FINAL REPORT

NASALANCE SCORES IN NORMAL CHILDREN AND IN REPAIRED CLEFT LIP AND PALATE CHILDREN SPEAKING THE MALAY LANGUAGE

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ABSTRACT

Cleft lip and palate is a common facial birth defect. Corrective surgery to repair the cleft is often done early in infancy, before the child learns to speak. However, a number of these patients still develop speech problems. A common speech problem in these patients is hypernasality. Hypernasality was traditionally determined perceptually by speech-language therapists involved in the management of cleft patients. It can now also be measured objectively using the nasometer, which measures nasalance scores. This is a comparative cross-sectional study on nasometric analysis which ran from January to May 2004 in Hospital Universiti Sains Malaysia. Its purpose was to gather and compare nasalance data from normal and repaired cleft children and to compare objective nasalance scores with perceptual nasality ratings done by speech-language therapists. The subjects were one hundred and three normal Malay children and twenty-seven repaired cleft lip and palate children with Malay language/Bahasa Melayu as their first language. A Kay Nasometer model 6400 was used to obtain the nasalance scores. Three Bahasa Melayu passages (a nasal, an oral and an oronasal passage) were constructed which resemble the passages used to measure nasalance with English speaking subjects. Two speech-language therapists listened to the audio recordings and rated the nasality on a seven-point equal appearing interval scale. Our results showed that the groups' mean overall nasalance scores were 37.2% (SD 5.62) for the normal children and 50.4% (SD 9.38) for the cleft lip and palate children. The difference was significant at $\rho < 0.001$. There was a fair to moderate correlation between the mean nasalance scores and the nasality ratings made by the speech-language therapists with $\rho < 0.05$. This study provides the normative nasalance scores for children using the Malay language, which can be used as objective references in the management of patients with resonance disorders.

Key words: cleft lip and palate, speech, hypernasality, nasometer, nasalance.

ABSTRAK

Rekahan bibir dan lelangit adalah satu daripada kecacatan muka yang lazim ditemui. Pembedahan biasanya dilakukan di peringkat awal umur bayi, sebelum bayi mula bertutur. Malangnya, ramai dalam kalangan mereka yang masih menghadapi masalah pertuturan, terutamanya kesengauan. Lazimnya, tahap kesengauan diukur secara subjektif oleh pakar pertuturan yang terlibat dalam pengendalian pesakit rekahan. Ia juga boleh diukur dengan alat nasometer yang mengukur skor nasalan. Ini adalah satu kajian rentasan yang berlangsung dari Januari ke Mei 2004 di Hospital Universiti Sains Malaysia untuk mendapatkan nilai nasalan bagi kanak-kanak normal dan kanak-kanak rekahan bibir dan lelangit yang telah dibedah untuk tujuan perbandingan. Perbandingan juga dikaji di antara kesengauan yang dinilai secara subjektif oleh pegawai terapi pertuturan dengan skor nasalan yang diperoleh daripada nasometer. Seratus tiga orang kanak-kanak normal dan dua puluh tujuh orang pesakit rekahan lelangit yang telah dibedah turut serta dalam kajian ini. Kesemua mereka berbahasa Melayu. Alat pengukur nasalan adalah Kay Nasometer model 6400. Tiga rangsangan bahasa Melayu yang menyerupai rangsangan bahasa Inggeris yang digunakan dalam kajian asing direka untuk kajian ini. Dua pegawai terapi pertuturan dari Hospital Universiti Sains Malaysia menganalisa rakaman suara semua peserta dan menilai tahap kesengauan mereka secara subjektif menggunakan skala tujuh-mata. Hasil kajian menunjukkan purata skor nasalan bagi kumpulan normal adalah 37.2% (SD 5.62) dan kumpulan rekahan pula adalah 50.4% (SD 9.38). Perbezaan ini adalah signifikan pada $\rho < 0.001$. Korelasi yang sederhana didapati di antara purata skor nasalan dan tahap kesengauan yang dinilai oleh pegawai terapi pertuturan dengan $\rho < 0.05$. Kajian ini menghasilkan skor nasalan bagi kanak-kanak normal yang menggunakan Bahasa Melayu, di mana nilai ini boleh digunakan sebagai nilai rujukan dalam pengendalian pesakit bermasalah kesengauan.

Kata kunci: rekahan bibir dan lelangit, pertuturan, kesengauan, nasometer, nasalan.

1.0 INTRODUCTION

1.1 BACKGROUND

Cleft lip and palate is a common facial birth defect that poses a variety of problems not only to its sufferers but also to their immediate family members. Bronshtein et al. (1996) stated that the incidence of cleft lip and palate varies in different geographical region. He stated the occurrences as 1 per 1000 live births in whites and about 1.7% among the Japanese.

Many factors have been shown to increase the incidence of cleft lip and palate, such as hereditary factors, parental age, medications, maternal smoking and alcohol intake (Sandberg et al. 2002). Those born with cleft lip and palate have a wide range of problems associated with the deformity. Besides the obvious esthetic factor, they may also have problems with feeding, dental anomalies, ear infections, hearing problems, speech and language disorders, low self-esteem, sleep disorders and impaired social interaction (Habel et al. 1996).

Cleft lip and palate surgery is very important to get an acceptable esthetic result, to optimize normal bony facial growth and also to get a good speech outcome (Habel et al. 1996). Speech has now become one of the main outcomes measured in the management of cleft lip and palate patients (Enderby & Emerson 1996; Lohmander & Olsson 2004; Witt & Marsh 1997). Johns et al. (2003) noted that there are three main causes of speech abnormalities. These are structural deficits, misarticulations, or mechanical interferences. Berkowitz (1994) and Sell and Ma (1996) included "faulty learning" as another possible cause. Johns et al. (2003) found that after primary palatoplasty, up to twenty percent of patients have unsatisfactory speech results and require secondary management. However, with early recognition and intervention, the chances for development of normal speech are increased.

In order for speech to be recognized as an outcome of cleft patients' management, it has to be easily measured. One of the measurements done in assessing speech was the perceptual assessment of nasality. Nasality was traditionally assessed by the perceptions of professionals involved in the management of resonance disorders. The nasometer is now often used for objective measurement of nasality, and the term "nasalance" is used to describe the findings (Kay Elemetrics Corp. 2003).

Most speech sounds are oral, i.e. made within the oral cavity. Only /m, n, ŋ/ are nasal sounds, i.e. made using the nasal cavity. Nasality in speech occurs when the oral cavity is not entirely sealed from the nasal cavity, thus allowing air to escape through the nose. After surgical repair of the cleft lip and palate, patients can still sound nasal due to the inability of the soft palate to seal and separate these two cavities. This problem could be due to muscle weakness of the soft palate or because the soft palate is not long enough to be in contact with the pharyngeal wall (Randall et al. 2000).

1.2 RATIONALE OF THIS STUDY

Many studies have shown that language and dialect influenced nasalance scores (Anderson 1996; Seaver et al. 1991; Van Doorn & Purcell 1998). More and more researchers (Anderson 1996; Seaver et al. 1991; Sweeney et al. 2004; Van Doorn & Purcell 1998; Whitehill 2001) are now recommending that the norms for a certain language should be obtained before the nasometer can be clinically useful for use in that region. Therefore, this study was deemed necessary because to date, there is no published data available for nasalance scores in Malay language.

1.3 HYPOTHESES AND RESEARCH QUESTIONS

1. What are the nasalance scores for the normal and repaired cleft children speaking the Malay language?

2. There is a difference in the nasalance scores between normal children and repaired cleft children.

3. Is there any age and gender association in the nasalance scores for the normal children?

4. The nasalance scores obtained with the nasometer is related to the perceptual speech determination rated by the speech-language therapists.

1.4 OBJECTIVES

The general objective of this study is to measure the nasalance scores in Malay-speaking children. The specific aims of this study are:

1. To determine the nasalance scores in Malay-speaking normal children and repaired cleft lip and/or palate children.

2. To compare the nasalance scores between the normal and cleft groups.

3. To ascertain if there is any age and gender association in the nasalance scores for the normal subjects.

4. To compare the objective nasality measurements (nasalance scores) obtained with nasometer and nasality ratings perceptually determined by two speech-language therapists.

2.0 METHODOLOGY

2.1 STUDY DESIGN

This is a comparative cross sectional study on nasometric analysis. The case group comprised of repaired cleft cases seen at Hospital Universiti Sains Malaysia and the comparison group was normal children attending two schools in Kota Bharu area. The two study groups were compared to see the differences in the mean nasalance scores. This study was carried out between January and May, year 2004 at Polyclinic C, School of Dental Sciences, Universiti Sains Malaysia, Kubang Kerian, Kelantan.

2.2 SAMPLE

All samples were Malay children with Malay language (Bahasa Melayu) with Kelantan dialect as their first language. This was to minimize the effect of language and dialect, which has been shown by some researchers to influence nasalance scores (Anderson 1996; Seaver et al. 1991; Van Doorn & Purcell 1998).

2.2.1 Sample size calculation

The sample size was calculated using PS software (Dupont & Plummer 2003). The formula to calculate sample size to compare two population means using independent t test is:

$$n = \frac{2\sigma^2}{\Delta^2}(z_{\alpha/2} + z_{\beta})^2$$

where:

- n = the sample size required
- α = type I error i.e. the probability of rejecting the null hypothesis when it is true
- β = type II error i.e. the probability of not rejecting the null hypothesis when it is false
- power = $1 - \beta$ (i. e. the probability of rejecting the null hypothesis when it is false)
- σ = standard deviation
- Δ = detectable difference

Using $\alpha = 0.05$, $\beta = 0.20$, $\sigma = 7.61$ (Vallino-Napoli & Montgomery 1997) and $\Delta = 6$ (Vallino-Napoli & Montgomery 1997), the sample size calculated was 26.

