CHAPTER 1. INTRODUCTION

In this chapter, the background of and justification to this study are stated, followed by the statement of purpose of this study and the organizations of the dissertation.

1.1. Background

Drooling often caused repeated breakdown and infections in peri-oral skin. Clothing and bibs become soiled and needed frequent changing. In addition, teaching materials and communicative devices may become wet and damaged. Dehydration may happen for severe drooling cases (Morris, 1977). It is also unsightly and produces an unpleasant odor, people may avoid individuals who drool and physical contact may be reduced. Social isolation may be the result (Blasco & Allaire, 1992; Thorbecke & Jackson, 1982; Van de Heyning, Marquet, & Creten, 1980).

Treatment approaches including medication, surgery focus on reducing saliva production or redirecting the flow, cognitive behavioral techniques aim at using voluntary control to prevent drooling. However it was still inconclusive for the treatment effectiveness. All of them are not directly intervening the sensorimotor deficit, which is the major cause of drooling (Ekedahl, Mansson, & Sandberg, 1974; Lespargot, Langevin, Muller, & Guillemont, 1993; Potulska & Friedman, 2005).

Oral motor therapy is a fundamental management modality used to treat the underlying problem - oral motor deficit - of drooling (Blasco, 2002). The effectiveness of Rood's approach for lip and mouth closure techniques on drooling of children with mental retardation and cerebral palsy has been demonstrated by various studies (Iammatteo, Trombly, & Luecke, 1989; Ray, Bundy, & Nelson, 1983; Samelstad, 1988; Yam, Yang, Abdullah, & Chan, 2005). However, these are single

case studies with the results that cannot be generalized to the population. From a retrospective study using the Beckman's protocol, significant improvement is found in the strength and range of lips and cheek, ($p < 0.008$), (Beckman et al., 2005). Significant improvement is found in two randomized control trail studies on the suckling ability of at risk infants (Fucile, Gisel, & Lau, 2002, 2005). Most of the research studies are mainly work on children with cerebral palsy or at risk infant; the effectiveness of the techniques for children with severe mental handicap (SMH) is not extensively explored. There were no studies that addressed the effectiveness of treatment when it was carried out by caregivers, who have more contact with the child throughout the day and with larger chance for bringing the skills throughout the transitions of the people with SMH from one setting to another.

In the present study, it is trying to investigate the effectiveness of oral motor therapy on drooling management for children with severe mental handicap when the therapy is carried out by caregivers, with training from professional staff.

1.2. Statement of Purpose

The objectives of the study included:

- To evaluate the effectiveness of oral motor therapy on drooling of children with severe mental handicap (SMH) implemented by caregivers, including the parents, maid, and the house-parent of the school hostel, and
- To determine potential factors influencing the success of the caregiver education and training on implementation of oral motor therapy

1.3. Organizations of Chapters

This dissertation consists of five chapters. Chapter 2 summarizes a review of

related literature on interventions for drooling. It highlights the pros and cons of different modalities and the rationale of two common approaches of oral motor therapy. Chapter 3 presents the method used in this study including research design, sampling, data collection procedures, and outcome measures. Chapter 4 presents the results, including the demographic characteristics of the participating students, the findings of the assessments and comparison between the experimental and control groups. Chapter 5 discusses and interprets the findings before addressing the limitations of the study and the implications for further research. Finally, Chapter 6 sets out the conclusions.

CHAPTER 2. LITERATURE REVIEW

2.1. Persons with Severe Mental Handicap

The term severe mental handicap (SMH) here refers to the conditions with severe mental handicap and profound mental handicap. According to ICD-10, people with SMH demonstrate a marked degree of motor impairment or other associated deficits that indicate the presence of clinically significant damage to or maldevelopment of the central nervous system. The intelligent quotient (IQ) in this category is estimated to be under 34. Comprehension and use of language are limited to, and to the best, understanding basic commands and making simple requests (WHO, 1996). Those “marked degree of motor impairment” may also happen at oral and facial structure, and together with the maldevelopment of central nervous system which affect the motor control for saliva. The inability to understand and follow instructions may make the affected persons more difficult to perform oral motor exercise by themselves or to use cognitive behavioral/ behavioral therapy (e.g., self-instruction technique) for management of drooling.

2.2. Drooling

Drooling, unintentional loss of saliva from the oral cavity, causes physical, functional, psychosocial, and clinical burdens on the persons, their families, and other caregivers. Drooling normally happens during infancy and subsides by 15 to 18 months old as a consequence of oral motor development and will be considered as abnormal if it persists in awaked time after 4 years old (Blasco & Allaire, 1992). Children with drooling problems often experience repeated peri-oral skin breakdown and infections. Clothing and bibs become soiled and need frequent changing. In

addition, teaching materials and communicative devices may become wet and damaged. Dehydration may happen for severe cases (Morris, 1977). As drooling creates an unsightly appearance and produces an unpleasant odor, people may avoid physical contact with individuals who drool. Social isolation may eventually be the result (Blasco & Allaire, 1992; Thorbecke & Jackson, 1982; Van de Heyning et al., 1980).

There was no published paper reporting the prevalence rate of drooling among people with severe mental handicap. However, the prevalence rate for individuals with cerebral palsy with drooling problems has been estimated to be in 37.4 to 58 percent (Tahmassebi & Curzon, 2003; Van de Heyning et al., 1980).

