Braille Readability in Packaging Design of Egyptian Pharmaceutical Packaging for Visually Impaired

Randa Darwish Mohamed

Assistant Professor in Printing, Publishing and Packaging Dept., Faculty of Applied Arts, Helwan University, Egypt.

Abstract:

According to the report of the World Health Organization in the celebration of World Sight Day in Egypt on 10 October 2013, Egypt has approximately 1 million people blind and 3 million visually impaired. Braille used for the European pharmaceutical packaging is prescribed according to EU Directive 2004/27/EC, cell and dot dimensions are specified in the Standard EN 15823. Braille is usually adapted to different users, languages, scope, media, and printing processes. There is no any imperative legislation or standards about the application of Braille on packaging in Egypt. The problem is the diversity in packages of different sizes products that need different sizes of fonts to suit them. The research aims to determine the readability of different sizes of Braille font to be used on various sizes of packages. This is important to provide comfort and safety for the visually impaired when dealing with products, it also helps companies to choose the appropriate application of Braille on the different products. A test file with different Braille Normal text sizes was prepared using embossing technique. The most important results found that the sizes ranging from 18 points of Braille Normal font can be used when necessary, and more preferably is the 20 points size is. The default adjustment of the Braille Normal font gives greater distances than is required between words and between letters and these distances should be reduced beginning from the font size of 24 points. The visually impaired ask for putting many of data on the packages. A survey on the answers of the questionnaires and comments gave more information and directions for further research.

Keywords -Braille -Visually Impaired -Readability -Packaging -Packaging Design -Pharmaceutical Packaging

Paper received 17thOctober 2015, Accepted 22ndNovember 2015 Published 1st of January 2016

1. Introduction

According to the report of the World Health Organization (WHO) in the celebration of World Sight Day in Egypt on 10 October 2013, Egypt has approximately 1 million people blind and 3 million visually impaired. (World Sight Day, 2015).

Blindness – to be used only for total vision loss (no light perception) and for conditions where individuals have to rely predominantly on vision substitution skills, even though even mere light perception can still be an adjunct for Orientation and Mobility. (Visual Standards, 2002)

Blindness is also defined as visual acuity of less than 3/60, or a corresponding visual fi eld loss to less than 10° , in the better eye with the best possible correction.

low vision is defined as visual acuity of less than 6/18 but equal to or better than 3/60, or a corresponding visual field loss to less than 20° , in the better eye with the best possible correction.

Visual impairment includes both low vision and blindness. (Vision 2020, 2015)

Braille used for the European pharmaceutical packaging is prescribed according to EU Directive 2004/27/EC, cell and dot dimensions are specified in the Standard EN 15823, in other fields there are only recommendations and specifications in force. Braille is usually adapted to different users, languages, scope, media, and printing processes. (GorazdGolob & others, 2013).

The problem of the research is the diversity in packages of different sizes products that need different sizes of fonts to suit them.

The research aims to determine the readability of different sizes of Braille font to be used on various sizes of packages. This is important to provide comfort and safety for the visually impaired when dealing with products, it also helps companies to choose the appropriate application of Braille on the different products.

1.1 The Braille alphabet

The name Braille is in relation to Louis Braille, who quoted this way of reading and writing from an officer in the French army called Charles Barbier, which he designed a system of reading whereby military soldiers could use to communicate silently at night. Braille designed his way that has become a global reading and writing system used for the blinds. (Abd El Rahman, 2012). Braille system is extended to include notation for mathematics and music.

The Braille alphabet is based on six raised dots, with two columns of three dots, which form the so-called Braille cell. The six-dot system allowed the recognition of raised letters with a single fingertip. Numbering of the dots is defined as depicted in figure (1). Variations of the risings of these six dots represent all the letters of the alphabet, punctuation and groups of letters. Overall 63 combinations of these six dots exist. (The Impact, 2007).

The reading direction of the Arabic Braille is from left to right unlike the normal Arabic text reading method.



Some of Arabic alphabet is shown in figure (2). (Abd El Rahman, 2012).