2.2.2 Normal subjects

The reference population for the normal group was all school children in Kota Bharu area. The schools around Kota Bharu were assigned a number and two schools were selected using Excel® random numbers. The source population was children from these two schools. The random numbers were again employed to select the children for participation in this study. Approval to use the school children for this study was granted by the Ministry of Education, Malaysia and the Department of Education, Kelantan (Appendix A). The children were divided into three groups as follows:

1. 6-9 years old (Group 1)
2. 10-13 years old (Group 2)
3. 14-17 years old (Group 3).

It has been decided to use these age ranges because Smith et al. (2003) found that nasal airflow and the velopharyngeal orifice area were similar for ages 5 through 9, 10 through 13, and 14 through 18 years old. However, they found no significant sex differences for both nasal airflow and velopharyngeal orifice area.

One hundred and three children were randomly chosen as the normal subjects. There were 30 children in Group 1, 37 children in Group 2 and 36 children in Group 3. Prior to data collection, parents/guardians were given a set of written information and consent forms (Appendix B), which has been approved by the Research and Ethics Committee of School of Medical Sciences, Universiti Sains Malaysia (Appendix C). The researcher's contact numbers and address were also printed on the information and consent forms. They were given ample time to consider before participating in the study. Informed consent was obtained from those who agreed to participate in the study.

2.2.2.1 Inclusion criteria for the normal subjects

Subjects who conformed to the criteria listed below were selected for this study:

- considered as healthy (no known medical problems as reported by parents/guardians)
- aged 6;0 to 17;11 years old
- able to read the passages presented during data collection or at least repeat the sentences after the examiner.

2.2.2.2 Exclusion criteria for the normal subjects

Exclusion criteria imposed on the normal subjects were as follows:

- history of hearing problems
- any ear, nose or throat infections on the day data was collected.

2.2.3 Cleft subjects

The reference population for the cases was all non-syndromic repaired cleft palate (± cleft lip) residing around Kota Bharu area. The study sample was repaired cleft patients seen at Hospital Universiti Sains Malaysia. All would-be subjects were assigned a number and Excel® random numbers were used in selecting the participants. Selected subjects were contacted and the parents/guardians were informed about the research. Those who agreed to come were given an appointment. During the hospital visit, parents/guardians were again briefed about the conduct of study and written information and consent forms (Appendixes C and D) given to them to be signed. 27 cleft lip and palate subjects participated in this study.

2.2.3.1 Inclusion criteria for the cleft subjects

Inclusion criteria used for the cleft subjects were:

- non-syndromic repaired cleft cases with no other medical illnesses that could affect their speech
- aged 6;0 to 17;11 years old
- no mental retardation as was noted from the case notes
- able to read the test passages or at least repeat them after the examiner.

2.2.3.2 Exclusion criteria for the cleft subjects

Exclusion criteria for the cleft subjects were:

- history of persistent and prolonged hearing problem during early childhood
- any symptoms of ear, nose or throat infections during data collection
- presence of fistula with diameter > 5 mm^2

With all the inclusion and exclusion criteria in mind, a flow chart for experimental procedures was constructed. Figure 2.1 shows the flow chart for the experimental procedures.

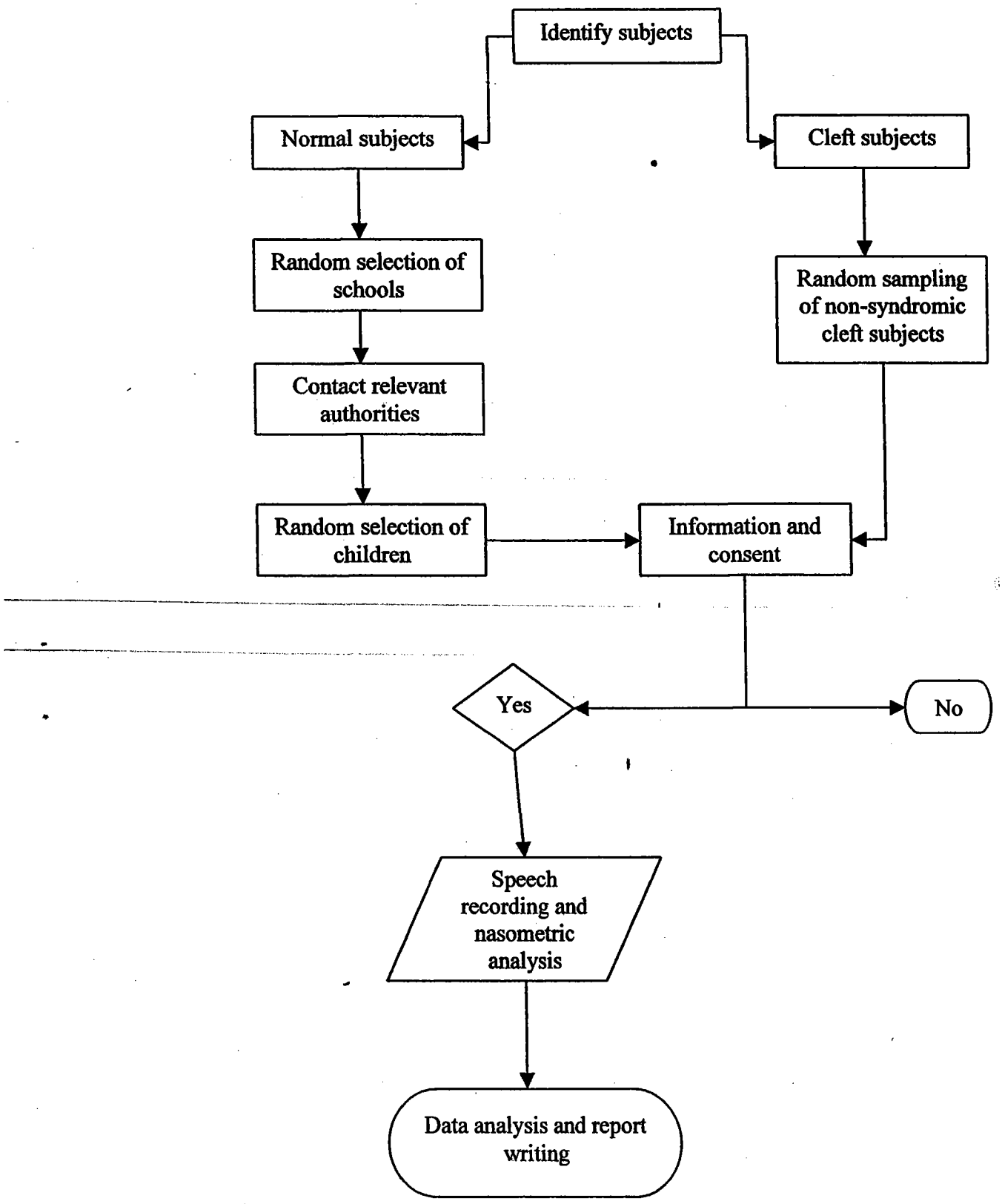

FIGURE 2.1 Flow chart for experimental procedures

2.3 READING STIMULI

Three short and simple test stimuli (Tachimura et al. 2000; Watterson et al. 1996) in the Malay language were constructed which resemble the passages often used with nasometry in English speaking subjects. The nasal passage contains 34.72 percent nasal phonemes, the oral passage was devoid of nasal phoneme and the oronasal passage has 11.86 percent nasal phonemes (Appendix E).

2.4 INSTRUMENTATION

The nasometer II model 6400 by Kay Elemetrics, connected to a tabletop computer was used in this study. Prior to initiating data collection, the nasometer was calibrated following procedures outlined in the manual (Kay Elemetrics Corp. 2003). Figure 2.2 showed a subject with the nasometer headset in place during data collection. Calibration of the nasometer was also done periodically, after every 25 - 30 subjects. The headset placement and necessary adjustments were done according to the manufacturer's specifications.

FIGURE 2.2 A subject fitted with the nasometer headset

The nasometer was placed in a suitable dental surgery room, isolated from the common corridor to decrease the effect of background noise. There was no noise disturbance during the nasometric analysis procedures to ensure high quality data collection.

2.5 PROCEDURES

2.5.1 Initial procedures for the normal subjects

Normal children selected from the schools were brought to the clinic with the hospital's vehicle. Upon arrival at the clinic, they were given a briefing about the procedures. A picture of a child wearing the headgear and the written test passages were shown to them.

One child was called into the room at a time. He/she was encouraged to talk to the examiner for initial voice assessment perceptually. If the examiner heard any problem in his/her voice, such as excessive hoarseness, he/she would be excluded from the study. The child's oral cavity and back of mouth was then examined to exclude any oral deformities or any signs of throat infections.

2.5.2 Initial procedures for the cleft subjects

Parents of the cleft subjects were given a socio-demographic form (Appendix F) to be filled. The children were encouraged to talk to the examiner for perceptual voice assessment followed by oral examinations as were carried out with the normal subjects. The cleft subjects were also shown the picture of a child wearing the headgear and the written test passages before the nasometry procedures.

