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STUDY OF SUITABLE METHODS TO FACILITATE INDEPENDENT SELF ADMINISTRATION OF MEDICINES IN A GROUP OF BLIND AND PARTIALLY SIGHTED PERSONS IN SRI LANKA

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ABSTRACT

Visually disabled persons face difficulties in self-administration of medicines. They have difficulty locating medicines, identifying different medicines, taking the correct dose and remembering verbal instructions given by doctors and pharmacists. Some of them have devised their own coping methods to overcome these difficulties. However these methods are mostly unsuitable and unsatisfactory and at times lead to medicines related mishaps. The objective of this study was to develop and study suitable methods for self- administration of medicines in a group of visually disabled and partially sighted people in Sri Lanka. Containers which convey medicinal instructions via tactile methods and Braille labels were developed for testing in all participants. Large font sized labels and colour strips were prepared for testing in partially sighted participants in addition to the other methods. The ability of the participants to understand the instructions conveyed by the different methods were studied. Their preference for the developed methods was obtained. Instructions on administering medicines conveyed via tactile methods were comprehended better by the visually disabled compared to Braille labels. Tactile methods were preferred by the majority of participants to Braille labels. Large font sized labels were preferred to tactile methods by the partially sighted persons who were able to read. Medicine containers using tactile methods were the most suitable and preferred method to convey instructions on administering medicines to visually disabled. Braille labels were seen to have limitations and were preferred less by the participants.

Key words: Assistive technologies, Braille, Tactile methods, Medicine use, Partially sighted, Visually disabled, Visual impairment, Blind.

INTRODUCTION

About 284 million people are visually disabled worldwide. Thirty nine million of them are blind. Most people (about 65%) with visual disability are elderly (aged 50 years or more), and females are more at risk at every age, in every part of the world. The number of people blinded by infectious diseases has been greatly reduced, but age-related disability is increasing. Cataract remains the leading cause of blindness globally, except in the most developed countries. It has been estimated that correction of refractive errors could give normal vision to more than twelve million children aged between five to fifteen years worldwide. About 80% of all visual disability is avoidable globally. Visual disability is not distributed uniformly throughout the world. Approximately 90% of visually disabled people live in developing countries [1].

People who experienced the challenge of vision loss also often experienced the challenge of other disabilities in addition to their vision loss. Presence of additional disabilities can further limit the ability of people with vision loss to effectively manage their medications while also increasing the need for more types of medications [2].

Inability to access necessary instructions supplied with prescriptions and product labels of over-the-counter medications and difficulties in remembering instructions on how to administer medicines given to them verbally by the doctors and pharmacists are the major difficulties faced by visually disabled persons in self-administering medicines [3 -7]. Visually disabled persons use different strategies and methods to overcome difficulties in self-administration of medicines. Those who live in developed countries use advanced assistive technologies such as 'talking pill boxes' to overcome difficulties in self administration of medicines.

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In developing countries such as Sri Lanka, assistive technologies are not in common use because many cannot afford them. Therefore, to use medicines many visually disabled persons need assistance of another person. Some of them have devised their own coping strategies but these strategies are mostly unsuitable and unsatisfactory and at times lead to medicines related mishaps [4-7].

In pharmaceutical products the required information is usually given in the written form. Only a few manufacturers give some important information about their products in Braille. The information given is usually restricted to the name and dosage of the medicine due to the limited space on the cartons. Furthermore, the Braille used is English Braille because it is an international language. Unfortunately many Sri Lankan visually disabled persons do not know English Braille.

Therefore there is a need to develop methods to enable independent self administration of medicines for the visually disabled persons residing in developing countries. These methods should be easy to use, simple, effective, low cost and easily available. Some methods already suggested in literature need to be studied for their suitability to be used in the local population and adopted if shown to be effective [8].

Objective of our study was to adopt, develop and validate low cost, effective and safe methods for independent self-administration of medicines in visually disabled persons. We intended to develop tactile methods to enable identification of medicine containers, different medicines, doses, frequency, and time of administration. We also wanted to develop further methods that could be used by partially sighted persons to self administer medicines.

