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Research Article

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Effect of Font Style on Memory among the Preclinical Students of UniKL RCMP, Malaysia

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ABSTRACT

Introduction: Low-quality text passages require more attention to comprehend, thereby reducing resources towards concentration. It was also shown that fonts played a role in the better understanding and comprehension of the materials read. Inversely, font size had only a small impact on the participants to recall information from a text. On the contrary, it was found that despite the participant's higher confidence to remember information if it was in a larger font, the differences in actual recall were minimal. Objective: The aim of the research was to study the effect of font style and size on memory among the pre-clinical medical students in Universiti Kuala Lumpur Royal College of Medicine Perak (UniKL RCMP). Methodology: This was a cross-sectional study done at UniKL RCMP by a simple random sampling of 136 MBBS preclinical students of Universiti Kuala Lumpur Royal College of Medicine Perak (The study included a 5-minute test on memory and a structured questionnaire and data analysis by using SPSS ANOVA. Results & Discussion: Among the 4 font styles studied, 'Serif' was found to be the most preferred one for the memorization (32.4%) compared to the other types of fonts tested – 'Script' (29.4%), 'San Serif' (25%) and 'Monospace' (13.2%). The least preferred font with the lowest mean score was Monospace (4.08) followed by Script (4.32), Serif (4.45) and San Serif (4.46). Conclusion: Easily readable fonts required less effort to decipher the word, hence resulted in better comprehension and memory. Font style affected memory, but font size had no significant effect on memory contrary to the belief that the bigger is better.

Key words: *Font, Memory, Serif, Sans-Serif, Script, Monospace.*

INTRODUCTION

Medical school students have broad and extensive learning objectives and things to be learned and remembered for the future. The reading materials or lecture notes that are given by the lecturers including vast and complicated words, have been used repeatedly. Students usually are unable to comprehend the facts that should be highlighted due to various reasons. Thus, they fail to achieve the learning objectives. A broad spectrum of the factors play a role to make reading and learning become easier or vice versa [1]. For example, factors such as the length of a passage or the size and weight of a font have been found to influence how a passage would be remembered [2, 3]. Any form of distractions may interrupt the learning process and draw attention away from the significance of the messages [4]. It has been concluded that low-quality text passages require more attention to comprehend, thereby reducing the resources towards concentration [5, 6]. Evidence has shown that fonts play a role in better understanding and comprehension of the materials read [7, 8]. Font size had only a small impact on the participants' ability to recall

information from the text. On the contrary, it was found that despite the participants' higher confidence to remember information when the text was in a larger font, the differences in actual recall were minimal [8]. It is vital to better understand how changing the style of the font and putting it on a virtual display terminal (VDT) could affect the participants' recall of information [2, 9, 10]. Based on the above facts, this research expected to determine the effect of font style and size on memory among the medical students in University Kuala Lumpur Royal College Medical Perak (UniKL-RCMP). The current study's objectives were **i**. to identify the effect of font style on memory in the preclinical medical students of UniKL-RCMP ; ii. To examine the demography of the respondents in relation to the different font styles. ; and **iii**. To correlate the scores of the respondents for different font styles with their ability to memorize.

MATERIALS AND METHODS

Study Population and Study Field: 195 preclinical medical students of Universiti Kuala Lumpur, Royal College of Medicine Perak were selected by using simple random sampling method. The study was done at UniKL RCMP from 2-26 July 2018. **Sampling Method:** A cross-sectional study using a simple random sampling method based on the sample frame of both Year-I and II medical students' names was used. **Sample Size:** The sample size was calculated using www.openepi.com. The estimated population size of 195 subjects from MBBS preclinical students of UniKL RCMP, with the anticipated frequency of 50% and confidence limit of 5%, the minimum sample size at a confidence level of 95% was 130. The planned sample size was 136. **Study Design: Memory Test:** The participants were given a test paper containing 20 words which were divided into 4 sets of different font styles (i.e., *monospace*, *Script*, *Sans-Serif* and *Seri*f). Each set included 5 words. A period of 5 minutes was given to the participants to memorize those 20 words. i. The test paper was then collected back by the researchers. ii. The participants were then instructed to write down those 20 words. iii. Individual scores were then calculated and recorded. **Questionnaire:** It was Consisted of two parts: Part A: Demographic information; and Part B: 10 questions regarding the fonts. **Inclusion-Exclusion Criteria:** The preclinical (Year-1 & 2) medical students of UniKL RCMP who agreed to participate in this study. **Exclusion Criterion:** The preclinical (Year-1 & Year-2) medical students of UniKL RCMP who refused to participate in this study. **Ethical Consideration**: This was approved by the Medical Research Ethics Committee (MREC) of University Kuala Lumpur Royal College of Medicine Perak, 3, Jalan Greentown, 31350 Ipoh, Negeri Perak, Malaysia [UniKLRCMP/MREC/2018/007, Dated 25th June 2018]. The potential participants were explained using the Subject Information Form. Those students who agreed to participate were provided with the Consent Form. All the personal data and responses from the participants were kept confidential at any time.