2.5.3 Common procedures for normal and cleft subjects

Each of the child's height and weight were measured with a height and weighing scale available in the clinic. These data was recorded before the nasometric analysis. The subject was then seated comfortably in a chair facing the computer. A piece of paper with the stimuli written on it was given to the child. He/she was asked to read the passages. For the subjects who could not read, he/she was requested to repeat the sentences, one after another, imitating the examiner. 118 subjects read or repeated each stimulus once. Twelve subjects first read the test stimuli and then repeated them after the examiner. This was done to see if there was any difference in the nasalance scores computed for the read versus repeated stimuli. Dialectal variations present in the Kelantan dialect were accepted during the readings/repetitions.

Recordings of all the subjects' voice during the readings/repetitions were made using a Sony TCM-40DV cassette recorder with a Sony C-60EFB cassette. These recordings were later presented to two speech-language therapists working in Hospital Universiti Sains Malaysia (HUSM) for perceptual evaluation (Appendix G).

The nasometer headset was then placed on the child's head with the horizontal plate between the child's nose and the upper lip (Sweeney et al. 2004). The child was asked to say some words to ensure that there was no interference with his/her upper lip during speech. The angle of the plate was checked before and during data collection to make sure that it was as perpendicular as possible to the frontal plane or the subject's face (Kay Elemetrics Corp. 2003). The subject was again requested to read or repeat the stimuli with the nasometer software running to capture the voice input. All voice input were saved for analysis later. Figure 2.3 showed a cleft subject during data collection.

FIGURE 2.3 A subject undergoing nasometric analysis

The data to be analyzed was selected with cursors that appear on the computer screen in contour display mode (Kay Elemetrics Corp. 2003). Nasalance score was automatically calculated with the nasometer software when the "Compute Result Statistics" were selected from the "Analyze" menu. All data were kept in the computer hard drive and copies made onto a handy drive and a compact disc. Information about the nasalance score for each stimulus was printed out and kept in a file.

Two speech-language therapists (SLTs) listened independently to the recorded speech sample made by the 27 cleft subjects and ten randomly selected normal subjects. Seven-point equal-appearing interval scale was used to rate the nasality where a score of zero represented normal resonance and six represented severe hypernasality. An example of this scale is shown in Figure 2.4 (adapted from Peterson-Falzone et al. 2001). The SLTs listened and rated the same speech samples again on a different day.

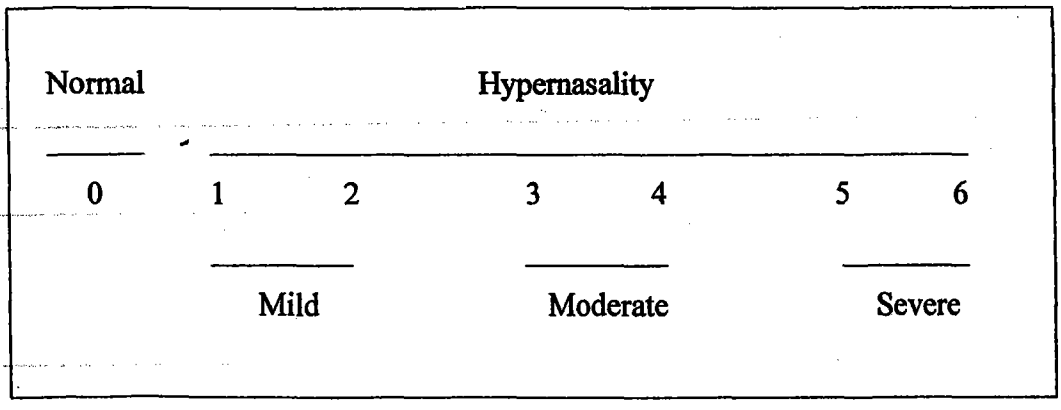

FIGURE 2.4 Seven-point equal-appearing interval scale for hypernasality ratings

2.6 DATA ANALYSES

The data was entered into a SPSS 11.0 for Windows datasheet for statistical analysis. For all analyses, a ρ value of < 0.05 was accepted as significant. Descriptive statistics were used to find the means of each passage for the normal and cleft groups. Independent t-test was used to see if there was any difference in the nasalance scores between the normal and cleft subjects. General linear model was also utilized to see if there was any interaction between age and gender in the mean nasalance score of the normal group.

The correlations between the two speech therapists' ratings and between their first and second ratings were determined with Pearson correlation coefficient or Spearman's correlation. Scatter plots were first established before deciding to use Pearson's or Spearman's correlation. If the scatter plot showed a linear bivariate normal distribution, analysis was done under Pearson's, if it was not normally distributed, Spearman's was used. Other correlations verified were between the mean ratings from both the speech therapists and the nasalance scores obtained with nasometer.

3.0 RESULTS

3.1 SOCIO-DEMOGRAPHIC PROFILE OF SUBJECTS

All 103 of the school children brought to the clinic were included in the study because they fulfilled the criteria set for the comparison group. Hundred percent of them qualified because a medical staff nurse had already done the first screening (for suitable candidates with the inclusion and exclusion criteria as references) at their respective schools.

The socio-demographic characteristics for all the subjects were shown in Table 3.1. The ratio of male to female was approximately the same in the normal group, but more females participated in the cleft group. It was also observed that there were more subjects in the younger age group for the repaired cleft subjects (40.7%) where as, for the normal group, this age range has the lowest number of participants (29.1%).

TABLE 3.1 Socio-demographic characteristics of subjects

Characteristics		Normal sample (n = 103)	Cleft sample (n = 27)
		Freq (%)	Freq (%)
Age (years)	6-9	30 (29.1)	11 (40.7)
	10-13	37 (35.9)	8 (29.6)
	14-17	36 (35.0)	8 (29.6)
Gender	Male	52 (52.0)	12 (44.4)
	Female	51 (51.0)	15 (55.6)

Further variables obtained for the cleft group were shown in Tables 3.2, 3.3 and 3.4.

TABLE 3.2 Types of clefts presented by the cleft subjects

Cleft type	Freq (%)
UCLP*	12 (44.4)
BCLP**	9 (33.3)
CPO***	6 (22.2)

*UCLP – Unilateral cleft lip and palate

**BCLP – Bilateral cleft lip and palate

***CPO – Cleft palate only

TABLE 3.3 Age of subjects when first palatal surgery was done

Palatal repair	Freq (%)
< 1 year old	8 (29.6)
> 1 year old	19 (70.4)

TABLE 3.4 Socio-economic status of the cleft group (based on the Economic Planning Unit 2004 and Amanah Ikhtiar Malaysia 2002)

Family income	Freq (%)
< RM 340.00	2 (7.4)
RM 341.00 – RM 680.00	13 (48.1)
RM 681.00 – RM 1300.00	5 (18.5)
> RM 1301.00	7 (25.9)

From the analysis, it was observed that the majority of the cleft cases had unilateral cleft lip and palate, surgery was most often done when they were more than one year old and more than half of them came from poor family with family income less than RM 680.00 per month. RM 680.00 is the poverty index line and RM 340.00 is the absolute hardcore poor in Kelantan (Amanah Ikhtiar Malaysia 2002; Economic Planning Unit 2004). RM 1300.00 is the average household income in Kelantan (Amanah Ikhtiar Malaysia 2002).

3.2 NASALANCE SCORES

The nasalance scores obtained from the two groups were summarized in Table 3.5. Independent t-test showed significant differences in the mean nasalance scores for the oral, oronasal and all passages between the normal and cleft groups with $\rho < 0.001$. No differences were found for the nasal passage between both groups ($\rho = 0.791$). No significant difference was observed in the nasalance scores of the twelve subjects who read and repeated the stimuli.

TABLE 3.5 Mean nasalance score (NS) and standard deviation (SD) for the normal and cleft groups

Stimulus	Normal group Mean NS (%) (SD)	Cleft group Mean NS (%) (SD)	t statistic (df)	ρ value
Nasal passage	59.3 (5.65)	59.6 (6.23)	-0.265 (128)	0.791
Oral passage	17.7 (6.31)	42.9 (14.43)	-8.882 (28.655)	0.001
Oronasal passage	34.6 (6.02)	48.6 (9.81)	-7.101 (31.314)	0.001
All passages	37.2 (5.62)	50.4 (9.38)	-7.000 (31.052)	0.001

Table 3.6 and Table 3.7 showed the mean nasalance scores (SD) for the normal and cleft groups by their gender and age groups.

TABLE 3.6 Mean nasalance scores (SD) for normal and cleft groups by gender

Gender	Mean NS (%) (SD)	
	Normal group	Cleft group
Male	36.3 (5.54)	49.3 (10.52)
Female	38.1 (5.62)	51.3 (8.63)

The differences between genders were not significant for both the normal group ($t = -1.623$; $df = 101$; $\rho = 0.108$) and the cleft group ($t = -0.554$; $df = 25$; $\rho = 0.585$).

