Influence of Age and Education in Comprehending the Healthcare Pictograms

[1]A Shanthi, [2]Dr M Anuradha,
[1]PhD Research Scholar, [2]Assistant Professor
Department of Journalism and Mass Communication, Periyar University, Salem, India
[1]Shanthi3714@gmail.com, [2]anumadav.jmc@gmail.com

Abstract: *The purpose of pictogram is for quick and clear communication. The role of the pictogram is to draw attention, deliver information about the object and time saving and also reduce the burden of seeking assistance from somebody. Still, pictograms that are not clear enough will have a negative effect on the comprehension of the message. Older and low educated people are ones who are vulnerable to misunderstandings. Comprehension is expected to be influenced by age and education level in reading the healthcare pictograms. So it considered that age and education level are the major factors that is to be considered while designing a pictogram. In order to be equally well understood by older and low educated adults, pictograms should have a simple design and make use of familiar objects*

Key Words: *Healthcare pictograms, pictogram communication, literacy level, symbol comprehension.*

INTRODUCTION:

Visual images are present enormously in the modern life and are often effective in communicating the intended information, but their success is lies largely by constant exposure to this type of graphic material which initiates the learning process (Mangan, 1978). Visuals effectively communicate a message to one population may prove meaningless to another.

This paper is concerned about the demographic variables age and education level in understanding the healthcare pictograms in hospital settings. It is always said that the use of visuals makes the communication easy and effective. Pictograms are the simplified visuals that are used in place of effortless communication (Walker, 1978). Hospitals are the places where varied people visit every day with varied backgrounds. Older people are ones who visit hospital frequently. So it is necessary to give due importance for elderly people who perceive the pictograms that are used in hospital settings (Hanson, E.C., Hartzema, A, 1995).

Review of Literature

The use of pictograms in healthcare settings has been receiving increased attention these days. The success of using pictograms as a communication tool lies on the comprehensive design and testing process in order to produce clear, culturally acceptable pictograms. The success of any pictogram design lies on the level of understanding of the pictogram (Kolers 1969).

Pictogram is considered to be part of a universal language which can easily be accepted by all and can deliver meaning with little or no compulsion on language or cultural settings (Davies, Haines, Norris, and Wilson, 1998).The pictograms were designed by highly trained professionals who unfortunately lack insight into the target audiences and tend to make assumptions on what can be communicated. This stresses the importance of designing and evaluating pictograms in collaboration with the target population (Cairney, P., Sless, D, 1982).

The creation of pictogram is a complex, multistage process. To minimize problems when designing pictograms is to identify the target population. Keeping in mind that particular target group in all stages of the design and executed. But many a time these categories are neglected or not given much importance (Dowse, R., Ehlers., 1998). It is necessary to include the elderly people in testing the healthcare pictograms and their responses should be taken into account while designing healthcare pictograms and their response in perceiving the healthcare symbols. It is also important to make the design more successful. Age is one of the major factors that have to be considered in healthcare pictograms since elderly people are the once who frequently visit the hospitals with various health ailments (Hanson, E.C., Hartzema, A, 1995).

While designing a pictogram it is important to recognize and take into consideration the target population so that the pictogram catches the target group's attention. According to the Elaboration Likelihood Model (ELM) of persuasion (Petty, 1986) an individual is more likely to find motivation and ability to centrally process information when the message contains relevant elements (Cacioppo, 1986). In other words, information that is tailored to individual

preferences and interests is processed more deeply which is expected to improve comprehension and recall of information (Tam, 2005).

Despite some advantages associated to its use, especially in conveying warning messages (Katz, 2006) pictograms are figures representing ideas and concepts which may not always be clear to all, affecting the comprehension of the message (Wolf, 2006). Older and low educated adults are recognized to be particularly vulnerable to misunderstandings and often times have difficulties interpreting the message being conveyed (Knapp, 2005). Regardless of the growing number of pictograms related to healthcare pictograms that have been developed in the past few years, to the best of our knowledge no published studies investigated the understanding of the pictograms by older adults or people with low education levels. In order to fill this existent gap, this research aims to investigate older and lower educated adults'

2. Methods

This study aims to investigate the level of understanding of the healthcare pictograms who visit hospital setting based on their age and education level. A quantitative survey method was used to collect the data. Data were collected among 844 different categories of respondents who visit hospital. Each questionnaire was personally filled by the researcher since the questions require lot of explanations to make the respondents understand them and answer accordingly to get accurate answers. In this study, the non-probability purposive sampling technique was adopted. In purposive sampling, the researcher deliberately chooses to include the people who visited hospital in the study based on their ability to provide necessary data. As per the ISO comprehension test the 35 healthcare pictograms were displayed in a 50.8 mm x 50.8 mm square and the respondents were asked to describe what each pictogram meant.