METHODOLOGY

The study was conducted in 76 visually disabled or partially sighted persons over the age of 18 years in 2010 and 2011.

Ethics approval for the study was obtained from the Ethics Review Committee of the Faculty of Medicine, University of Colombo. The permission was obtained from the Ministry of Social Services and the institutions where the study was conducted.

The study settings were the School for the visually disabled, Ratmalana, Seeduwa Vocational Training centre, Sri Lanka Council for the Blind, and Arts Faculty of the University of Colombo. The participants were from different parts of the country and their educational and socio-economic back grounds were diverse.

The study population comprised visually disabled persons 18 years and above at the above mentioned institutes. Since this population was difficult to access and was limited in numbers, purposive sampling was done. All consenting participants at the above mentioned settings that fulfilled the inclusion criteria were included as the study sample.

Informed written consent was obtained from the participants before they were included as study participants. The information sheet was explained to the participants and their queries were clarified by the investigators. Data collection was done in the presence of teachers and caretakers. An interviewer administered questionnaire was used to collect data regarding preference for the methods developed.

Since there was no recognized standard locally or internationally for acceptance of tactile methods which enable visually disabled persons to self-administer medicines, principles used by the European Commission standard for validating FIP (International Pharmaceutical Federation) pictograms was used. According to the said standard the percentage comprehension of pictograms should be more than 80% to be accepted as valid. Therefore, methods that were correctly understood by 80% or more participants were accepted as valid [9,10]. Data were analyzed using Microsoft Excel.

Study Instruments

Medicine containers were developed to study five tactile methods (Methods 1 to 5) as described below to be tested on visually disabled subjects with no useful eye sight. The containers developed were numbered from 1 to 12. There were two containers under the label of 7 (7.I and &.7.II) and 11(11.I and 11.II); three containers under label 12 (12.I, 12.II, 12.III). Some of these methods were based on tactile methods suggested in relevant literature [8] whereas the others were developed by the investigators.

Method 1: This method used buttons and elastic/rubber bands. Three circles of elastic/rubber bands were placed around the body of a plastic container from top to bottom to indicate morning, noon and night respectively. Buttons were attached to the bands to indicate the dose. In one container, four circles of elastic bands were placed to indicate medicines to be taken six hourly. Sticky tapes were placed around the bands so that they would not move around. Six containers with six different combinations of bands and buttons were studied on the participants. Three of these containers are shown in the following figures.

Figure 1: One tablet to be taken at noon

Figure 2: Two tablets to be taken in the morning; three tablets to be taken at night.

Figure 3: One tablet to be taken every six hours.

Method 2: This method used cardboard bands and staples. Cardboard bands were used to indicate the time of day and staples were used to indicate the dose. A staple placed vertically indicated one tablet whereas a staple placed horizontally indicated half a tablet. Two such containers were developed. One of them is given below as an example.

Figure 4: Half a tablet to be taken in the morning and one and a half tablets to be taken at night.

Method 3: This method used fabric glue to give tactile inputs. Three circles were drawn from top to bottom using

fabric glue on the body of a plastic container to indicate plates used for each meal of the day. Dots were drawn to the left of, to the right of, or inside the circles to indicate tablets to be taken before, after, and with meals respectively.
Figure 5: One tablet to be taken before breakfast, two tablets to be taken before lunch and one tablet to be taken before dinner.
Figure 6: Two tablets to be taken after breakfast and one tablet to be taken after dinner.
Figure 7: One tablet to be taken with breakfast and two tablets to be taken with dinner.

Method 4: This was developed using cardboard with punched holes. In this method cardboard bands were used to indicate the time of day and punched holes on the cardboard band were used to indicate the dose.
Figure 8: One tablet to be taken in the morning and noon. Two tablets to be taken at night

Method 5: This method used Braille labels
To prepare Braille labels (as shown in Figure 9) Sinhala Braille was used.

The following two additional methods were developed to be validated on participants who were partially sighted.

Instruction labels with larger font sizes (Figure 10)
Labels were prepared using three font sizes 18, 20 and 22 with bold letters. Initially to test the readable font size, a name of a drug (metformin) was printed in the font sizes 14, 16, 18, 20, 22, 24 and 26 and participants were asked to tell the lowest font size they were able to read. Also those words were printed in both normal and bold format.