TABLE 3.7 Mean nasalance scores (SD) for normal and cleft groups by age group

	Mean NS (%) (SD)	
Age group (years)	**Normal group**	**Cleft group**
6 – 9	36.46 (5.181)	51.73 (9.192)
10 – 13	35.54 (5.042)	50.71 (8.730)
14 - 17	39.43 (5.931)	48.21 (9.381)

Using Analysis of Variance (ANOVA) with Scheffe's post hoc test, a significant difference was found only in the normal sample between age groups 10 – 13 and 14 – 17 (F statistic = 5.073; df = 2; $\rho = 0.008$). There is no significant difference for age in the cleft group (F statistic = 0.315; df = 2; $\rho = 0.733$). Figure 3.1 and Figure 3.2 showed the plotting of mean nasalance scores and age group for the normal and cleft samples. The general linear model (univariate analysis of variance) showed that there was no interaction between age and gender for the mean nasalance scores in the normal group (F statistic = 0.186; df = 2; $\rho = 0.830$).

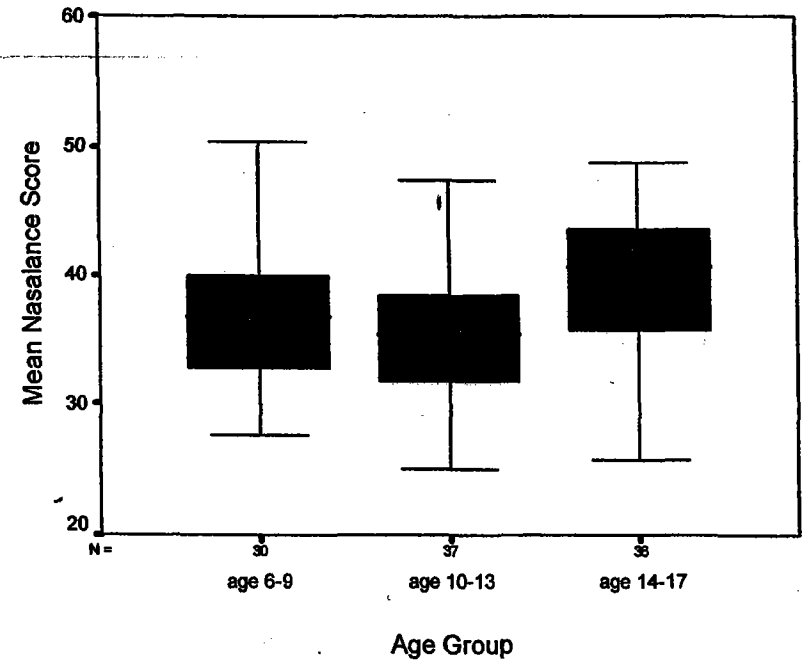

FIGURE 3.1 Mean nasalance scores and age group for the normal subjects

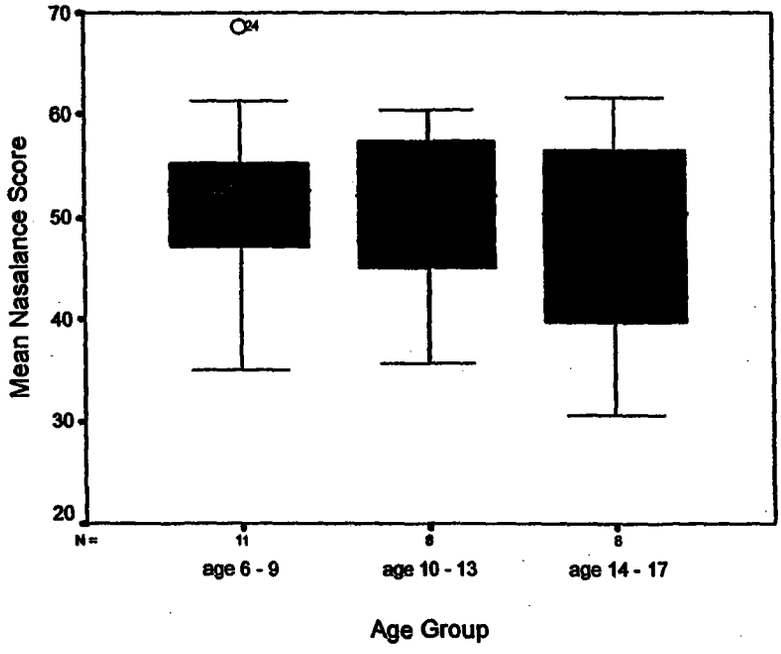

FIGURE 3.2 Mean nasalance scores and age group for the cleft subjects

3.3 RESULTS OF PERCEPTUAL SPEECH ASSESSMENTS

The Pearson's correlation coefficients between the first and second ratings by Speech Therapist 1 (SP 1) and Speech Therapist 2 (SP 2) were 0.585 and 0.926 respectively, which were significant at $\rho < 0.01$. Figures 3.3 and 3.4 showed the scatter plot for the two ratings (first time rating and second time rating) given by both speech-language therapists. The correlation coefficients between their ratings ranged from 0.599 to 0.722, with $\rho < 0.01$, which is considered a moderate to good correlation.

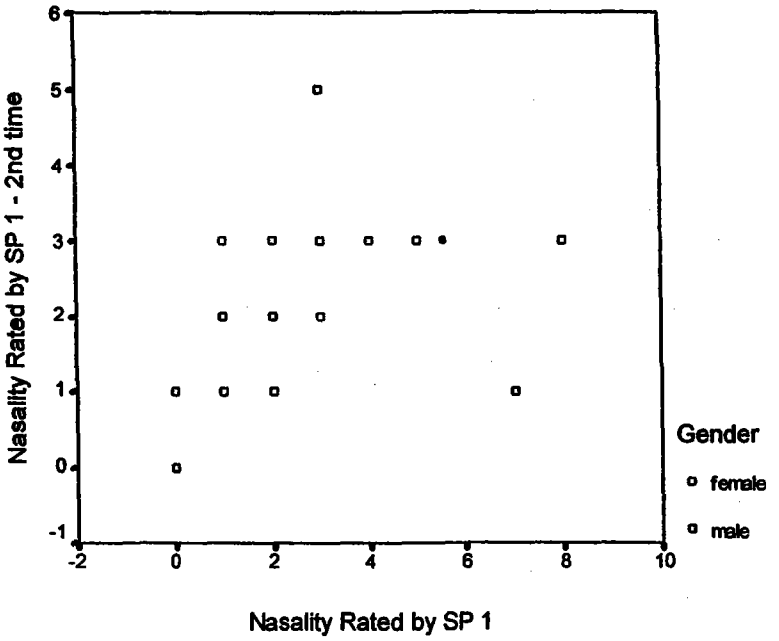

FIGURE 3.3 Scatter plot showing the nasality ratings by SP 1

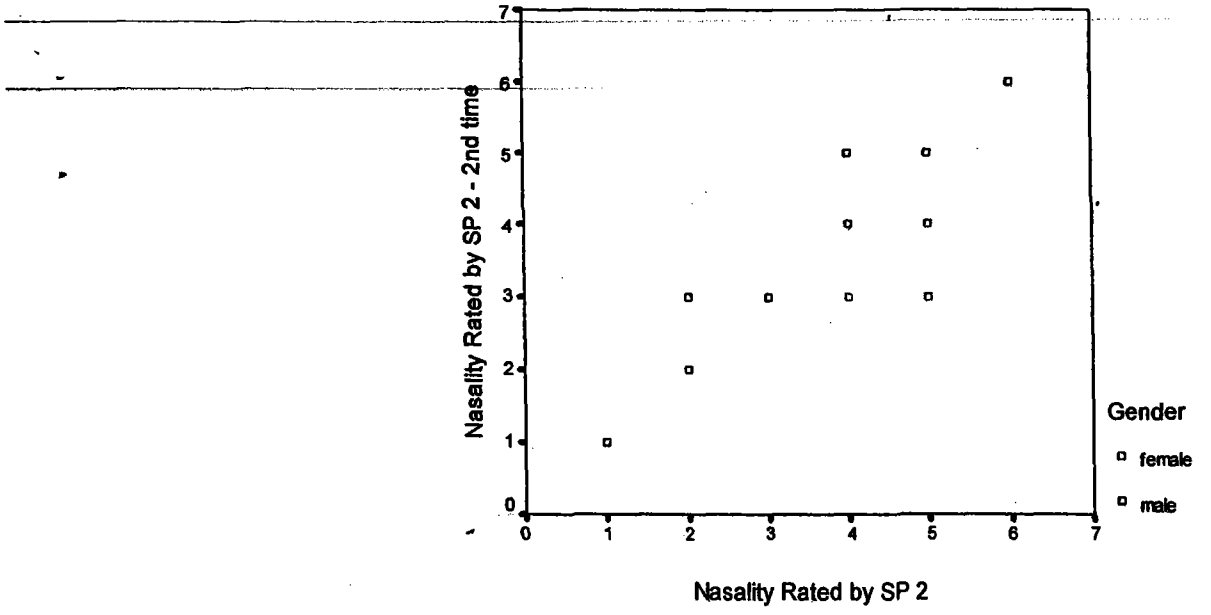

FIGURE 3.4 Scatter plot showing the nasality ratings by SP 2

3.4 CORRELATIONS BETWEEN NASALITY AND NASALANCE

Table 3.8 showed the correlations for the nasalance scores and the hypernasality ratings made by the two speech therapists. Figure 3.5 showed the scatter plot for nasalance scores and the mean nasality ratings (for oral passage) by the two speech-language therapists. The Spearman's correlation between the mean nasalance scores

for the oral passage and the perceptual nasality ratings by the two speech-language therapists ranged from 0.423 to 0.524 (a fair to moderate correlation). The scatter plot shows a linear relationship between the nasalance scores and the perceptual ratings. This shows that as the nasalance scores increase, the severity of the hypernasality was also increased.

