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COMPARISON OF READING SPEED USING MALAY UNRELATED WORD READING CHART WITH STANDARDIZED ENGLISH READING CHARTS

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ABSTRACT

The objective of this study was to compare the reading speed of Malay language unrelated words reading chart named the Universiti Teknologi MARA unrelated words (UiTM-Muw) reading chart with Colenbrander reading chart and MNRead acuity chart. The participants were asked to read three different reading charts at random order, aloud and as quickly as possible. The time taken to read each chart was recorded and any error made while reading was noted. Reading speed was quantified as correct words read in a minute (cwpm). Comparison of reading speed showed a significant difference in reading speed between UiTM-Muw reading chart and Colenbrander reading chart [t(98)=-16.79, p=0.001] as well as MNread acuity chart [t(98)=-18.72, p=0.001]. However, weak agreement was found between reading speed of UiTM-Muw reading chart with MNRead acuity chart (mean difference = -83.6 cwpm) and Colenbrander reading chart (mean difference = -81.9 cwpm). Hence, UiTM-Muw reading chart in Malay language was incomparable with standardized English reading chart.

Keywords: Malay words, Reading speed, Reading chart, reading, Reading performance, Unrelated words.

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1. INTRODUCTION

Related words referred to meaningful words of print while unrelated words referred to meaningless words of print. Presence of guessing cues in reading the related words that might lead to increment in reading speed [1, 2]. Reading speed was compared between related words and unrelated words at various eccentricities at retina, which were at 0 degree (fovea), 5 degrees, 10 degrees and 15 degrees in the inferior section of visual field. Reading speed was found to be higher for related words than for unrelated words at all eccentricities. The reading speed was the

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highest at the fovea, and declined as retinal eccentricity increased. The reading speed for unrelated words was much slower than related words with the increment of retinal eccentricity [2].

The words processing during reading was studied based on lexico-semantic fit and message-level [3]. When reading a good lexico-semantic fit either in strong and weak message-level, it showed no difference in Event Related brain Potential (ERP) experiment. Reading poor lexico-semantic fit words showed a quite different pattern in ERP experiment in both strong and weak constraint sentences. Both message-level and lexico-semantic information were found to be important during reading process in capturing the meaning of sentences which lead to improvement in reading comprehension [3].

Reading time was remarkably affected and became slower by manipulated linguistic context that used negative target sentences. This showed context dependency during reading process [4]. Therefore, the aim of this study was to compare the reading speed of Malay language unrelated words reading chart called the Universiti Teknologi MARA unrelated words (UiTM-Muw) reading chart with standardized English reading chart [Colenbrander reading chart and MNRead acuity chart].

2. MATERIALS AND METHODS

Fifty normally sighted young university students aged between 18 and 30 years old were recruited through convenient sampling with informed consent. The inclusion criteria were fluency of reading both Malay and English language, best-corrected distance visual acuity of at least 6/9 binocularly, no history of binocular vision problem and no history of eye pathology condition. This study adhered to the tenets of declaration of Helsinki and was approved by the Research Ethic Committee of the university (Approval code: 600-FSK(P.T5/2).

The unrelated words were used to construct the UiTM-Muw reading chart (Fig. 1). The words were extracted from Word Registry of Primary School (*Daftar Kata Bahasa Melayu Sekolah Kebangsaan)* produced by the Malaysian Ministry of Education (MMoE). Malay language words registered for primary school students grade 1 until grade 6. The extracted unrelated words were constructed in meaningless sentences to avoid any contextual cues in reading the chart during reading evaluation. The Universiti Teknologi MARA Malay unrelated words (UiTM-Muw) reading chart contained 14 print sizes ranging from 1.3 log MAR to 0.0 log MAR (N40 to N1) for testing distance of 40 cm. Sentence was comprised of a maximum of 60 characters per sentence (about 5 to 8 words). The "Times new roman" font typeface was chosen as it was commonly used in most reading materials [5]. The sentences were set with left to right alignment and printed with 100% contrast on matte surface white paper card to avoid specular reflection.

The participants were assigned randomly to read the UiTM-Muw reading chart, Colenbrander reading chart and MNRead acuity chart loudly. The reading distance was set at 40cm and the reading chart was placed at 45° on reading stand. A blank card was placed to cover the reading chart prior to each evaluation to avoid pre-reading. The participants read the sentences as fast as possible from the largest line towards the smallest line. The end point was

determined when the participants failed to read any of the words on a print size or read half of the words on that print size wrongly. The total duration in reading each chart was recorded to the nearest 0.1-second. Any mistake such as incorrect, missed, substitution or omission was noted. Reading speed was calculated by dividing the total number of words that were read correctly by the time taken to read the chart in correct words per minute (cwpm).