RESULTS

A total of 136 preclinical medical students participated in the current study. Among them, 57.4% (78) and 42.6% (58) formed Year-1 and Year-2 students; respectively. Moreover, 74. 26% (101) and 25.74% (35) were female and male; respectively.

The total mean score was 4.33 regarding the memory test. The obtained mean scores of Sans Serif, Serif, Script, and Monospace were 4.46, 4.45, 4.32, and 4.08; respectively. There were statistically significant (p=0.031) differences between the groups. The top good score obtained for Sans Serif among Year-I was 91.3% and 94.5% for the male and female study participants; respectively. But in Year-2, it was Script, and 58.3% & 80.4% by male & female study participants respectively (Table 1). The font Serif was found to be the most liked according to sex (32.4%) and the year of study (32.4%). There were statistically significant (p=0.002) differences observed in both groups (Table 2). The least liked font style was Monospace among sex (41.2%) and the year of study (41.2%). Again, there were statistically significant (p=0.000) differences observed between four different font styles (Table 3). Three reasons were described by the study participants for choosing the most liked font style. Those were interesting, good for memorization, and commonly used by the people (Table 4).

There were also statistically significant (p=0.000) differences observed between the three mentioned reasons. Nevertheless, there were no statistically (p=0.184) significant differences observed in the effect of font style on memorization skill when compared between sexes and years of study (Table 5). Newspaper, textbook, magazines, family, friends, and social media were the sources of information about the fonts. Nonetheless, there were again statistically significant (p=0.000) differences observed between the sources of information (Table 6). Once again, the Monospace has been identified as the font least desirable to read with statistically significant (p=0.000)

differences observed among sexes and years of study (Table 7). There were statistically significant (p=0.000) differences observed between sexes and years of survey regarding the font size effect on memorization (Table 8).

Table 1: Distribution of Respondents According to the Score of Memory Test for Font Style

Score for memory test for font style	Category	Year-I		Year-II	
		Male (%)	Female (%)	Male (%)	Female (%)
'Serif'	Good (score 10-8)	20 (87)	47 (85.5)	5 (41.7)	39 (84.8)
	Average (score 3-7)	3 (13)	7 (12.7)	6 (50)	6 (13)
	Bad (score 0-2)	0 (0)	1 (1.8)	1 (8.3)	1 (2.2)
'Sans Serif'	Good (score 10-8)	21 (91.3)	52 (94.5)	3 (25)	38 (82.6)
	Average (score 3-7)	2 (8.7)	3 (5.5)	9 (75)	4 (8.7)
	Bad (score 0-2)	0 (0)	0 (0)	0 (0)	4 (8.7)
'Script'	Good (score 10-8)	18 (78.3)	47 (85.5)	7 (58.3)	37 (80.4)
	Average (score 3-7)	3 (13.0)	5 (9.0)	5 (41.7	8 (17.4)
	Bad (score 0-2)	2 (8.7)	3 (5.5)	0 (0)	1 (2.2)
'Monospace'	Good (score 10-8)	18 (78.3)	46 (83.6)	4 (33.3)	36 (78.3)
	Average (score 3-7)	3 (13.0)	6 (11.0)	4 (33.3)	5 (11.0)
	Bad (score 0-2)	2 (8.7)	3 (5.5)	4 (33.3)	5 (11.0)