TABLE 3.8 Spearman's correlation coefficients between the mean nasalance scores for oral passage and perceptual nasality ratings by SP 1 and SP 2.

Passage	SP 1 – 1st rating	SP 1 – 2nd rating	SP 2 – 1st rating	SP 2 – 2nd rating
Oral	0.492**	0.524**	0.423*	0.486*

** Correlation is significant at $\rho = 0.01$

* Correlation is significant at $\rho = 0.05$

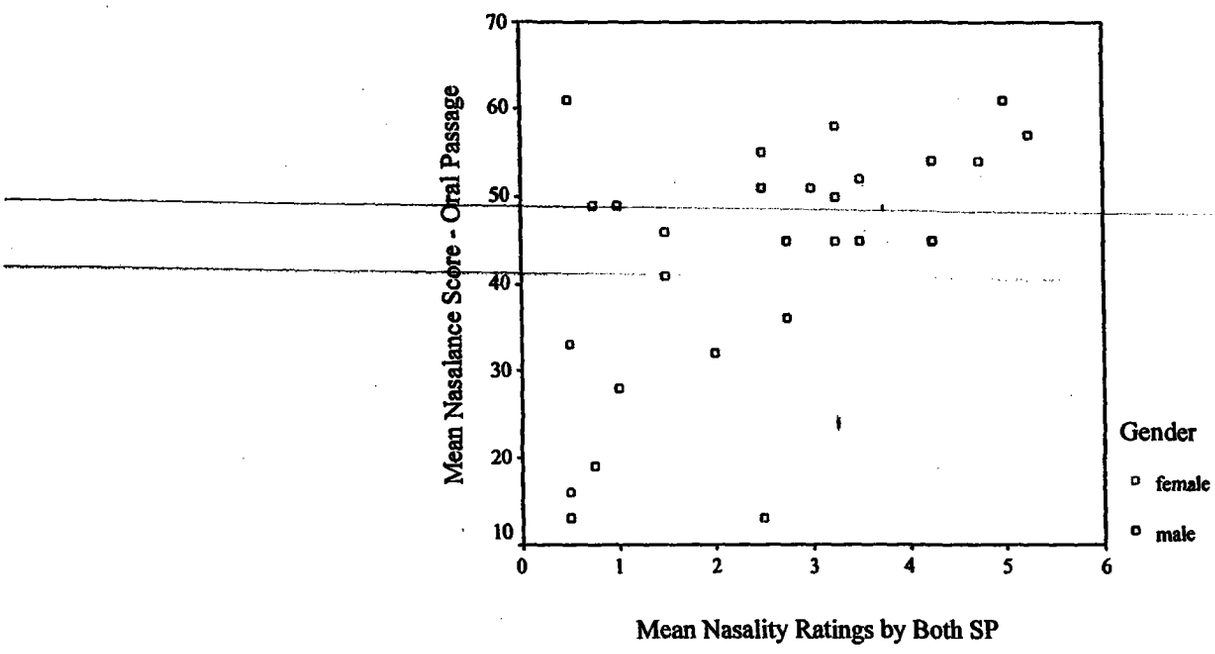

FIGURE 3.5 Scatter plot for nasalance scores of oral passage and mean nasality ratings by both speech-language therapists

The ten normal speech samples randomly presented to the speech-language therapists were all rated as having normal resonance. Therefore, no statistical analysis was computed for any of them.

4.0 DISCUSSION

In Hospital Universiti Sains Malaysia, a child born with a cleft lip and palate will be given special attention from day one of his/her life. However, due to factors such as families' financial constrains and other problems, many of these children may be lost during the follow-up. When they grew older, they faced many problems associated with the deformities that would otherwise have been corrected or minimized during their childhood. One of the complaints that were frequently reported by these adolescents was their nasal speech.

This study aimed to find the mean nasalance scores for normal and repaired cleft children residing around Kota Bharu area. As language and dialect has been shown to influence nasalance scores, the results of this study can only be confidently used with persons in this region (or coming from this area). However, the researcher has tried her best to remind the subjects to read the passages as they would in a classroom, that is, resembling the standard Malay language. Nevertheless, some variations existed, but were considered comparable to the standard Malay language in terms of the percentage of nasal phonemes existed in the sentences, such as 'makan', which was pronounced as 'makang'.

One of the exclusion criteria imposed on the repaired cleft subjects was fistula more than 5 mm^2 in diameter. In this study, three subjects had fistula but its diameter was less than 5 mm^2. Secondary surgeries were performed on seven subjects. The time since the last surgery for 25 of them was more than one year. Only two subjects had a surgery less than one year before data collection (one subject had it done four months before and another subject six months before).

4.1 READING STIMULI

There was no published stimulus in Malay language that could be used with the young subjects. To the author's knowledge, no studies were done on the frequency of occurrence of phonemes in Bahasa Melayu. Therefore, three passages were constructed which resembles the standard passages used in nasometry in terms of the percentage of nasal phonemes. This has been decided in order to compare the results from this study with other researches. Anderson (1996) adopted the same principle in constructing her stimuli for used with 40 of her Spanish-speaking subjects. She cited Leeper et al. (1992) that found significant differences in nasometric values across languages in bilingual speakers, which further strengthened the need to construct new stimuli in Malay language for nasometry purposes.

Teoh (1994) claimed that Malay language is a western Austronesian language. It is "a Type III language namely of CV(C) type in which every syllable must have an onset". 'Standard' Malay was based on the Johor-Riau Malay dialect spoken mainly in the south of Peninsular Malaysia (Kelantan is situated in the North-eastern part of Peninsular Malaysia). It is characterized by schwa (/□/) in word final positions, which in other dialects (for example the Kelantan dialect used by the subjects in this study) normally is realized as [a]. According to Teoh, vowel nasalization in standard Malay "operates across morpheme boundary and penetrates the glides [w], [y], and [h] and glottal stop". It simply meant that the nasalization of vowels spread to adjacent

segments if the next phoneme is a glide, for example /mahal/ (expensive) is realized as [mãhãl]. Another characteristic of standard Malay is the deletion of final consonant /r/, which was also observed in Kelantan dialect.

Nichols (1999) experimented with shorter nasal stimulus and noted that the overall mean nasalance scores in any study which utilized many children might be reliable, but assessment of individuals might not. The author claimed that there was a reduction in the stability of measurements when the number of sentences used in the stimulus was reduced. In contrast, Watterson et al. (1996) in their study utilizing shorter passages reported similar findings with the well-known Zoo Passage and Rainbow Passage. In conclusion to their findings, Watterson et al. recommended a simpler stimulus for use with younger subjects for practical purposes. The passages used in this study were short and using simple words so that they could be easily read or repeated by young children.

Dalston and Seaver (1992) found that Rainbow Passage "does not provide clinically relevant information that cannot be obtained using the other speech samples studied". Many other researchers followed this recommendation and excluded an oronasal stimulus, or forwarded the same recommendation as Dalston and Seaver, considering that their results with an oronasal stimulus showed the same outcome (Watterson et al. 1993; Watterson et al. 1996). Despite the proposition, an oronasal stimulus was still employed in this study to ensure its effect in Malay language. From the analysis, the same conclusion can be made on the Malay oronasal passage used in this study. Future studies pertaining to nasalance scores need not include an oronasal stimulus, which would assure certain benefits such as reducing the time in data gathering and less data to analyze.

Kuehn and Moller (2000) claimed that a standard reading passage was useful because it provided a consistent speech sample. The same standard passage could be used for recordings and then utilized in perceptual judgments by the respective listeners. Another plus point in using a standard passage was that the researcher(s) could compare the speech characteristics before and after any treatment or intervention. In this study, the same passages were used as stimuli for nasometric analysis and the perceptual nasality judgment. Future researchers in the studies of speech in Malay could reliably compare their results with this study if they use these passages as part of the stimuli.

4.2 NASALANCE SCORES

The normative mean nasalance scores (standard deviations/SD) reported by Kay Elemetrics (Kay) (2003) were 59.55% (SD 7.96) for Nasal Sentences, 11.25% (SD 5.63) for Zoo Passage (oral passage) and 31.47% (SD 6.65) for Rainbow Passage (oronasal passage). However, Kay's data was derived from 40 adults, as compared to this study, which used younger subjects. Nevertheless, the mean nasalance scores obtained from this study were within the range reported in Kay's documented scores. The mean nasalance scores for the normal group was also within the range reported by other researchers which looked at nasalance scores for a language different from English (Haapanen 1991b; Nichols 1999; Prathanee et al. 2003; Whitehill 2001). These are shown in Table 4.1.

TABLE 4.1 Nasalance scores (NS) in other languages

Researcher(s)	Language	NS % (SD) Oral stimulus	NS % (SD) Nasal stimulus
Haapanen 1991b	Finnish	13.6 (5.6)	-
Nichols 1999	Spanish	17.0 (6.72)	55.3 (6.00)
Prathanee et al. 2003	Thai	14.3 (5.8)	51.1 (6.4)
Whitehill 2001	Cantonese	13.7 (7.16)	55.7 (7.38)
This study	Malay	17.7 (6.31)	59.3 (5.65)

Van Lierde et al. (2002) found a significant difference in nasalance scores between normal children and cleft palate children for the oronasal and oral texts, but no significant difference for the nasal text. Findings from this study were consistent with Van Lierde et al.'s and other researchers' that looked at the differences between nasalance scores in cleft patients and in normal children. Table 4.2 showed the nasalance scores in patients with speech disorders reported in other studies.