3. Measurements

Age and education level were the main independent variables. To assess age differences in the outcomes, the following age intervals were used: younger respondents (20-30 years), Young respondents (31-40) middle aged respondents (41-50 years), and older respondents (60 years and older) Education level included illiterate (not attended school) Secondary education (completed primary school), intermediate (completed under graduate) and high (higher educational or university degree) levels. Gender (male, female).

4. Statistical analysis

Descriptive analysis was conducted on respondents'' comprehensive level based on the demographic variable such as age, education level and gender. ANOVA and chi-square tests of independence were used, where appropriate, to investigate differences in age, education level and gender between respondents exposed to healthcare pictograms.
Chi-square tests of independence were conducted to investigate differences in respondents' understanding of healthcare categories with reference to the understanding of healthcare pictograms. These models were controlled for gender, pictogram's category, and pictogram shown at the start of the interview. pictograms. Univariate analysis was used to investigate whether there were age and education level differences in understanding the healthcare pictograms.
Tukey's Tests for Differences of Means was used to assess the influence of age and education difference in understanding the pictograms in particular to the respective intervals. A p-value of < 0.05 was considered to be statistically significant.

5. Findings

The purpose of this study is to analysis the influence of the 3 major demographic variables namely gender, age and education level in understanding the healthcare pictograms. The distributions of the variables are tabulated as follows.

Gender Distribution of Respondents

Gender	Frequency	%
Male	441	52.3
Female	403	47.7
Others	0	0
Total	844	100

From the total population it is clear from the table that 52.3% of the respondents were male and 47.7% of the respondents were female among the total sample of 844 respondents

Relationship between Gender and Health care pictograms

Cross Tabulation Chi Squared Values of Gender at D.F = 1, Significant Level α = 0.01, Tabulated Chi squared value Xt2 = 6.635. There is no gender difference found in the understanding level of the healthcare pictograms. Hence the null hypothesis H02 is proved that there is no significant relationship existing between the demographic variable genders and understanding level of healthcare pictograms.

Age Distribution of Respondents

Age Group	Frequency	%
20-30	95	11.3
31-40	311	36.8
41-50	347	41.1
Above 50	91	10.8
Total	844	100

11.3% of the respondents belong to the age group of 20-30 years, 36.8% of the respondents belong to the age group of 31-40 years, 41.1% of the respondents belong to the age group of 41-50 years, and 10.8% of the respondents were above 50 years

Relationship between Age and Health care pictograms

Cross Tabulation Chi Squared Values of Age at D.F =3, Significant Level α =0.01, Tabulated Chi squared value Xt2 = 11.345. There is a strong relationship found between understanding of the healthcare pictograms and the demographic variable - age of the respondent for each wrongly understood healthcare pictogram. Hence the null hypothesis H04 is rejected. There is a significant relationship existing between the demographic variables, age and the comprehension level of healthcare pictograms.

Relationship between age and Health care pictograms

One Way Anova analysis of percentage of correct responses for age

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Factor	3	43597	14532.218	28.502	0.000
Error	80	40789	509.860		
Total	83	84385			

One Way Anova Analysis of percentage of correct responses for age is performed. It affirmed the same result of chi square test

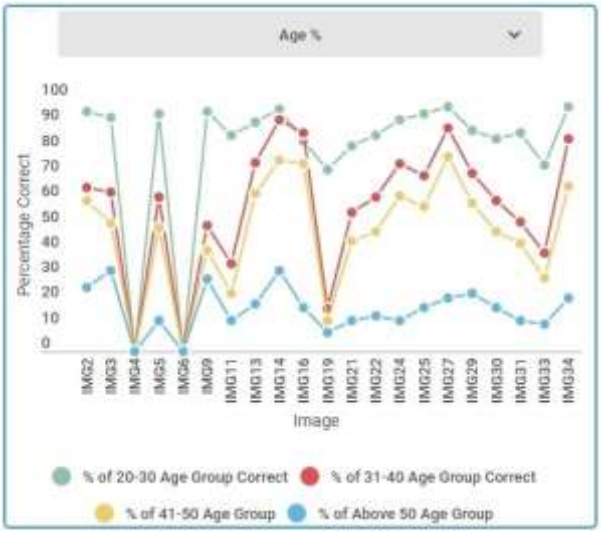
Tukey's Tests for Difference of Means of Age

Tukey's range test, also known as the Tukey's test, Tukey method, Tukey's honest significance test, Tukey's HSD (honestly significant difference) test, or the Tukey–Kramer method, is a single-step multiple comparison procedure and statistical test. It can be used on raw data or in conjunction with an ANOVA (post-hoc analysis) to find means that are significantly different from each other.