Table 2: Distribution of Respondents According to Gender and Year of Study for the Most Liked Font Style

Font style	Gender (n)		Total (%)	Year of Study (n)		Total (%)	ANOVA	
	Male	Female		I	II		F value	Significance
Serif	11	33	44 (32.4)	28	16	44 (32.4)	4.897	0.002
Sans serif	9	25	34 (25)	24	10	34 (25)		
Script	13	27	40 (29.4)	18	22	40 (29.4)		
Monospace	1	17	18 (13.2)	9	9	18 (13.2)		

***** Mean difference is significant at the 0.05 level

Table 3: Distribution of Respondents According to Gender and Year of Study for the Least-Liked Font Style

Font style	Gender (n)		Total (%)	Year of study (n)		Total (%)	ANOVA	
	Male	Female		I	II		F value	Significance
Serif	3	14	17 (12.5)	7	10	17 (12.5)	18.682	0.000
Sans serif	5	11	16 (11.8)	7	9	16 (11.8)		
Script	6	41	47 (34.5)	33	14	47 (34.5)		
Monospace	20	36	56 (41.2)	32	24	56 (41.2)		

* Mean difference is significant at the 0.05 level.

Table 4: Distribution of Respondents According to Gender and Year of Study Regarding the Reason for Choosing the Most Liked Font Style

Reason	Gender (n)		Total (%)	Year of Study (n)		Total (%)	ANOVA	
	Male	Female		I	II		F Value	Significance
Interesting	20	44	64 (47.1)	36	28	64 (47.1)	9.863	0.000
Memorization	8	33	41 (30.1)	21	20	41 (30.1)		
Commonly used by people	6	25	31 (22.8)	22	9	31 (22.8)		

***** Mean difference is significant at the 0.05 level

Table 5: Distribution of Respondents According to Gender & Year of Study Regarding the Effect of Font Style on Memorization

Effect of font style on memorization	Gender (n)		Total (%)	Year of Study (n)		Total (%)	ANOVA	
	Male	Female		I	II		F Value	Significance
Yes	20	54	74 (54.4)	40	34	74 (54.4)	1.778	0.184
No	14	48	62 (45.6)	39	23	62 (45.6)		

***** Mean difference is significant at the 0.05 level

Table 6: Distribution of Respondents According to the Source of Information of the Fonts

Sources	N (%)	ANOVA	
		F value	Significance
Newspaper	21 (10.4)	10.715	0.000
Textbook	45 (22.4)		
Magazines	31 (15.4)		

Family	6 (3)		
Friends	48 (23.9)		
Social media	50 (24.9)		

***** Mean difference is significant at the 0.05 level

Table 7: Distribution of Respondents According to Gender and Year of Study Regarding the Font Least Desirable to Read

Font Style	Gender (n)		Total (%)	Year of Study (n)		Total (%)	ANOVA	
	Male	Female		I	II		F value	Significance
Serif	4	14	18 (13.2)	4	14	18 (13.2)	21.517	.000
Sans serif	2	10	12 (8.8)	7	5	12 (8.8)		
Script	9	42	51 (37.5)	34	17	51 (37.5)		
Monospace	19	36	55 (40.5)	34	21	55 (40.5)		

***** Mean difference is significant at the 0.05 level

Table 8: Distribution of Respondents According to Gender and Year of Study Regarding Font Size Affecting Memorization

Response	**Gender (n)**		**Total (%)**	**Year of Study (n)**		**Total (%)**	**ANOVA**	
	Male	**Female**		**I**	**II**		**F value**	**Significance**
Yes	70	26	96 (70.6)	50	46	96 (70.6)	52.796	.000
No	32	8	40 (29.4)	29	11	40 (29.4)		

***** Mean difference is significant at the 0.05 level

DISCUSSION

Demographic Characteristics

Out of the total 136 respondents, 26% were males, and 74% were females. Sociodemographic profiles were quite like a number earlier Malaysian studies conducted in medical schools [11-13].

Memory Test Mean Scores

A hypothesis can be made that sans-serif had the most effect on memorization according to the current study's result. This hypothesis was supported by another study reported that the readability of the information presented on a VDT was significantly higher with a sans-serif font (Verdana) than a serif font (Times New Roman) [10]. It was plausible to say that the more comfortable the text can be digested, the more accessible it can be recalled. This study was in the same line with the earlier studies that the font type had influence on recalling the facts [2, 6].