Method developed to assess the ability of partially sighted persons to differentiate colors (Figure 11)
We wanted to find out the colors that the partially sighted participants recognized the best. For this, five colored paper strips were pasted on a white A4 paper horizontally, leaving space between each two strips. The colors used and the order in which they were pasted from top to bottom on the A4 paper were green, blue, pink, red and yellow respectively.

Figure 1. Container NO.1

Figure 2. Container NO.4

Figure 3. Container NO.6

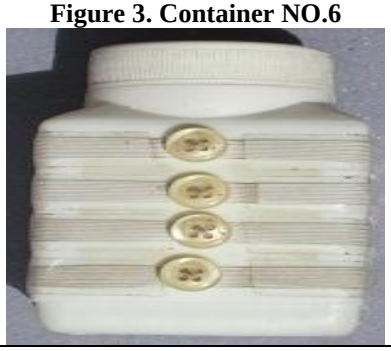


Figure 4. Container NO. 7 II

Figure 5. Container NO.8

Figure 6. Container NO.9

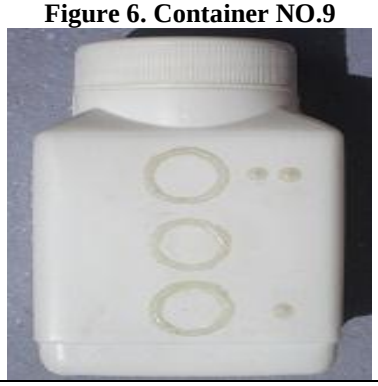


Figure 7. Container NO.10

Figure 8. Container NO.11 I

Figure 9. Container NO.12.I

Figure 10. Large font sized label

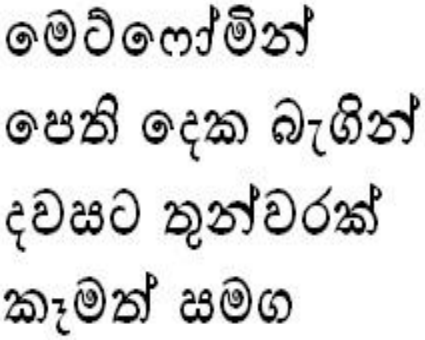
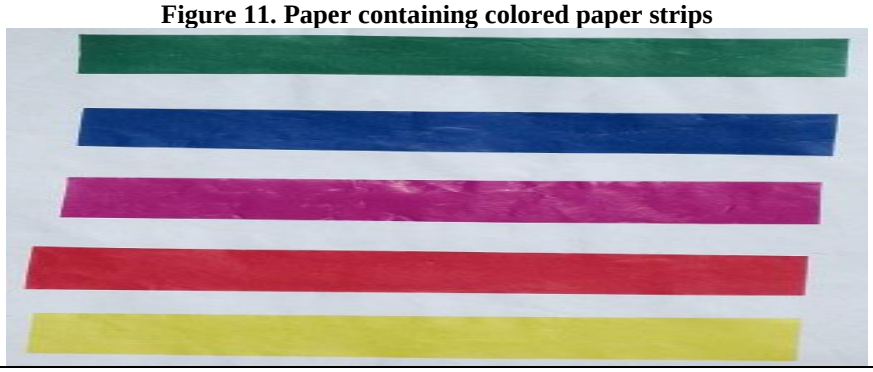


Figure 11. Paper containing colored paper strips



RESULTS

Seventy six out of 78 persons who fulfilled the inclusion criteria were included in the study. Two did not participate.

The sample comprised forty two visually disabled students of the School for the Visually Disabled in Ratmalana, twenty visually disabled trainees at Vocational Training Center in Seeduwa, eight visually disabled trainees at Sri Lanka Council for the Blind and six visually disabled undergraduates of the Arts Faculty of the University of Colombo.

Out of 76 participants, 33 were partially sighted and the rest were blind.

The following methods were validated on all 76 participants.