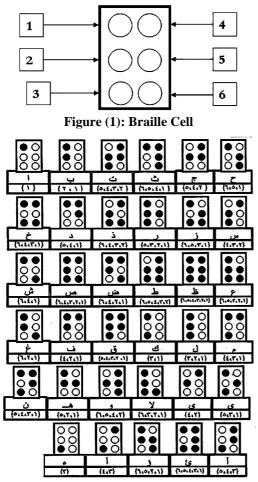


Figure (2): Arabic Braille Alphabet

1.2. Design and Production of Packaging for Blinds

Packaging is the science, art and technology of enclosing or protecting products for distribution, storage, sale, and use. Packaging also refers to the process of design, evaluation, and production of packages. Packaging can be described as a coordinated system of preparing goods for transport, warehousing, logistics, sale, and end use. Packaging contains, protects, preserves, transports, informs, and sells.

Package labelling (en-GB) or labeling (en-US) is any written, electronic, or graphic communications on the packaging or on a separate but associated label. (Edward Choi, 2010) (Packaging & Labeling, 2015). Braille is typically applied to packaging through embossing on the press, die-cutter or even folder-gluer, which is the common process for pharmaceuticals, or with the addition of ink-jet or screen-printed label. (GorazdGolob& others, 2013).

Braille is used for three main purposes:

The first is to deliver essential safety information such as warnings on household chemicals.

The second purpose is to give information on pharmaceuticals.

The third purpose is to help blind people to live more independently. (Braille's Bid, 2010).

1.3 Design and Production Requirements for Braille on Packaging

Braille is demanding extra resources to produce it and more importantly to check it so quality control is essential as the right Braille must be applied.

Braille dots have to be formed to a specific height and insured that it is in the right tolerance as packs may be rejected if not. Pharmaceutical companies will check what is delivered and will look for any dots that are flat or squashed.

BrailleCAM is a portable camera designed to accurately measure the Braille dots. It links to a PC, can show 3D images of a dot using colour representation, can allow the user to view dot form, and inspect for surface cracking. It has advantages over a micrometer as there is no physical contact with the dot.

Braille has been mandatory on new pharmaceutical packaging since 2005 under the European Directive 2004/27/EC.

The legislation stipulates that:

- The Braille must not obscure the printed text for sighted users, but that the dots are of a significant height and well defined so that anyone who reads Braille can do so easily. The recommended Braille font from the European Commission is Marburg Medium. The law covers any medical product for human use. However the directive does not cover food, food supplements, medical devices, biocides or cosmetics. (Braille's Bid, 2010).

The name in Braille does not have to be printed on the immediate packaging - such as blisters, ampoules and bottles; it only has to appear on the outer/secondary packaging, which is normally a carton.

In case where there is no secondary packaging, eg. Large volume bottles (500 ml, 1000 ml, etc.); it is possible to fix an adhesive Braille label around the bottle during the manufacturing process.

Concerning the location of the Braille on the outer packaging there is no need to put the Braille dots on an empty space of the packaging, but the underlying printed text has to be easily legible.

On request the package leaflet should be provided for partially sighted people in a suitable print, taking into consideration all aspects determining the readability; eg.: font size: sans serif typefaces, 16 - 20 point, contrast: black letters on white paper, word spacing, text alignment, line spacing, layout, and paper quality.

For blind people the text has to be provided in an appropriate format, it is recommended to provide the text in a format perceptible by hearing (CD-ROM, audiocassette, etc.). In certain cases the appropriate format may be the package leaflet available in Braille. (Guidance, 2005).

1.4. Braille Applying Methods 1.4.1. Embossing

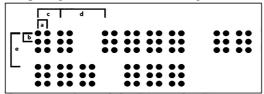
For embossing the Braille labelling separate cutting and creasing tools have to be produced, which should preferably be used for all folding cartons of one dimension to reduce costs.