Data was analyzed using Statistical Package for Social Sciences (SPSS) version 20.0 and Medcalc 11.2.1.0. Comparison of reading speed between Muw reading chart with Colenbrander reading chart and MNRead acuity chart was analyzed using independent sample t-test and agreement between charts was determined using Bland and Altman.

3. RESULTS

The data was normally distributed (Shapiro-Wilk: $p>0.05$), therefore the parametric test was considered for further analysis. The significant level was set at $p<0.05$. The means, standard deviations, maximum values and minimum values of reading speed for the UiTM-Muw reading chart, Colenbrander reading chart and MNRead acuity chart were tabulated in Table 1. Independent samples *t*-test showed that the reading speed of UiTM-Muw reading chart was significantly lower than reading speed of Colenbrander reading chart [$t(98)=-16.79$, $p=0.001$] and MNRead reading chart [$t(98)=-18.72$, $p=0.001$].

Table-1. The summary of reading speed in three reading charts

	Mean reading speed±SD (cwpm)	Maximum value (cwpm)	Minimum value (cwpm)
UiTM-Muw reading chart	112±15	87	153
Colenbrander reading chart	194±31	138	282
MNRead acuity chart	196±28	144	266

The difference of mean reading speed between UiTM-Muw reading chart with Colenbrander reading chart and MNRead acuity chart were 42 percent and 43 percent respectively. The Bland and Altman scatterplot showed larger mean difference of -82 wpm, the standard deviation for mean difference was 22.9 wpm and the 95% limits of agreement were -37 wpm and -126.8 wpm (Fig. 2a). Larger mean difference was also found Bland and Altman scatterplot (Fig. 2b) between UiTM-Muw reading chart and MNRead acuity chart with mean difference of -83.6 wpm and standard deviation of differences was 21.4 wpm. The 95% limits of agreement were -41.7 wpm and -125.4 wpm respectively. Greater mean difference in Bland and Altman scatterplot suggested a weak agreement between UiTM-Muw reading chart and Colenbrander reading chart as well as MNRead acuity chart.

4. DISCUSSIONS

The mean reading speed of UiTM-Muw reading chart was 112±15 cwpm. The reading speed of Malay speaker was reported to be 200±30 wpm (Buari et al. 2014). Surprisingly, it showed great difference in reading speed even both studies were evaluated on participants with similar

age range, same composition of print sizes (1.3 logMAR to 0.0 logMAR or N40 to N1) and had equal number of characters (60 characters). The discrepancy might due to the current study used unrelated words whereby the other study constructed the reading chart using related words [6]. The reading speed of UiTM-Muw reading chart was found within the reading speed range of normally sighted school children aged 13 to 18 years (72 to 136 wpm) [7]. The similarity was both studies used the unrelated words to evaluate the reading speed of Malay speaker. However, it only tested the reading speed using text with single font size, which was one step greater than near visual acuity, compared with our study, the young adult participants read 14 print sizes from N40 to N1 in 0.1 logMAR step.

Both reading speed between UiTM-Muw reading chart and Colenbrander reading chart as well as MNRead acuity chart was significantly different. The mean difference based on Bland and Altman scatterplot was also larger. It might suggest weak agreement between UiTM-Muw reading chart with Colenbrander reading chart and MNRead acuity chart. The reading speed of UiTM-Muw reading chart was slower than Colenbrander reading chart and MNRead acuity chart by 42 percent and 43 percent respectively. The discrepancy might be due to the construction of the UiTM-Muw reading chart using unrelated words to produce meaningless sentences, whereby both MNRead acuity chart and Colenbrander reading chart contained related words or meaningful sentences. Previous studies had shown that the reading speed of the unrelated word was slower than the related words or sentences by 57.8% to 65.8% [1, 2]. The usage of the unrelated words reading chart was to evaluate the reading speed based on ability to recognize the word using the vision. Reading the meaningful sentences might be influenced by guessing the cues of adjacent word therefore the reading speed was higher than reading the unrelated words [1, 2, 8]. The reaction time was found slower in identifying the unrelated word than related word in both isolated and crowded words stimuli [9]. Reading a sequence of unrelated letters or words was significantly different from meaningful sentences because the subjects relied on visual information in contrast to syntactic and semantic clues [1].