Method 1 developed using buttons and elastic bands

Table 1. Percentage of participants who understood the instructions conveyed by the 6 different containers developed using buttons and elastic/rubber bands

Container No.	Total tested	% Correct
1	76	84.21
2	76	93.42
3	76	88.16
4	76	96.05
5	76	94.74
6	76	81.58

Method 2 developed using cardboard bands and staples

Table 2. Percentage of participants who understood the instructions conveyed by the 2 containers developed using cardboard bands and staples

Container No.	Total tested	% Correct
7 I	76	89.47
7 II	76	85.53

Method 3 developed using fabric glue

Table 3. Percentage of participants who understood the instructions conveyed by the 3 containers developed using fabric glue

Container No.	Total tested	% Correct
8	76	95.65
9	76	95.65
10	76	95.65

Method 4 developed using cardboard with punched holes

Table 4. Percentage of participants who understood the instructions conveyed by the 2 containers developed using cardboard with punched holes

Container No.	Total tested	% Correct
11.I	76	24.00
11.II	76	36.73

Method 5 developed using Braille labels

Table 5 Percentage of participants who understood the instructions conveyed by the 3 containers developed using Braille labels

No.	Total tested	% Correct
12.I	76	62.75
12.II	76	24.00
12.III	76	36.73

The following additional methods were validated on the 33 participants who were partially sighted

Method using larger font sized labels

Fifteen out of thirty three (45.45%) partially sighted persons could read the larger font sized labels developed. Both bold and non-bold words from font size eighteen were read by the participants.

Method developed to assess the ability of partially sighted persons to comprehend colours

Table 6. Percentage comprehension of colors by partially sighted persons

Color	Total tested	% Correct
Green	33	93.94
Blue	33	100.00
Pink	33	39.39
Red	33	84.85
Yellow	33	96.97

Of the participants who were unable to recognize pink color, the majority stated it as purple. Some participants recognized pink as red.

Method preferences given by totally blind persons and partially sighted persons who were unable to read large font sized letters

Table 7. Percentage preference to each of the methods that can be used, to give instructions on administration of medicines

	Button	Staple	Glue	Card punch	Braille
Total	60	60	55	60	52
1st preference%	56.67	6.67	20.00	3.33	17.31
2nd preference%	28.33	21.67	32.73	10.00	17.31

3rd preference%	10.00	21.67	32.73	15.00	17.31
4th preference%	3.33	31.67	12.73	45.00	9.62
5th preference%	1.67	18.33	1.82	26.67	38.46

Method preferences given by partially sighted persons who were able to read large font sized letters

Table 8. Percentage preference to each of the methods that can be used, to give instructions on administration of medicines

	Button	**Staple**	**Glue**	**Card punch**	**Braille**	**Written labels**
Total	14	14	12	14	5	14
1st preference%	28.57	7.14	16.67	7.14	20.00	71.43
2nd preference%	35.71	21.43	25.00	0.00	0.00	7.14
3rd preference%	14.29	21.43	25.00	28.57	20.00	0.00
4th preference%	21.43	7.14	25.00	28.57	0.00	7.14
5th preference%	0.00	42.86	8.33	28.57	40.00	7.14
6th preference%	0.00	0.00	0.00	7.14	20.00	7.14

DISCUSSION

This study has helped identification and validation of suitable methods to convey instructions on administering medicines to a group of visually disabled consumers in Sri Lanka. The preference of the study participants to the different methods was also identified.

The material used to develop the methods such as rubber bands, elastic bands, buttons, cardboard, staples, and glue have the advantage of being low cost, easy to find and available in an average household. The caregivers of the visually disabled patients can prepare suitable medicine containers using the said material to store the medicines to be taken.

The number of participants was limited to 76 in our study and may not be representative of some communities of visual disabled persons in Sri Lanka. However it was effective in bringing to light some useful methods that could be studied further in a larger number and more representative sample.

Methods validated on all participants

The majority of the participants preferred the containers with elastic bands and buttons. The elastic bands were firm and stable and the buttons fixed to them resembled tablets. The participants found this method to be reliable and simple to use.

Compared to elastic bands rubber bands were not as satisfactory since the elasticity of rubber bands was lost soon and buttons attached to the rubber bands moved around and sometimes turned over making the identification of buttons using touch difficult.