TABLE 4.2 Nasalance scores (NS) for oral stimulus in repaired cleft patients and patients with other craniofacial anomalies reported in other studies

Studies	Sample size	Age	NS (SD)
Tachimura et al 2004	43	4 - 20	33.5 (13.3)
Nandurkar 2002	10	5 - 12	34.0 (9.38)
Watterson et al. 1998	25	5;4 - 13;3	30.28 (15.35)
Pinborough-Zimmerman et al. 1998	15	4;6 - 13;1	31.06
This study	27	6;0 - 17;11	42.9 (14.43)

The nasalance scores for the cleft group in this study were higher than those reported in other studies. This would suggest that our repaired cleft patients' speech were less acceptable than those patients reported in other studies. One of the factors could be lack of speech therapy services in this country. Speech and language therapy services in HUSM were started at the end of 1999. During that time most of the repaired cleft cases involved in this study would have adopted their own speech articulatory patterns. Those who have received speech therapy would have been more than three years old by 1999 (i.e. the patients were not young enough to benefit maximally from speech therapy). It would be beneficial to examine the nasalance scores in repaired cleft patients who were monitored by a speech-language therapist since they were

small. If the nasalance scores were lower than those reported in this study, the advantages of speech and language therapy could be emphasized to other patients.

The length of the connected speech sample (Watterson et al. 1993; Watterson et al. 1999; Wozney et al. 1994 cited in Kuehn & Moller 2000) and the loudness of production (Watterson et al. 1994) did not have a significant influence on nasalance scores. However, in this study subjects were cautioned not to shout or speak too loudly because there was a meter (called the VU meter) shown at the base of the computer screen which showed how much sound energy was taken for recordings by the nasometer (Kay Elemetrics Corp. 2003). If a subject spoke too loud, the meter levels would be too high (overdriven) and shown as red (the meter should only show green and yellow color during recordings) and the subject was advised accordingly. It was observed that hands-on experience with the nasometer over the period of study had made the data collection more reliable.

Scarsellone et al. (1999) examined the effect of maxillary dentures on nasalance scores in normal elderly subjects. They found a significantly lower nasalance scores when dentures were removed but the differences averaged to no more than 2%. They further suggested that the existing normative data for nasalance scores could be used for older individuals, even if they are wearing dentures. This finding could also be applied to any individual wearing a maxillary prosthesis, such as an orthodontic removable appliance, which was frequently constructed for cleft patients whom underwent orthodontic treatment. However, none of the cleft subjects participated in this study wore removable oral prostheses or appliances.

4.3 PERCEPTUAL SPEECH ASSESSMENTS

At present, researchers are recommending that more listeners should be employed in the speech ratings. Due to the shortage of speech-language therapists in HUSM, only two speech-language therapists listened to the recorded speech samples made during data collection. There was a moderate to good correlations between their ratings on the nasality of the subjects. Only audio recordings were used in the perceptual speech assessments due to the limited time and budget. Owing to this limitation, the clearness of the speech samples heard by the speech-language therapists could be queried. However, Moller and Starr (1984) cited in Kuehn and Moller (2000) reported that the perceptual ratings of nasality done under different listening conditions such as live, audio and audio-visual were found to give similar results of nasality, articulation and intelligibility.

Kuehn and Moller (2000) found that deviant articulation was related to increased perception of nasality ratings. In the perceptual speech determination form (Appendix G), ratings of articulation problems were included, but no analysis was reported. However, it was noted that SP 1 rated nine out of 27 (33.3%) cases as having normal articulation patterns, 17 (63%) had mild articulation problems and one (3.7%) had moderate articulation problem. SP 2 rated the cases as six (22.2%) with normal articulation patterns, 15 (55.5%) had mild articulation problems, five (18.5%) had moderate articulation problems and one (3.7%) had severe articulation problem.

4.4 COMPARISON OF PERCEPTUAL EVALUATION AND NASALANCE SCORES

Bagnall and David (1988) assessed the acceptability of speech in repaired cleft children. They reported that naive listeners (non speech therapist) rated the majority (71.5%) of repaired cleft children as having less acceptable speech results compared to their peers. Speech-language pathologists rating the same speech samples found that 48% of the cleft children have "unacceptable speech in need of further intervention". In contrast, a study by Witt et al. (1996) found no significant difference when peers were asked to rate the speech of twenty-one repaired cleft children aged 8-12 years old (mean age 10;6 years) and sixteen matched controls. Speech-language pathologists' ratings made on the same batch of subjects was found to have significant differences in the resonance and intelligibility aspects in the cleft group. Witt et al. (1997) repeated the study on parents, teachers and speech-language pathologists and they concluded, "parents and teachers are capable of identifying speech dysfunction" and recommended the use of "their ratings as an inexpensive screening tool to detect children at risk for development of speech dysfunction and to monitor these children".

Sweeney et al. (2004) examined the correlations between perceptual ratings of nasality and nasalance scores and found that "the relationships are stronger if perceptual ratings of hypernasality are correlated with speech stimuli devoid of nasal consonants and if perceptual ratings of hyponasality are related to speech stimuli loaded with nasal consonants". Watterson et al. gave the same conclusion from their study in 1993. They found that the sensitivity of the oral passage to detect the presence of hypernasality was 0.71. In this study, the oral passage was deemed the best passage to assess the relationship between nasalance scores and the judgments made by the two speech-language therapists (refer to Table 3.8).

The disagreement between the Nasometer and listeners' judgments could also be "partially related to Nasometer's limited "view" of hypernasality relative to the information that may be used by listeners to arrive at judgments". Watterson et al. (1993) quoted findings by other researchers that "listener perceptions of hypernasality may also be influenced by suprasegmental features such as vocal intensity, vocal pitch, phonetic context, articulation skills, and other variables that are not measured by the Nasometer". Nasal emission was another factor that could affect nasalance scores, but were not registered as an increase in nasality ratings by listeners (Nellis et al. 1992).

4.5 LIMITATIONS Appropriate precautions have been taken to ensure reliable results would be generated from this study, which could be used as references in future studies and clinical works. However, there were some limitations that could not be avoided due to unavailability of resources, financial and time constrains. Should other similar studies be carried out later, the author hoped that these limitations could be looked at as new challenges for a better research.

1. Audiologic assessment was not done on the subjects. Parents/guardians' reporting of absence of hearing pathology were accepted as reliable. All cleft palate patients, especially those in the younger age group, were at risk of hearing problems, which could have an impact on their speech and language

development (Witzel 1995 and Jocelyn et al 1996 both cited in Bureau et al 2001). For future studies, an audiologist would be a valuable member of the research team to ensure more reliable results.

2. Oral examinations were done by a medical staff nurse and the first author (a dentist). No ear, nose and throat (ENT) specialist examined the subjects, therefore the real ENT status of the subjects could be questioned.

3. Data collection and speech sample recordings were not done in a sound-treated room, because there was no such room available in the setting where this study was carried out. Background noises could affect the recordings, although according to Kay Elemetrics Corp. (2003) the nasometer would not pick up petty background noises.

4. Subjects in this study either read or repeated the stimuli. Only twelve subjects read and repeated the stimuli to see the differences between these two methods of collecting data. No significant difference was detected, however the results would be more reliable if more subjects were included in the analysis. There are other studies that did not separate the two differing methods of data collection (Dalston & Seaver 1992; Keuning et al. 2002; Nichols 1999), that is, it was not considered as a factor influencing nasalance scores. However, there are some studies that made sure all of the subjects involved used only one method, either reading the test stimuli (Anderson 1996; Tachimura et al. 2000) or reciting them after the examiner (Sweeney et al. 2004).

5. Only two speech-language therapists were included in this study. This was due to the limited number of speech personnel in the hospital. A study was thought to be more reliable if more listeners were employed in the speech ratings.

6. The speech-language therapists participating in this study were general speech-language pathologists. No specialist speech-language pathologist worked in the hospital. This was thought as a limitation because other studies have shown that nasalance scores and nasality ratings were of better correlations when the ratings were accomplished by experienced (specialists) speech-language pathologists.

4.6 RECOMMENDATIONS

When a child was born with a cleft, the family was faced with not only emotional burden, but also financial liability. Strauss (1999) cited in Murray (2002) stressed that "craniofacial anomalies patients require surgical, nutritional, dental, speech, medical and behavioral interventions" and all these imposed a "substantial economic burden". Murray in 2002 called for a preventive approach to lessen the likelihood of giving birth to a cleft baby. The sensible guide to follow in decreasing the risk of having a child with a cleft was to avoid exposures of known environmental factors and other teratogenic substances such as smoking and alcohol in pregnancy. Drugs for medical treatment, for example anticonvulsant medications, need to be re-evaluated when the mother was trying to get pregnant or suspected she was pregnant. Prevention may also

benefit from maternal nutritional supplementation, in particular with folic acid (400μg daily), vitamin B_6 or other micronutrients (Loffredo et al. 2001 cited in Murray 2002).

Young mothers-to-be should be educated through the various means (e.g. mass media) to increase their awareness of these issues. Information about the etiology and genetics of the defects should be made available at all clinics and hospitals, along with the influence of cleft upon a child's development and the problems associated with the deformity. The parents of an affected child should be given detailed information about management protocol, types of treatment available that they can choose from (if there was any), the complications and outcomes of treatment and any other information relevant to the parents. There should also be a personnel assigned in every hospital to cater for these cleft (and other syndromic) patients' needs such as to listen to any queries that might be brought up by parents and families, or for information about support group in the area.