Most Liked Font Style

The most desired or preferred font style among the respondents in this study was serif (44%), followed by script (40%), sans-serif (34%) and monospace (18%). The choice for serif might be due to its decorative pattern that was appealing to the readers. The main feature of the serif font, in general, was its ability to make reading easier which then led it to be attracting among the readers [14]. Specific font styles have their own shapes and patterns that draw the interest of the readers. This might be the reason of readers for choosing the font styles as their preferred fonts.

Least Liked Font Style

The present study also showed that among the respondents, the least desired font style was monospace (41.2 %), followed by script (34.5 %), serif (12.5 %) and sans serif with (11.8%). ANOVA test also revealed that monospace was the least desirable font to read (p=0.000) as the poor visibility of the monospace font might cause the readers to lose their attraction to it.

Reasons for Choosing a Font Style

Among various reasons for choosing the most liked font style, the "interest" factor topped the list with 47.1% for both gender and years of study. Post Hoc Test also confirmed that the most liked font style was also chosen due to its 'interesting' factor (p=0.000).

Effect of Font Style

74 (54.4%) respondents in this study agreed that font style affects the memorization process. If a font is easier to read, then it can be predicted that fewer attentional resources are spent attending to the process of reading, and more attention can be given to the message. As more attentional resources are devoted to processing of relevant information, it can be predicted that the greater depth of processing and also greater fracture recall of that information will occur [2].

Frequency of Usage

Regarding the usage of the most preferred font style, it was found that the respondents' maximal usage frequency falls at the scale of 6 (16.9%) showing the moderate use of the serif font.

Source of Information

Regarding the source from which the respondents obtain information and knowledge about a font, it was found to be likely influenced by the evolution of information technology. In terms of the typed media, the leading source was found to be the social media (25%), followed by friends (24%), textbook (22%), magazines (15%), newspaper (11%) and lastly the family (3%). The ANOVA test for the source of information of the fonts confirmed the social media to be the primary source of obtaining information about the font (p=0.000). The predominance of social media may be due to the advancing technology which has been pretty much considered as a norm in modern society. Young people, which in this case the respondents (aged 20-21 years) relied very much on social media as it has been considered as the "sea of information at the fingertips" which has made easy communication with one another or so-called "friends", possible. That is why friends were ranked 2nd in the list of sources. As for magazines, textbook, newspaper, and family, they were considered obsolete in this generation as y-generation prefer social media because of its convenience.

Font Least Desirable to Read

The main feature of the serif font, in general, was its ability to make reading easier which then led it to be attracting among the respondents [14]. Specific font styles having their own shapes and patterns would draw the interest of the readers. This might be the reason for choosing font styles as the preferred ones.

Font Size

Regarding the size of fonts, the majority (70.6%) of the participants agreed that the font size does not affect the memorization. One earlier study reported that font size had no effect on memory, even though most people assumed that bigger is better [15] According to the previous study [5], decreasing the font size impaired the reading rate and accuracy in young children, however, for older children, it enhanced the comprehension. The influence of font size was significantly more abundant in the belief-based predictions than in the real judgments of learning [16].

CONCLUSION

Easily readable fonts required less effort to decipher the word, hence resulted in better comprehension and better memory. Among the 4 font styles studied, Serif was found to be the most suitable one for memorization compared to the other types of fonts. Although the font style affected memory, the font size had no significant effect on memory contrary to the belief that the bigger is better. Font type had a substantial influence on the effective communication. Thereafter, medical educators needed to be more careful for choosing the font in their teaching-learning sessions.

Limitations

It was challenging to design and conduct such kind of study within a short period of one month. The respondents were not so cordial to fill up the questionnaires as expected. Sometimes they did not give full attention when filling up the surveys. As for the memory test, the credibility of the answers was questionable as some students were not honest in answering the quiz. The sample size was too small to make a profound impact on the result. Further studies should include more font styles and larger sample size to examine the effects more accurately.

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Conflict of Interest

Authors possessed no conflict of interest.

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