The majority of the participants said it was better to have three bands around the container even when a medicine had to be taken twice daily or once daily since it gave them a better understanding of the correct time (morning, noon or night) the medicine had to be taken. It was comparatively more difficult to comprehend the time of day the drug had to be taken when just one or two bands were placed around the containers. The majority of the participants felt that it was better to have bands without buttons attached to indicate that no medicines were due at that time of day.

The method using cardboard bands and staples were comprehended by the majority of participants. However a drawback of this method was that the staple did not resemble the shape of a tablet. Furthermore, staples were less prominent to touch. For these reasons participants showed less preference for this method compared to the method using buttons and elastic/rubber bands.

The method using fabric glue was also well comprehended by the participants and was identified as another suitable method. The main advantage of this method over the others was that timing of medicines in relation to meals could also be satisfactorily conveyed by this method.

When considering the method developed using cardboard with punched holes, though punched holes resembled the shape of tablets, they were less prominent to touch because they were indented and not embossed. The participants preferred embossed structures to indented structures as they were more used to working with embossed structures such as Braille and embossed pictures. Due to this less preference was given by the participants to this method.

Many participants had difficulty reading the names of the medicines written in the Braille labels and some read the names incorrectly. Furthermore, the information in the Braille labels was written in the conventional way of writing which is to write everything in one sentence. This way of writing caused difficulty in understanding the information given.

Another major difficulty the participants faced was the erasing of the Braille dots due to prolonged use. Some participants stated that the poor quality of the Braille paper that was available for their use could lead to erasing of information and misinterpretation of information given if they were to use this method.

When the container was box shaped, different parts of the Braille sentence ran into different sides of the container due to space limitations. When Braille words ran across edges they found it more difficult to figure out the correct meaning. When a cylindrical container was used with the same Braille label, the comprehension of the given instructions was much better and almost all the

participants stated that it was much easier to read. According to advice given by some participants during the initial phase of the study when preparing the Braille labels the numbers were written using Braille letters. This was to avoid the possibility of dots indicating a particular number of being accidentally erasing off with resultant misinterpretation of numbers relating to dose and frequency.

Methods validated on participants who were partially sighted

It was seen that the ability to read did not depend on whether the letters were in bold print or not. Words from font size 18 and above were read irrespective of whether they were in bold print or not. However large font sized labels took more space and were difficult to paste onto containers. Therefore, font eighteen which was the minimum font size read by them would be a suitable font size for such labels.

In the method developed to assess the ability of partially sighted persons to comprehend colors, most of the participants misrecognized pink as purple. Some participants misrecognized pink as red. Therefore when colour coding medicine containers or a colour code is used to convey instructions on medicines colour combinations such as pink and purple and pink and red should not be used together.

Method preferences given by totally blind persons and partially sighted persons who are unable to read large font sized letters

Preferences by the participants for the methods developed were based on the ease of recognition by touch, resemblance of shapes to actual tablets and the amount of information conveyed by the methods developed. For example, when comparing the method developed using buttons and elastic bands with the method developed using Braille labels, the buttons and bands were prominent to the touch compared to Braille dots. Also, a button resembled the shape of a tablet. Some participants could not understand Braille. Thus, method developed using buttons and elastic bands obtained the highest first preference among all methods developed.

Method preferences given by partially sighted persons who were able to read large font sized letters

Preferences was given by the participants for the methods developed based on the ease of reading large font sized letters, ease of recognition by sight and touch, resemblance of shapes to actual objects and the amount of information conveyed by the methods developed. The large font sized labels were read with ease by the majority of partially sighted participants. Thus, this method obtained the highest first preference among them.

CONCLUSIONS AND RECOMMENDATIONS

Methods which were not accepted as valid were methods developed using Braille labels and large font sized labels as they had less than 80% comprehension by the participants.

Conclusions and recommendations when considering totally blind persons

For simple drug regimens that do not require tablet halves to be taken and which do not include medicines to be taken specifically with respect to meals

The preferred method was the method developed using buttons and elastic bands. Therefore this method is recommended to be used in simple drug regimens.