Difference of Levels	Difference of Means	SE of Difference	95% CI	Tukey HSD Q statistic	Adjusted P-Value
Age 31-40 Vs Age 20-30	-23.04	6.97	[-41.32, -4.76]	4.676	0.008
Age 41-50– Vs Age 20-30	-33.43	6.97	[-51.71, -15.15]	6.784	0.000
Age Above 50 Vs Age 20-30	-63.40	6.97	[-81.69, -45.12]	12.867	0.000
Age 41-50 Vs Age 31-40	-10.39	6.97	[-28.67, 7.89]	2.107	0.448
Age Above 50 Vs	-40.36	6.97	[-58.64, -22.08]	8.191	0.000

Age 31-40					
Age Above 50 Vs Age 41-50	-29.98	6.97	[-48.26, -11.70]	6.083	0.000

To find the understanding level with respect to age, Tukey post hoc test was performed and the results obtained showed that the age group 21 – 30 and above 50 are the two significant age groups which deviate from the other two age groups 31 – 40 and 41 – 50 .



Age factor becomes a major component in comprehending the healthcare pictograms. The level of understanding of the respondents of age 20-30 was 80%. The level of understanding of the respondents of age above 50 was 16.5%. The level of understanding of the respondents of age 31- 40 was 56.9%. The level of understanding of the respondents of age 41-50 was 46.5%. Hence, it is evident that a strong relationship exists between the age of the respondent and the comprehension level of the healthcare pictograms.

Distribution of Educational Qualification of the Respondents

Education Qualification	Frequency	%
Illiterate	109	12.9
Higher Secondary	227	26.9
Bachelor's Degree	361	42.8
Master's Degree	147	17.4
Total	844	100

Among the 844 respondents 12.9% of the respondents were illiterate, 26.7% of the respondents with higher secondary qualification, 42.8% had bachelor's degree and 17.4% of the respondents had master's degree.

Relationship between qualification and Health care pictograms

Cross Tabulation Chi Squared Values of Qualification at D.F = 3, Significant Level $\alpha = 0.01$, Tabulated Chi squared value Xt2 = 11.345. As P>0.01, there is a strong relationship existing between the understanding level of the healthcare pictograms and the demographic variable - qualification of the respondents for each wrongly understood healthcare pictogram. There is a significant relationship existing between the demographic variable, qualification and the comprehension level of healthcare pictograms.

Tukey's Tests for Difference of Means of Education Qualification

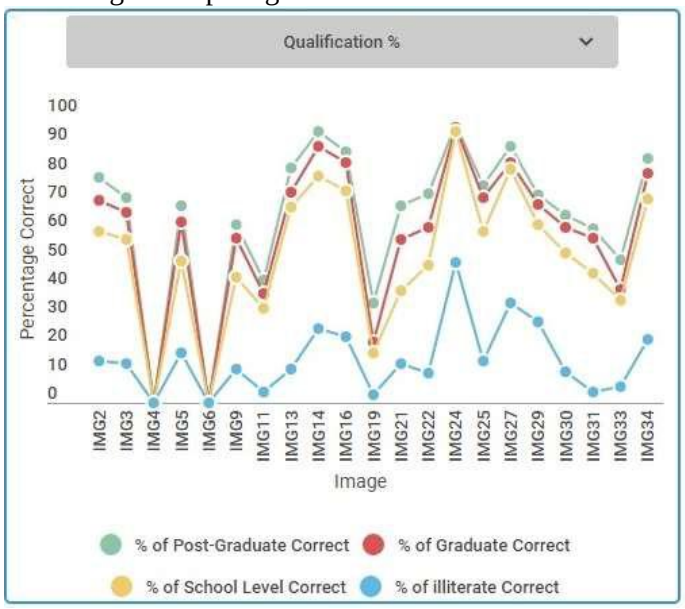
Source	DF	Adj SS	Adj MS	F-Value	P-Value
Factor	3	31119	10373.087	19.259	0.000
Error	80	43088	538.599		
Total	83	74207			