According to the draft standard DIN 55561 "Packaging – Braille on Labelling", published in June 2006, a standardization for the manufacture of Braille on labelling cartons in Germany, the following recommendations of the German Study institute for



the Blind in Marburg are applied:

- Dot diameter: 1.6 mm (basic diameter) = diameter on the female matrix and on the artwork film / artwork file.
- Dot distance: 2.5 mm (from dot centre to dot centre).
- Character spacing: 6.0 mm (from dot centre to dot centre).
- Line spacing: 9.9 mm or 10.0 mm. Figure (3).



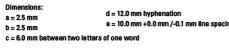


Figure (3): Dot distances (Marburg Medium) according to recommendations of the Germany Study institute for the Blind in Marburg

Implementation steps:

It is important to have available different Braille translations, work out an optimal

plan for issuing the Braille labelled folding cartons.

The size of the different folding cartons used has to be regarded including the fact that Braille labelling should preferably be placed on one main side of the carton only, figure (4). In a number of cases, however, one side of the carton will not be sufficient due to the considerable length of names of pharmaceutical products, which are often required to ensure the safe use and distinction from other preparations. In these cases, implementation of the Braille labelling on two opposite sides of the folding cartons, i.e. A1 and A2 can be done.

The next step will be the implementation of Braille in the artwork files by the print office and the final print approval according to the internal release procedures of the pharmaceutical company. The Braille labelling has to be laid down as an additional layer in the artwork file. The colour used to represent the Braille text must not be used for any other written or printed information on the packaging. The Braille in the artwork file, in the print approval file, in the cutting and creasing tool and in the finished folding carton must match exactly. The Braille message must also be reproduced in regular type outside the line of the embossing die.

In order to ensure that the Braille text can be checked at all stages of production, approved proofs for folding cartons carrying Braille must be set up as follows:

The first proof age must contain the printed image only and should be used for approving the regular print. The second proof page must contain the Braille dots only together with the die-line and the Braille message in alphanumeric text (outside the dieline). (The Impact, 2007).

The name of the medicinal product, followed by its strength and pharmaceutical form, and if appropriate, whether it is intended for babies, children or adults; where the product contains up to three active substances, the international non-proprietary name shall be included, or, if one does not exist, the common name. The contracted Braille system with lettercombinations should not be used, except in small volume packaging (up to 10 ml volume). (Guidance, 2005).

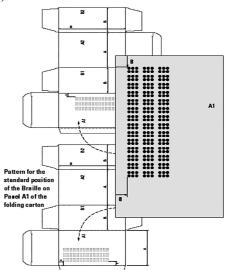


Figure (4): Pattern of the standard position of the Braille on panel A1 of the folding carton

1.4.2. Screen Printing with UV Inks

The process lays down UV cured ink with a thickness of up to 0.5mm directly onto the surface of a plastic container.

Screen printing facilities onsite were adapted to maintain an even and consistent print height, which is crucial for Braille, and allows highlighting particular areas of the packaging artwork like logos and branding by offsetting the print from the surface of the container.

The European directive, DIN EN 15823, force setting up minimum heights for Braille as 0.12mm. (Braille Printing, 2014). Manufacture of Braille on adhesive labels may also be performed by screen printing.

It has to be ensured that the Braille labelling is not located on places where barcodes and perforations are applied on the folding carton. The legibility and optical characteristics should not be impaired for seeing people due to a potentially broken and / or bursting surface of the folding carton. (The Impact, 2007). Figure (5) shows Braille text printed with UV ink on a plastic bottle by screen printing. (Braille Printing, 2014).



Figure (5): Braille text printed with UV ink on a plastic bottle by screen printing



1.4.3. Thermographic Printing

Thermography is a premium post-printing process that adds a simple dimensional quality, a slight 3-D perspective, also known as raised printing. This raised layer of ink creates raised type that can literally run the fingers over and feel. Thermographic printing has even been used for mass-printing of braille books for the blind, figure (6). (Raised-Print, 2015)

Thermography is a process that combines offset printing ink with a powdered resin which is baked so that the resin rises to give the ink a textured effect. The image is first offset printed with a slow drying ink. Next, the wet printed sheets travel through a tunnel that dusts them with resin, vacuums off the extra, and then melts the remaining resin to form a raised, glassy and slightly enlarged image.