For drug regimens that require tablet halves to be taken

The only method which can be used in this instance is the method developed using cardboard bands and staples. Therefore the method developed using cardboard bands and staples is recommended to be used in drug regimens that require tablet halves to be taken.

For drug regimens that require medicines to be taken specifically with respect to meals

The only method which can be used in this instance is the method developed using fabric glue. Therefore the method developed using fabric glue is recommended to be used in drug regimens that require medicines to be taken specifically with respect to meals.

Conclusions and recommendations when considering partially sighted persons who are unable to read large font sized letters but who can comprehend colors

All the conclusions and recommendations given under section 5.1 apply here as well. Also, it can be concluded that green, blue, red and yellow colors are accepted as valid to be used as a mode of differentiating medicines or medicinal containers when it comes to partially sighted persons. For example green, blue, red and yellow colored containers can be used to group and identify medicines to be taken at similar time of the day (e.g. morning only = blue; night only = green; morning and night only = red; taken at morning, noon and night = yellow) etc.

Conclusions and recommendations when considering partially sighted persons who are able to read large font sized letters

Large font sized labels with minimum font size of eighteen is recommended in any drug regimen to be used in partially sighted persons who are able to read large font sized letters because of the high first preference shown by them towards these labels. Good quality Braille paper should be used in preparing Braille labels. Labels using native Braille languages should be used when dispensing drugs for patients who do not understand English Braille. Cylindrical shaped medicine containers should be used when Braille labels are used.

General Recommendations

In countries like Sri Lanka where there is no system to facilitate independent and safe self-administration of medicines in visually disabled persons with risk of medication errors, these methods may be recommended for use by them under the supervision of

their caregivers. Further studies should be done in a wider, more representative population to study and develop more methods to facilitate administration of different types of medications such as liquid medications, asthma inhalers and insulin. The health care professionals such as pharmacists, doctors and nurses should be made aware of these methods. They should work to provide the relevant knowledge, skills and attitudes to visually disabled persons and their caregivers to use these methods.

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REFERENCES

1. World Health Organization. Visual impairment and blindness. Fact Sheet N°282. Geneva, WHO, 2012. http, //www.who.int/mediacentre/factsheets/fs282/en/ - accessed 3rd October 2012.
2. Falvo D. Medical and Psychosocial Aspects of Chronic Illness and Disability. Third edition, p.123-133, Jones and Bartlett Publishers, Inc., 2005.
3. Weeraratne C. Prescribing for the blind and partially sighted patients. *The Sri Lanka Prescriber*. 17(4), 2009, 4-6.
4. Weeraratne C, Luke WANV, Maduranga BBS, Madugalle SSB. Restrictions to effective use of medicine among blind students and strategies adopted by themselves to overcome the limitations. *Proceedings of the 5th Singapore PHOM & 4th Asian Regional HTA Conference*, 19 & 20 August 2010.
5. Gibson M, Knapp P, Raynor T, Pam Turpin, Atkin K, Bradbury H, Tovey P. Medicines information needs of older people with sight loss. 2006. http, //www.rnib. org.uk/aboutus/research/reports/2009andearlier/ minops.doc - accessed 3rd July 2012.
6. Nikolaus T, Kruse W, Bach M, Specht-Leible N, Oster P, Schlierf G. Elderly patients' problems with medication, an in hospital and follow up study. *European Journal of Clinical Pharmacology*, 49(4), 1996, 255-259.
7. Weeraratne CL, Rosa CT, Opatha OKDST. Challenges faced by visually disabled people in use of medicines, self-adopted coping strategies and medicine related mishaps. *WHO South East Asia Journal of Public health*, 1(3), 2012, 256-267.
8. Ley ER. If blindness comes. https, //nfb.org/images/nfb/publications/vod/vod217/vodsum0706.htm -last accessed 20th January 2012
9. Pascuet E, Dawson J, Vaillancourt R. A picture worth a thousand words. The use of pictograms for medication labeling. *International Pharmacy Journal*, 23(1), 2008, 1-4.
10. Sorfleet C, Vaillancourt R, Groves S, Dawson J. Design, development and evaluation of pictographic instructions for medications used during humanitarian missions. *Canadian Pharmacists Journal*, 142(2), 2009, 82-88.