One Way Anova Analysis of percentage of correct responses for education qualification is performed. It affirmed the same result of chi square test

Tukey's Tests for Differences of Means of Education

Difference of Levels	Difference of Means	SE of Difference	95% CI	Tukey HSD Q statistic	Adjusted P-Value
Degree Vs Post Graduate	-5.69	7.16	[-24.48, 13.10]	1.1236	0.857
School Level Vs Post Graduate	-13.72	7.16	[-32.51, 5.07]	2.7089	0.230
Illiterate–Post Vs Graduate	-49.47	7.16	[-68.26, -30.68]	9.7686	0.000
School Level Vs Degree	-8.03	7.16	[-26.82, 10.76]	1.5853	0.678
Illiterate Vs Degree	-43.78	7.16	[-62.57, -24.99]	8.6449	0.000
Illiterate Vs School Level	-35.75	7.16	[-54.54, -16.96]	7.0596	0.000

To find the understanding level with respect to age, Tukey post hoc test was performed. The results obtained showed that the illiterate had poor understanding of the pictograms.



The education level plays a major role in the comprehension of healthcare pictograms. The illiterate had poor understanding of the pictograms. The illiterate has a significant relationship with the comprehension of the healthcare pictograms. On an average, the illiterate group showed a lower understanding level of 15.1% compared to other groups. Following that, the level of understanding of the respondents who have completed school was 50.9%. The level of understanding of the respondents who have completed degree was 58.9%. The level of understanding of the respondents who have completed post-graduation was 64.6%. It is evident from the results that there is a significant relationship prevailing between the level of education and the level of comprehension.

Age was the strongest predictor influencing respondents' understanding for pictograms. Young respondents (20-30 years old) with high education level had the highest understanding whereas older respondents (>50 years old) with low education level showed the lowest understanding for this pictogram system.

Discussion

This research investigated the influence of age and education level in understanding the healthcare pictograms. This study confirmed that both age and education levels are sensitive aspects to be considered when designing a pictogram

to be equally well understood by older adults and those who have a low education level. Adults over 50 years old represent a substantial and increasing proportion of visitors of hospital. Considering that this group of the general population is not always expected them to understand the meaning of the pictograms in the hospital settings, it is important to find strategies that will help these visitors, not only to just understand the meaning of the pictogram, but also to be able to easily navigate through the hospital settings.

The use of familiar objects or messages can foster information processes (Elaboration Likelihood Model of persuasion (Petty, 1986), hypothetically it could be claimed that those pictograms have higher chance of being well understood and, therefore, effective in conveying messages. However, the respondents above 50 years old and with low education showed a poor understanding. This indicates that the understand is suitable to younger and high educated respondents than to older and low educated respondents. This result explains, nowadays, complex pictograms and signs are widespread and part of daily life routines. Those who are younger and higher educated tend to be more prone to understand and follow those instructions, making them more adjustable to unfamiliar and complex pictograms. On the other hand, older and low educated adults respond better to what they are used to and are highly penalized when they are requested to interpret icons with complex messages that require more cognitive resources for interpretation (Morrow, 1996). Applying this to the present study, it is reasonable to assume that familiarity influenced older and low educated respondents' in understanding the pictogram.

Results from this study confirm that attention should be paid to specific target groups, namely older people and those with low education level, when designing pictograms which are known to be particularly useful for these two specific target groups.

CONCLUSION:

Combining the influence of age and education level of the respondents in understanding the healthcare pictograms it can be depicted that respondents in the category "younger (20-30 years old) with high education level had the highest understanding of the healthcare pictograms, whereas respondents in the category "older (> 50 years old) with low education level showed the lowest understanding for this pictogram system.

The more complex rating model pictogram was preferred over the triangle model throughout the whole population, but this preference is more emphasized among younger adults and those with high education levels. Age and education level were among the tested predictors, the ones influencing the most preference for one pictogram. Clearly, young and high educated respondents preferred the rating model, with a more complex design, whereas older adults and those with lower education levels preferred the triangle model.

The pictogram may raise some questions from visitors which need to be answered. It is equally important that health care providers are aware that older and low educated patients need special attention as they are particularly sensitive to pictograms and their understanding of the meaning of the pictograms is not always straightforward.

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