Although 'prevention is the best medicine', there is still need to look at the management protocol for these unfortunate children born with clefts so that they could be integrated socially without being labeled as different, esthetically and psychologically. Rohrich et al. (2000) did a long term study on optimal timing of cleft repair and recommended "closure of the soft palate at 3 to 6 months of age, with secondary closure of the residual hard palate at 15 to 18 months of age". This is to minimize speech problems in these children, which would cost a substantial amount of money to correct the deviant speech patterns. Enderby and Emerson (1996) documented that "speech and language therapy for cleft children with velopharyngeal incompetence or borderline competence was proven effective by some published evidence". As an extension from this study, the author would like to recommend the usage of nasometer in assessing hypernasality for pre- and post-operative assessments.

Park et al (2000) concluded that speech of a cleft child should be monitored at least up to age ten because their findings suggested that speech was not stable up to this age. Therefore, it was strongly recommended that our repaired cleft patients were encouraged to attend the speech clinic for assessments during their development.

As most of the cleft patients were from the lower socio-economic background and lived far from the city, speech and language therapy services should be extended into the community. One of the problems frequently faced by the parents to bring their child to the hospital was financial and logistic problems, especially for those who lived in the rural area. As for now, the speech and language therapy services were only available in selected hospitals. It would benefit more patients if this service was made available in the rural areas.

As was discussed earlier, the stimulus for nasometric purposes should be in Malay language, short and simple for easy recitations by young children and if possible reflecting the Malay language spoken in everyday life. Watterson et al. (1998) have further suggested for a construction of different stimulus with high-pressure and low-pressure consonants.

Various nasalance cut-off scores have been reported for oral passage to help differentiate between clinically significant hypernasality and normal resonance

balance. For example, Hardin et al. (1992) used a nasalance cut-off score of 26%, which correspond to a specificity of 0.85, sensitivity of 0.76 and overall efficiency of 0.82. When a cut-off score of 32% was used, Hardin et al. reported a specificity of 0.91 but the sensitivity was only 0.57, with overall efficiency of 0.81. Dalston et al. (1993) reported a nasalance cut-off score of 28%, which gave a specificity and sensitivity of 0.86 and 0.87 respectively, and an overall efficiency of 0.87. Watterson et al. (1996) established a cut-off score of 22% for the Zoo Passage, which gave them a specificity and sensitivity of 0.50 and 0.72 respectively, and overall efficiency of 0.70. Nasalance cut-off score was not identified from this study, however, the information above were given to show the reliability of nasometer in detecting hypernasality and how the cut-off scores differ from one study to another. These differences have been described as owing to several factors such as differences in methods and the different stimuli used (apart from the other factors that were discussed in chapter two). In future studies the nasalance cutoff scores in Malay language could be established utilizing the research methods described by these researchers.

4.7 CONCLUSIONS

This study provides normative nasalance scores for Malay-speaking Kelantanese children. These scores could be utilized as references in the management of patients with resonance disorders. The nasalance scores for the cleft group could be used in comparing the speech outcomes of our cleft patients with other centers worldwide. Thus, our management protocol in looking after these cleft cases could be improved by taking into account the extra measures taken by other cleft centers in managing their patients, for example the usage of a standardized speech assessment in measuring outcomes of palatal surgery. It is the author's hope that a speech assessment in Malay language would be developed for use in this country, which would also consider the different dialects in its application, as Malaysia is a multi-cultural country and craniofacial deformities do not choose their victims.

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Apabila selesai dilengkapkan, borang tersebut perlulah dikembalikan kepada penyelidik.

Anak/jagaan anda akan diminta untuk membaca/meniru penyelidik membaca beberapa perenggan ayat untuk mendapatkan nilai kesengauan yang akan diproses oleh komputer. Semasa pengambilan data ini, anak/jagaan anda perlu memakai satu alat yang akan diletakkan di atas kepala. Alat ini tidak akan mendatangkan sebarang kesan mudarat atau rasa sakit terhadap anak/jagaan anda.

Risiko
Tiada sebarang risiko atau kesan sampingan yang akan timbul dengan memakai alat yang digunakan untuk pengukuran nilai kesengauan.

Manfaat
Data yang didapati dari kajian ini diharapkan akan dapat digunakan bagi membangunkan suatu kaedah rawatan atau pendekatan yang berfaedah untuk kanak-kanak dengan rekahan bibir/lelangit dalam membaiki pertuturan mereka. Anak/jagaan anda juga akan diberi hadiah/sumbangan sebagai penghargaan.

Kerahsiaan
Identiti anda dan anak/jagaan anda sebagai peserta kajian adalah dirahsiakan. Segala maklumat yang bakal diperolehi akan sentiasa dirahsiakan dan hanya digunakan untuk tujuan kajian semata-mata. Ia juga tidak akan diedarkan kepada umum kecuali jika diperlukan oleh undang-undang.

Penyertaan dalam kajian:
Sekali lagi diingatkan bahawa penyertaan anak/jagaan anda di dalam kajian ini adalah secara sukarela. Anda berhak menolak atau menamatkan penyertaan anak/jagaan anda pada bila-bila masa. Penyertaan anak/jagaan anda juga boleh diberhentikan oleh penyelidik tanpa persetujuan anda sekiranya anak/jagaan anda didapati tidak lagi layak sebagai peserta kajian.

Sekiranya anda mempunyai sebarang soalan mengenai hak-hak anak/jagaan anda sebagai peserta dalam kajian ini, sila hubungi:

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Untuk dimasukkan ke dalam kajian ini, anda atau wakil sah anda mesti menandatangani serta menulis tarikh di halaman tandatangan (lihat Lampiran 1).

INFORMATION AND CONSENT FORMS FOR NORMAL CHILDREN

Tajuk kajian
Nasalance score in normal children and in repaired cleft lip and palate children speaking the Malay language. (Skor nasalan pada kanak-kanak normal dan kanak-kanak rekahan bibir dan lelangit yang telah dibedah yang menggunakan Bahasa Melayu)

Pengenalan
Anak/jagaan anda telah dipilih secara rawak untuk menyertai penyelidikan seperti tajuk di atas. Penyelidikan ini bertujuan untuk mendapatkan nilai normal bagi tahap kesengauan pertuturan kanak-kanak normal. Nilai ini kemudiannya akan digunakan sebagai perbandingan dengan nilai yang didapati pada kanak-kanak rekahan bibir dan lelangit yang telah menjalani pembedahan. Bidang rekahan bibir dan lelangit ini adalah sangat kompleks dan banyak perkara baru yang masih tidak difahami, contohnya mengapa pertuturan anak-anak ini masih sengau walaupun telah dibedah beberapa kali? Penyelidikan adalah amat perlu untuk membantu kita mencari jalan penyelesaian atau sekurang-kurangnya meringankan masalah yang mungkin dihadapi oleh anak-anak ini dalam menjalani kehidupan.

Sehubungan dengan itu anda terlebih dahulu diminta agar membaca dan memahami segala keterangan di bawah yang akan memberi penerangan lanjut mengenai prosedur, manfaat dan risiko, serta lain-lain aspek berkaitan dengan kajian.

Tujuan Kajian
Kajian ini adalah bertujuan untuk mengetahui tahap kesengauan dalam pertuturan anak-anak normal untuk dibandingkan dengan kanak-kanak yang telah menjalani pembedahan rekahan bibir/lelangit.

Syarat-syarat untuk menyertai kajian
Anak/jagaan anda layak untuk menyertai kajian ini sekiranya:

1. Anak/jagaan anda dilahirkan 'normal'.
2. Anak/jagaan anda tiada masalah perubatan yang melibatkan pertuturannya terganggu.
3. Anak/jagaan anda boleh membaca atau meniru apa yang dibaca oleh penyelidik.

Anda dan anak/jagaan anda tidak layak menyertai kajian ini sekiranya:

1. Anak/jagaan anda mengalami gejala berkaitan telinga, hidung dan tekak pada hari kajian dilakukan.

Prosedur kajian
Sekiranya anak/jagaan anda menepati syarat-syarat kelayakan seperti yang dinyatakan dan berminat untuk turut serta di dalam kajian ini, anda perlulah memberi persetujuan bertulis dengan cara menandatangani borang keizinan yang dilampirkan (Lampiran 1).

9.	c. Prof. Syed Hatim Noor	Coordinator, Biostatistic & Research Methodology Unit	M	✓
10.	Assoc. Prof. Zalina Ismail	Lecturer, School of Health Sciences	F	✓
11.	Assoc. Prof. Wan Abdul Manan Wan Muda	Lecturer, School of Health Sciences	M	✓
12.	Madam Siti Hawa Ali	Lecturer, School of Health Sciences	F	✓
13.	Dr. Wihaskoro Sosroseno	Lecturer, School of Dental Sciences	M	x
14.	Dr. Zaidun Kamari	Deputy Director, Hospital U.S.M	M	✓
15.	Dr. Mary Abraham	Director, Hospital Kota Bharu, Kelantan	F	✓
16.	Hj. Ismail Hassan	Ex-USM Linguistic Teacher	M	✓

Thank you.

