implications for future development and research. It is crucial to continuously develop assistive technologies to ensure their effectiveness and user-friendliness. This improvement was made possible by considering user feedback and keeping up with advancements in technology (John et al, 2012). John et al (2012), also emphasized the need to provide incentives to encourage honesty in research techniques. Although not directly correlated, this concept can be employed in the creation and assessment of assistive technologies. The ongoing success of tools like BASA was attributed to the incorporation of transparent user feedback and continual enhancements.

Items	Problems Encountered	
	Mean	Description
BASA helped me read and understand the medicine instruction.	3.11	High
BASA helped me follow instructions of the pharmacist.	3.28	Very high
BASA helped me check the frequency and dose of medication.	3.33	Very high
BASA helped me to remember when to take the medication	3.00	High
BASA saved me from taking the wrong medication.	3.17	High
BASA made me feel safe in taking my medication.	3.00	High
BASA helped me know the expiration date of my medicine.	3.17	High
BASA is convenient for me.	3.17	High
Overall mean	3.15±0.12	High

Table 3. Overall Mean on Level of Perception among participants on BASA after Intervention

Meanwhile, the researchers measured the medical conditions, problems encountered with medication and their level of perception among participants after the intervention process. Overall data were shown in tables 2.a and 2.b, respectively. Results of the survey indicated that most of the participants suffered with cough (86.7%), and fever (73.3%) at the time. These current medical conditions were important to assess if the Developed Medication Braille font Aid Slate Adaptation (BASA) is a potential tool to help them manage their conditions.

Results revealed that the level of problems faced among participants is found at a low level with a mean value of 2.47, which means that the problems presented were slightly experienced by the visually impaired participants. However, among problems encountered were as follows: Difficulty in determining expiration date (3.74); Difficulty of reading labels on medication packaging (3.44); and Do not know the correct dose (2.17). Zhi-han, et. al (2017) stressed that out of 100 visually impaired patients 75 do not know the expiration date of their medicine and 67 have difficulty in reading medication labels. Moreover, Poka, et. al (2022) stated that out of 86 visually impaired patients, 46 did not know the correct dose of their medication. Hence, it is essential for anyone to conduct re-orientation or education among this population to create an atmosphere of learning where they can understand the importance of determining and carefully reading the packaging and label of medication as well as the expiration date.

Users continuously acknowledge the many capabilities of BASA, such as aiding in medication adherence, boosting safety, and providing crucial information about pharmaceuticals, high mean values ranging from 3.69 to 3.86. This indicated a strong positive emotion towards BASA. The intervention's overall mean of 3.79 ± 0.06 provided additional support for the perception of a significant benefit, classifying it as both "Very High" and "Highly Beneficial." The results supported the notion that assistive technologies, like BASA, are essential in meeting the unique requirements of visually impaired individuals when it comes to managing medicine (Hayawaka et al (2013) World Health Organization (2019)). The favorable impressions of the users highlighted the potential influence of BASA in empowering people and enhancing their overall experiences with medication.

Based on the statistical test, results revealed that there was significant difference ($p > 0.05$) on the level of perception before and after the BASA intervention. This meant that BASA was effective in terms of addressing the important issues concerning the management of conditions among patients. According to Frost (2023), if the p-value is less than 0.05, reject the null hypothesis. The sample provides sufficient data to establish that the mean paired difference does not equal zero in the population. In line with related literature, the usage of Braille writings reduced the wrong dosage taken by visually impaired patients by 5% compared to 46.2% at baseline (Shetty, Sulina, Shetty, 2021.) Moreover, Almukainzi, Almuhareb, Aldwisan, Alquidhip (2020), 91% of the participants agreed that applying Braille writing on their medicines would improve the quality of their drug therapy and help them conquer their difficulties regarding their therapy. Therefore, the use of Braille labeling on medications may improve the following: drug treatment regimes, lessen medication errors, and promote independence in these individuals by self-administration of their medications.

CONCLUSION

In light of the findings, the researchers concluded that the majority of the participants' scores were in the good (80-100%) category and only two were in the moderate/fair. The medical status of the participants was observed to have the prevalence of communicable diseases which was cough as evident in the collected data. This study found that majority problems faced by visually impaired participants were determining the expiration date and reading the labels of their medicines. The pre- and post-survey concluded there was a significant difference between visually impaired patients before and after BASA intervention. The overall findings revealed that according to the participants, Braille font Aid Slate Adaptation (BASA) is highly beneficial for them, as it provides convenience. Therefore, the alternative hypothesis of the study was accepted.

COMPETING INTERESTS

No conflict of interest.

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