Controlling the inks, resin and heat determine whether the thermography is glossy or if it has a stippled, orange-peel effect.

The powders are transparent so they take on the color of the underlying ink. It is also possible to use a transparent, white ink which will make a transparent or "blind" design. (Thermography, 2015). Figure (7) shows thermographic printing stages. (Thermographic, 2014).

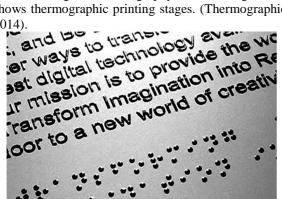


Figure (6): Braille text printed with thermographic printing

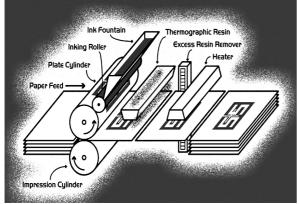


Figure (7): Thermographic printing stages **2.** Survey Study

- Field visit, questionnaire to the Drug Holding Company – HOLDIPHARMA in Egypt, and a survey on random sample of pharmaceutical packaging in the Egyptian market were done to know if there is any application of the Braille on the Egyptian pharmaceutical packaging.
- Questionnaire to a random sample of visually impaired to know whether they are buying products for themselves, and whether they come across them any products bearing the writings of Braille, and to

identify there needs of the necessary data on the various products.

2.1 Results of the survey study

- There are no instructions from the Ministry of Health to apply the Braille on the Egyptian pharmaceutical packaging.
- Scarcity of packages that have a Braille text. The Companies that apply the Braille on pharmaceutical packaging in the Egyptian market are agents for international companies. Figures (8), (9), and (10) show samples of pharmaceutical packages in the Egyptian market that have Braille text.



Figure (8): Braille text on the imported pharmaceutical packagingin the Egyptian market



Figure (9): Braille text on pharmaceutical packaging in the Egyptian market



Figure (10): Braille text on the printed area of imported pharmaceutical packagingin the Egyptian market

- 90% of the visually impaired sample buy and deal with various products themselves, and the most products are pharmaceutical and food packages. There are no other symbols (pictures or forms) for the blind could be distinguish and identify other than Braille lettering.
- visually impaired need to add data on the packaging in Braille, such as: product name, product, price, the manufacturer, the validity of ingredients, a summary of the Pharmaceutical Bulletin, product size and the number of units inside the package, methods of conservation, and indications. They encountered Nestle water plastic bottle size 1 liter compact with the word Nestle in Braille text, fig. (11), as well as drug product Zefo, fig. (12).





Figure (12): Braille text on xefo drug packaging **3.** Materials and Methods

A Braille text file was prepared with the font NormalBraille MicroSoft Word software. on NormalBraille is a true type font available for free on many internet sites. The default justification was used. Translation from Arabic to Braille was made in the site: http://libbraille.org/translator.php Arabic sentence was written with various sizes: 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, and 30 point, fig. (13). The sentence was embossed on 300 $\rm gm/m^2$ duplex cardboard. NormalBraille font sizes specifications are shown in table (1). Compared with the German standard DIN 55561, the standard size is roughly similar to the size of 23 point of the Normal Braille font used in the applied study.

Table (1):	Braille Normalfont size	s specifications
1 4010 (1)	Di anno i (or manone bize	specifications

Text Size point	Dot Diameter Mm	Dot Spacing Mm	Words Spacing mm		
10	۰,۷	١	۲,۸	٤,٣	
١٢	۰,۹	١,٣	٣,٤	0,1	
15	۰,۹۸	١,٥	٣,٩	٦	
١٦	١,١	١,٢	٤,٥	٦,٨	
١٨	١,٣	١,٩	٥	٧,٧	
۲.	١,٤	۲,۱	٥,٦	٨,٥	
22	١,٥	۲,۳	٦,٢	٩,٤	
۲٤	١,٢	۲,٥	٦,٨	۱۰,۲	
۲٦	١,٩	۲,۷	٧,٣	۱۱,۱	
۲۸	۲	٣	٧,٨	۲۱	
۳.	۲,۱	۳,۲	٨,٤	۱۲٫۸	

A questionnaire to a specific sample of blinds from the primary, preparatory, and secondary schools under the supervision of Model Center for the Blind, and a sample of blinds older than 18 years belonging to Resala Association for Charity was done to determine the readability of the different sizes of the Braille Normal font.