The total errors made by the participants were the highest during reading the UiTM-Muw reading chart with 3.5 percent. Whereby, participants only made approximately 1 percent of error while reading both Colenbrander reading chart and MNRead reading chart. The errors made during reading were counted as any words that incorrectly read, missed, omitted and substituted. The same technique was used in study of reading errors made by children with normal and low vision [10]. Errors were categorized into mispronunciation, substitution, refusals, additions, omissions and reversal. The highest error type made by the children were in the category of mispronunciation and substitution. Both normal and low vision children made 74% and 82% errors respectively during reading. Two factors that contributed to errors during reading were inaccurately decoding the text, which the children found difficulty to recognize the print and tend to guess semantically appropriate word and mistakenly identified the words look similar to another words in term of orthographic pattern [10]. Lack of syntactic and semantic clues in

unrelated words or sentences might be the explanation for slower reading and mistakes during reading.

The total number of words in UiTM-Muw reading chart was 92 words (60 characters/sentence), Colenbrander reading chart was 217 words (60 characters/sentence) and MNRead acuity chart was 168 words (70 characters/sentence). Even though the UiTM-Muw reading chart showed the same total character length with MNRead acuity chart (60 characters in each sentence), the number of characters in every word varied between both charts. The words that had longest number of characters (≥ 10 characters in a word) were different between MNRead acuity chart [‘grandfather’ (11 characters)] and UiTM-Muw near chart [*‘mengkategorikan’* (15 characters)]. The shortest number of characters (≤3 characters in a word) was also different between MNread [1 character (word ‘a’)] and UiTM-Muw reading chart [3 characters (word *‘air’*). The UiTM-Muw reading chart had surplus longest words (17 words) than MNRead acuity chart (2 words) and vice versa for shortest words (UiTM-Muw reading chart = 1 words; MNRead acuity chart = 73 words). In addition, Colenbrander reading chart had longest word with ≥ 7 characters in a word i.e ‘pouring’ and ‘drawing’ and the shortest words had 1 character i.e ‘a’ and ‘I’. This might explain why the reading time increased when reading the UiTM-Muw reading chart in comparison to the Colenbrander reading chart and MNRead acuity chart which lead to the increment of reading speed among the participants.

5. CONCLUSION

Thus, the reading speed using UiTM-Muw reading chart was incomparable and showed weak agreement with both Colenbrander reading chart and MNRead acuity chart. The evaluation of reading speed using UiTM-Muw reading chart should be evaluated and compared with the same construction of words, which was the unrelated words. Nevertheless, the near vision test in routine optometric assessment was suggested to be evaluated using sentence as it represents real reading activity in routine daily life.

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Competing Interests: The authors declare that they have no competing interests.

Contributors/Acknowledgement: All authors contributed equally to the conception and design of the study.

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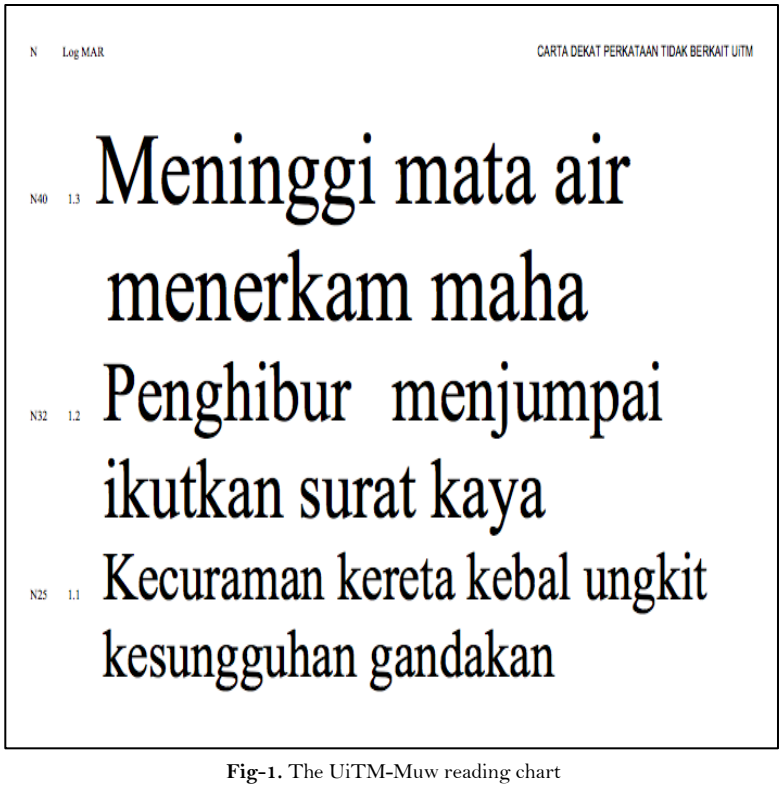