"GLOBAL COMPETITIVENESS : OUR COMMITMENT"

Yours sincerely,

(PROFESSOR. ZABIDI AZHAR MOHD. HUSSIN)
Chairman of Research & Ethics Committee

c.c ⇨ Secretary of Research & Ethics Committee

[illegible]

persetujuan bertulis dengan cara menandatangani borang keizinan pesakit yang dilampirkan (Lampiran 1). Apabila selesai dilengkapkan, borang tersebut perlulah dikembalikan kepada penyelidik. Seterusnya anda diminta menjawab beberapa soalan kajiselidik.

Anak/jagaan anda pula akan diminta untuk membaca/meniru penyelidik membaca beberapa perenggan ayat untuk mendapatkan nilai kesengauan yang akan diproses oleh komputer. Semasa pengambilan data ini, anak/jagaan anda perlu memakai satu alat yang akan diletakkan di atas kepala. Alat ini tidak akan mendatangkan sebarang kesan mudarat atau rasa sakit terhadap anak/jagaan anda. Penyelidik akan menunjukkan gambar yang memperlihatkan seorang kanak-kanak menggunakan alat tersebut.

Risiko
Tiada sebarang risiko atau kesan sampingan yang akan timbul dengan menjawab soalan yang diutarakan dan memakai alat yang digunakan untuk pengukuran nilai kesengauan.

Manfaat
Data yang didapati dari kajian ini diharapkan akan dapat digunakan bagi membangunkan suatu kaedah rawatan atau pendekatan yang berfaedah untuk kanak-kanak dengan rekahan bibir/lelangit dalam membaiki pertuturan mereka. Anak/jagaan anda juga akan diberi hadiah/sumbangan sebagai penghargaan.

Kerahsiaan
Identiti anda dan anak/jagaan anda sebagai peserta kajian adalah dirahsiakan. Segala maklumat yang bakal diperolehi akan sentiasa dirahsiakan dan hanya digunakan untuk tujuan kajian semata-mata. Ia juga tidak akan diedarkan kepada umum kecuali jika diperlukan oleh undang-undang.

Penyertaan dalam kajian:
Sekali lagi diingatkan bahawa penyertaan anda di dalam kajian ini adalah secara sukarela. Anda berhak menolak atau menamatkan penyertaan anda pada bila-bila masa. Penyertaan anda juga boleh diberhentikan oleh penyelidik tanpa persetujuan anda sekiranya anda didapati tidak lagi layak sebagai peserta kajian.

Sekiranya anda mempunyai sebarang soalan mengenai hak-hak anda sebagai peserta dalam kajian ini, sila hubungi:

Dr Norsila Abdul Wahab
Pusat Pengajian Sains Pergigian,
Universiti Sains Malaysia Kampus Kesihatan
16150 Kubang Kerian, Kelantan.

Tel: 09-7663769 / 013-3321802

Untuk dimasukkan ke dalam kajian ini, anda atau wakil sah anda mesti menandatangani serta menulis tarikh di halaman tandatangan (lihat Lampiran 1).

INFORMATION AND CONSENT FORMS FOR CLEFT SUBJECTS

Tajuk kajian
Nasalance score in normal children and in repaired cleft lip and palate children speaking the Malay language. (Skor nasalan pada kanak-kanak normal dan kanak-kanak rekahan bibir dan lelangit yang telah dibedah yang menggunakan Bahasa Melayu)

Pengenalan
Anak/jagaan anda telah dan akan/sedang menjalani rawatan bagi kes rekahan bibir/lelangit. Bidang ini adalah sangat kompleks dan banyak perkara baru yang masih tidak difahami, contohnya mengapa pertuturan anak-anak ini masih sengau walaupun telah dibedah beberapa kali? Penyelidikan adalah amat perlu untuk membantu kita mencari jalan penyelesaian atau sekurang-kurangnya meringankan masalah yang mungkin dihadapi oleh anak-anak ini dalam menjalani kehidupan.

Anda dan anak/jagaan anda dipelawa untuk menyertai satu kajian secara sukarela bagi mengetahui tahap kesengauan dalam pertuturan anak/jagaan anda yang telah menjalani pembedahan rekahan bibir/lelangit.

Sehubungan dengan itu anda terlebih dahulu diminta agar membaca dan memahami segala keterangan di bawah yang akan memberi penerangan lanjut mengenai prosedur, manfaat dan risiko, serta lain-lain aspek berkaitan dengan kajian.

Tujuan Kajian
Kajian ini adalah bertujuan untuk mengetahui tahap kesengauan dalam pertuturan anak-anak yang telah menjalani pembedahan rekahan bibir/lelangit. Data tahap kesengauan ini akan juga diambil dari kanak-kanak normal sebagai perbandingan.

Syarat-syarat untuk menyertai kajian
Anda dan anak/jagaan anda layak untuk menyertai kajian ini sekiranya:

1. Anak/jagaan anda telah menjalani pembedahan rekahan bibir/lelangit.
2. Anak/jagaan anda tidak menghidapi sebarang gejala berkaitan telinga, hidung dan tekak pada hari kajian dilakukan.
3. Anak/jagaan anda boleh membaca atau meniru apa yang dibaca oleh penyelidik.

Anda dan anak/jagaan anda tidak layak menyertai kajian ini sekiranya:

1. Anak/jagaan anda mengalami rekahan bibir/lelangit yang dikaitkan dengan sesuatu sindrom/penyakit.

Prosedur kajian
Sekiranya anda dan anak/jagaan anda menepati syarat-syarat kelayakan seperti yang dinyatakan dan berminat untuk turut serta di dalam kajian ini, anda perlulah memberi

Lampiran 1
No siri_____

Tajuk kajian: *Nasalance score in normal children and in repaired cleft lip and palate children speaking the Malay language.* (Skor nasalan pada kanak-kanak normal dan kanak-kanak rekahan bibir dan lelangit yang telah dibedah yang menggunakan Bahasa Melayu)

Borang Keizinan
Halaman Tandatangan

Untuk menyertai kajian, anda atau wakil sah anda mesti menandatangani mukasurat ini

Dengan menandatangani muka surat ini, saya mengesahkan yang berikut:

- ☐ Saya telah membaca semua maklumat dalam Borang Maklumat dan Keizinan Peserta, termasuk apa-apa maklumat berkaitan risiko yang ada dalam kajian dan saya telahpun diberi masa yang mencukupi untuk mempertimbangkan maklumat tersebut.
- ☐ Semua soalan-soalan saya telah dijawab dengan memuaskan.
- ☐ Saya secara sukarela, bersetuju menyertai kajian penyelidikan ini, mematuhi segala prosedur kajian dan memberi maklumat yang diperlukan kepada penyelidik dan juga kakitangan lain yang berkaitan apabila diminta.
- ☐ Saya boleh menamatkan penyertaan saya dalam kajian ini pada bila-bila masa.
- ☐ Saya telahpun menerima satu salinan Borang Maklumat dan Keizinan Peserta untuk simpanan peribadi saya.

_____	_____
Nama Ibu/Bapa/Penjaga	Nama Anak/jagaan
_____	_____
No. Kad Pengenalan Ibu/Bapa/Penjaga	No. K/P @ S/B Anak/jagaan
_____	_____
Tandatangan Ibu/Bapa/Penjaga atau Wakil Sah	Tarikh (ddmmyy)
_____	_____
Nama Individu yang Mengendalikan Perbincangan Keizinan	No. Kad Pengenalan
_____	_____
Tandatangan Individu yang Mengendalikan Perbincangan Keizinan	Tarikh (ddmmyy)

APPENDIX E

READING STIMULI

Nasal stimulus

Mimi mahu makan nasi
Mama Mimi masak nasi ayam
Nenek Mimi datang
Mimi jemput nenek makan

Oral stimulus

Perut Ali sakit
Ali pergi ke hospital
Doktor beri Ali ubat
Perut Ali tak sakit lagi

Oronasal stimulus

Burung kakak tua
Hinggap di jendela
Nenek sudah tua
Giginya tinggal dua

APPENDIX F

SOCIO-DEMOGRAPHIC FORM

DATA SOSIO-DEMOGRAFI No siri:_____

(i) Butir-butir Peribadi Anda

Alamat :

_____

_____

Jumlah anak dalam keluarga anda: _____orang. Anak ini yang ke:_____

Hubungan dengan anak: Ibu ☐ Bapa ☐ Penjaga ☐

Status Perkahwinan: Berkahwin ☐ Janda ☐ Duda ☐ Belum kahwin ☐

Tahap Pendidikan:

Tidak Bersekolah ☐

Sekolah Rendah ☐

Sekolah Menengah ☐

Diploma ☐

Ijazah & ke atas ☐

Pekerjaan :_____

Pendapatan bulanan : RM _____

Pendapatan bulanan pasangan anda (jika masih tinggal bersama) : RM_____

(ii) Butir-butir Peribadi Anak/jagaan Anda

Jantina : Lelaki ☐ Perempuan ☐

Tarikh lahir : _____

Berat badan : _____

Ketinggian : _____

APPENDIX G
PERCEPTUAL SPEECH DETERMINATION

No	Intelligibility			Normal resonance (0)	Hypernasality / hyponasality						Mixed nasality (7)	Articulation problem			
	Yes	No	Sometimes		Normal-mild (1)	Mild (2)	Mild-moderate (3)	Moderate (4)	Moderate-severe (5)	Severe (6)		No problem	Mild	Moderate	Severe
1															
2															
3															
4															
5															
6															
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