	• •	• :	• :							
::*										
:.	••									
	.:.									
•••	•:		••	• :						
		•	•		• :				• •	
•	•	•••	:	:.		÷.		Π.	÷	
:	:	:	•••	.:.	:.			:†:	4	- 6
••.	•••	. :	•.:	•.:	:::	•.:				
	•••		•	•	••	•		<u> </u>	5	
••	•••	-	•.:		•			·.:		
•	•	•.:				·.:		·	·	
•.:	•.:			•	• •	•	•.:		.:	
				•		•.:		.:		
				•.:	•.:				:::	- 3
•_	••	•••				.:	•			
.:	• :	•.:			•.	•.:	::			-,;
•	•:	•••		• •	• :				•••	
•.:		••	•	•	•••	••	••.			-
		-	••.		:::				\$	
• •			•.:	••			•.:		::	
	•	•••	•				•	::		
•	••	•.:	•.:	••		•.:		÷	•	
	A REPORT OF AND		LANGE PARK CHAILS AND THAT A LEVIL ANNUL	1944, Ande Ved. 4.427, N.427, 4.427, 4.444	1994 Auto Anto A.A. A.A. A.A.A. A.A.A.	CREAD CONTRACTOR CONTRACTOR CONTRACTOR	ALT BUT DEPUT AND AND AND ALAY, DAUX ALAYT, APPEN	CRACE AND CONTRACT CONTRACTORS	DRACE AND THE CONTROL OF A CONTROL	1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.
	:	•.:			•		.:.			
:	•	-		•.:	•	:::				
•	•.:				•::			3		
• •		••••	•••				• •		і ч и г.: н а.	<u>نط</u> ۱۰
••	•	.:.	.:.		•.•	••	24	<u>نط</u> ، ۲.۳.۳.۳.		E
•	•::	•.•			.:.	••••				
	.:.			•	•:	::	.:	-:;		
••	• •	•••			•:			 .		
•••	-				··.			••:		
•.•	.:.	•:	• :		• :		•••	.:	Ĩ	
	•	••••	•.:	•	•:		:: .			
.:.		• •	•••	• :			÷-:	ž		
•.:		. :	***	•.:		•	•:	þ.		
	• •		.:		•••	÷.				
							ينط ١٦			
	. :			• •		••••	È.			
		• •			•	••				
				•-						
•••				щ ул — — — — — — — — — — — — — — — — — —		ينط ٨ '				
•:.	. :									
		• •	:: .	•••	:.					
••_	••		:	:						
••				••	7					
	•••	::.	.:	••	.e.					
	::.	•	••	3						
			15	Ē						
	:		<u>.</u>	·C.						
	••	-:								
	:-	1								
	۲. ii									
	> .E									

Figure (13): Reduced pict.of 56% of the Braille text file

4. Results and discussion

Tables (2), (3), (4), and (5) show the readability for the blind samples and figures (14), (15), (16), and (17) represent these results.

47% of the students from primary school could identify the letters Braille of 16 pt. size, may be due to the small size of their fingers, which enabled them to identify the characters and the distances between them, and 93% of 18 pt. size, and 100% of 20 pt. size.

20% of the preparatory and secondary school students could hardly identify the letters Braille of 16 pt. size, 100% of 18 pt. size, and preferred 20 pt. and 22 pt. sizes in the reading as they are clearer and closer in size to the writings of Braille that they trained in the courses of their learning in grades they have passed.

100% of the older than 18 years sample could identify the letters Braille of 18 pt. size, and also preferred 20 pt. and 22 pt. sizes in the reading because they are more legible.