Fig-1. The UiTM-Muw reading chart

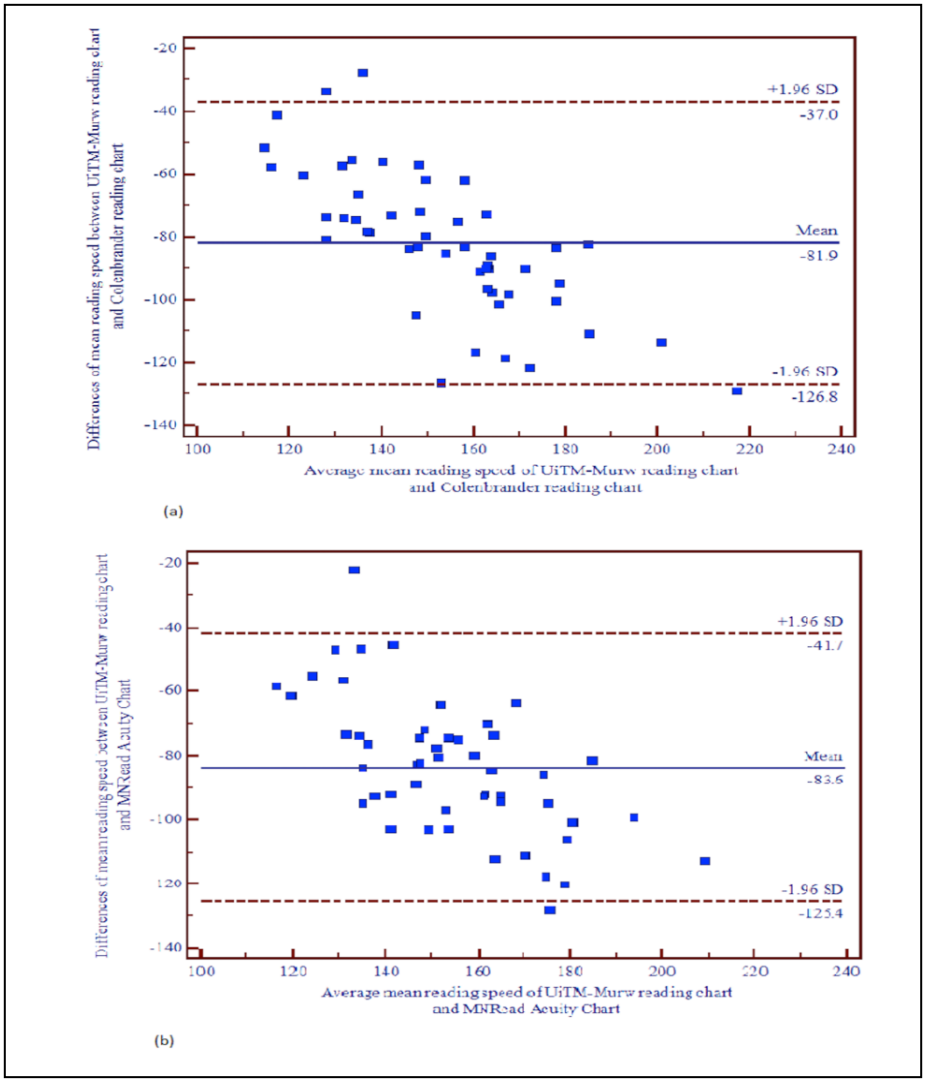

Fig-2. (a) Scatterplot of agreement of reading speed between Mrw reading chart and MNread acuity chart (b) Scatterplot agreement of reading speed between UiTM-Mrw reading chart and Colenbrander reading chart. The Bland and Altman plotted the difference of mean reading speed against the average of mean reading speed between two reading charts. It was expected that the 95% limits (±1.96SD) included 95% of differences between two measurements. The thick blue line represents the mean difference of reading speed between two charts, the upper and lower red dash lines represent the 95% limit of agreement (±1.96 SD).