It is possible to use small font sizes for Braille on the different packages beginning from 18 pt. size when it is necessary during the stages of packaging design.

Each of the secondary school students sample and the greater than 18 years sample gave notes about reducing the spacing between letters and words in large sizes of 24, 26, 28 and 30 pt. font sizes.



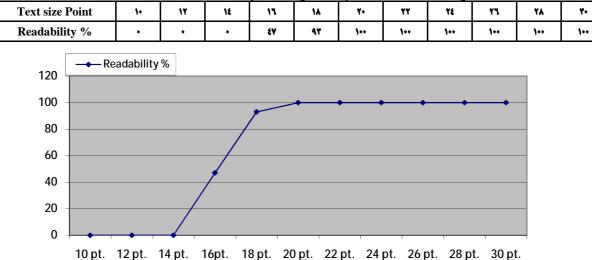


 Table (2): Readability of the primary school blind sample

Figure (14): Readability of the primary school blind sample Table (3): Readability of the preparatory school blind sample

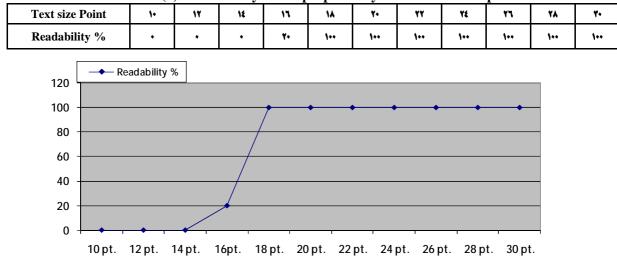
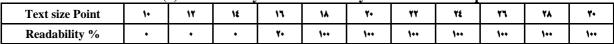


Figure (15): Readability of the preparatory school blind sample Table (4): Readability of the secondary school blind sample



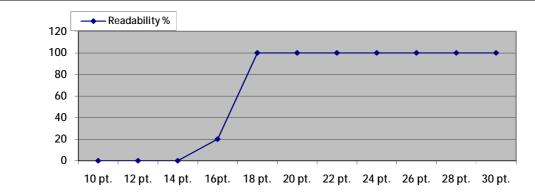


Table (5): Readability of the older than 18 years blind sample											
Text size Point	۱۰	۱۲	١٤	17	14	۲.	**	45	22	۲A	۳.
Readability %	•	٠	•	٠	1++	1++	1++	1++	1++	1++	1++

Figure (16): Readability of the secondary school blind sample Table (5): Readability of the older than 18 years blind sample

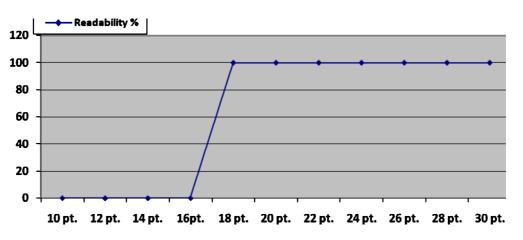


Figure (17): Readability of the older than 18 years blind sample

5. Recommendations

- It is recommended to issue a mandatory Egyptian Standard to apply Braille on the Egyptian pharmaceutical and food packages and other products.
- It is recommended to adjust spacing between letters and words from the beginning of the font size of 24 pt.in order to reduce them than the default adjustment of the font to maintain the readability.
- Packaging companies can choose the appropriate method to apply Braille, which can be produced in several ways, such as: direct application on cartons by embossing on line, adhesive labels, thermal ink, or UV varnishes during or after printing stage.
- For the small volume packaging, Braille labels or leaflets carrying data can be attached to.
- Results and recommendations of the research can be disseminating to include food and industrial products, and among others.

Acknowledgements

I extend my gratitude and appreciation to the Drug Holding Company - HOLDIPHARMA, Model Center for the Blinds, and Resala Association for Charity, for their cooperation and support.

References

1. Abd El Rahman El Faleej, (2012). Braille Principles, Retrieved March 12, 2015, from http://www.alukah.net/social/1006/37320/

- 2. Braille printing developed for plastic pharma packaging, nutraceutical business review, (2014, September10). Retrieved March 12, 2015, from <u>http://www.nutraceuticalbusinessreview.co</u> m/news/article_page/Braille_printing_deve loped_for_plastic_pharma_packaging/1015 09
- 3. Braille's Bid for a Better Future, Philip Chadwick,(2010,November 5), Retrieved March 12, 2015, from <u>http://www.packagingnews.co.uk/features/</u> braille%E2%80%99s-bid-for-a-betterfuture/
- 4. Edward Choi, (2010). Packaging Design Handbook (Professional Edition), Retrieved March 30, 2015, from <u>https://itunes.appl</u>e.com/us/app/packagingdesign-handbook/id364023155?mt=8
- 5. Guidance concerning the Braille requirements for labelling and the package leaflet, Article 56a of Directive 2001/83/EC as amended. EUROPEAN COMMISSION **ENTERPRISE** AND INDUSTRY **DIRECTORATE-GENERAL**, Consumer goods Pharmaceuticals, ENTR/F2 D (2005). Retrieved March 12, 2015, from http://www.cbgmeb.nl/NR/rdonlyres/680CCA9F-8FEA-4AFB-89B6-09360AAFB14D/30207/braille_guidelineeu.

pdf

http://libbraille.org/translator.php

6. Egyptian Organization for Standardization & Quality, Retrieved January 15, 2015,



from http://www.eos.org.eg/Public/areg/Calibration/

- Gorazd Golob, Diana Gregor Svetec, Raša Urbas, Bojan Rotar, NevenkaJereb, Volodymyr Mayik, Taras Dudok, Dot shape and legibility analysis of multilayer UV ink-jet printed Braille text, University of Ljubljana, Faculty of Natural Sciences and Engineering, Ukrainian Academy of Printing, GolobG_DotShape_2013, Retrieved May 24, 2015, from <u>http://dspace.upce.cz/bitstream/10195/5422</u> 6/1/GolobG_DotShape_2013.pdf
- 8. Packaging and labeling, Wikipedia, the free encyclopedia, Retrieved March 30, 2015, from <u>http://en.wikipedia.org/wiki/Packaging_an</u> d labeling
- 9. Raised-Print Thermography Helps Your Print Work Rise to The Occasion, Graphic Ideals,(2015, January 13). Retrieved October3, 2015, from http://graphicideals.com/businesscards/raised-print-thermography-tips/
- 10. The impact of the revised EU-legislation concerning particular needs of blind and partially-sighted patients and user testing – a challenge for pharmaceutical companies with focus on Germany, Master of Drug Regulatory Affairs", Wissenschaftliche Prüfungsarbeit der Mathematisch-Naturwissenschaftlichen Fakultät der Rheinischen Friedrich – Wilhelms -Universität Bonn, (2007). Retrieved March

12, 2015, from

http://dgra.de/media/pdf/studium/masterth esis/master_schickel_u.pdf

126

- 11. Thermographic printing or heat and special effects, (2014, June 23). Retrieved October3, 2015, from <u>http://trafficobjects.com/thermographic-</u> printing-or-heat-and-special-effects/
- 12. Thermography Printing Tips. Retrieved October 3, 2015, from http://www.mohawkconnects.com/sites/def ault/files/content/ThermographyPrintingTi ps_021813.pdf
- 13. Vision 2020, The Right to Sight, Global Initiative for The Elimination of Avoidable Blindness, Action Plan 2006–2011. Retrieved March 5, 2015, from http://www.who.int/blindness/Vision2020_r eport.pdf
- 14. Visual Standards, Aspects and Ranges of Vision Loss, with Emphasis on Population Surveys, International Council of Ophthalmology at the 29th International Congress of Ophthalmology, Sydney, Australia, (2002, April). Retrieved March 3, 2015, from

http://<u>www.icoph.org/downloads/visualstan</u> dardsreport.pdf,

15. World Sight Day, Retrieved March 3,2015, from

http://<u>www.emro.who.int/egy/egypt</u>events/world-sight-day.html