Oral motor dysfunction had been claimed as the primary cause of drooling in children with cerebral palsy (Harris & Purdy, 1987; Hussein, Kershaw, Tahmassebi, & Fayle, 1998). Consistent finding was found in Sochaniwskyi's study, among children with drooling problems, they showed significant decrease in frequency and efficiency of swallowing (Sochaniwskyj, Koheil, Bablich, Milner, & Kenny, 1986). Oral motor disorders caused inability to handle the continuously producing saliva was reported to be the major causes of drooling (Lespargot et al, 1993; Senner, Logemann, & Gaebler-Spiram, 2004). Swallow begins with sensory input, the tactile stimulation of pharyngeal receptors that send impulses to the integrative areas for swallowing—called "swallowing centers" in the medulla and pons. Motor output from this center, transmitted via the cranial nerves (including: trigeminal, facial, glossopharyngeal, vagus, accessory, and hypoglossal nerves), controls the sequential peristaltic coordination of pharyngeal and upper esophageal muscles that contract during swallowing, and at the same time various orofacial muscle coordinate to allow the salvia to be swallowed effectively (Meningaud, Poramate, Luc, &

Jacques-Charles, 2006). When the above sensorimotor loop is disordered, and makes ones oral motor and swallowing function cannot handle the continuously producing saliva, pooling will first happen, and then drooling would occur (Meningaud, Poramate, Luc, & Jacques-Charles, 2006).

2.3. Drooling and Oral Motor Abilities

Drooling is mostly caused by poor oral and facial muscle control (Potulska & Friedman, 2005). Children who drool may have increased difficulty forming a bolus (Ekedahl et al., 1974); reduced lip closure; less intraoral suction and more oral residue after the swallow (Lespargot et al., 1993); and decreased ability in sucking, chewing, swallowing, and head, lip, jaw, and tongue control (Van de Heyning et al, 1980). In sensory aspects, facial and oral hyposensitivity could lead to delay in triggering of swallowing reflex (Palmer & Heyman, 1993), as well as overall oral motor development due to insufficient oral sensorimotor experience.

2.4. Interventions for Drooling

Various approaches to manage drooling have been described in the literature, including oral motor therapy, cognitive behavioral therapy, medications, radiotherapy and surgical treatments (Meningaud, Poramate, Luc, & Jacques-Charles, 2006).

Different professionals tried to use their modalities to handle drooling, however it was still inconclusive for the effectiveness of them. Medication, used to reduce saliva production, has been reported to have undesirable side effects in one third of the persons. It includes excessively dry mouth, constipation, urinary retention, blurred vision, irritability, and confusion (Blasco, 2002). Surgical management (e.g. section the parasympathetic neural pathway, or redirection of the salary duct), which

is used to reduce or redirect the saliva flow, is reserved as the last resort due to its invasive in nature (Blasco, 2002). Intra-oral appliance could be effective to decrease drooling. However, there is a lack of scientific report on their efficacy (Blasco, 2002). Cognitive Behavioral techniques, aiming as the facilitating the use of voluntary control method such as self-instruction technique is usually effective for those that have mild drooling problems (Blasco, 2002). All these approaches are not directly intervening the oral sensorimotor deficit, which is the major cause of drooling (Ekedahl et al, 1974; Lespargot et al., 1993; Potulska & Friedman, 2005).

2.5. Oral Motor Therapy

Oral motor therapy is the fundamental management modalities for drooling (Blasco, 2002). It is to treat the underlying problem - oral motor deficit - of drooling. In this study, oral motor therapy would refer to therapy treating both oral sensory and motor problems.

"Oral motor" has been defined in a variety of ways. Strategies developed using Rood's concept at 1950's and '60's were primarily stimulation techniques, such as brushing (pressure massage), icing (thermal stimulation), quick stretch (tapping), and vibration (manual and mechanical) (Rood, 1958; Morris,1977; Loiselle,1979). These strategies have been known as a neurodevelopment approach used by physical and occupational therapists to prepare a muscle area for movement. These strategies cannot change the range of movement of a muscle or the strength of a muscle without additional muscle movement.

Other oral motor techniques such as Sara Rosenfeld-Johnson's Oral-Motor Exercises, Mouth Madness Oral Motor Activities for Children by Catherine Orr, require the individual's to have more cognitive cooperation to follow a command in

order to complete a movement. But what if the individual cannot cooperate cognitively, or, due to significant motoric involvement, cannot follow the therapist's verbal directive to "lick your lips," or "move your tongue up toward your nose," or "round and spread your lips?" Many individuals with impaired oral motor skills are not able to follow a command for oral movement. To better serve such individuals, Debra Beckman has, since 1975, worked to develop these specific interventions to activate muscle contraction and to build strength. The focus of these interventions is to increase functional response to pressure and movement, range, strength, variety and control of movement for the lips, cheeks, jaw and tongue. The interventions needed are determined by an assessment, the Beckman Oral Motor Protocol.

As our targeted population is severe mental handicap. So the rationale of the techniques used in the present study would be based on the Beckman Oral Motor Therapy Protocol (Beckman, 2005) and the Rood approach with techniques as described by Morris (1977) and Loiselle (1979).

2.5.1. Rood's Approach

Rood (1958) believes that activation of muscles proceeds from reflex or involuntary stimulation to voluntary control (Rood, 1958). Loiselle (1979) incorporated Rood's approach into oral motor skill training. Oral motor skills development, similar to other motor skills development, can be activated reflexively through stimulation of appropriate sensory receptor using the techniques of vibration, icing, stretching on facial and oral parts, thus facilitate the development of new neurological pathways, eventually voluntary control would develop together with the maturity of neurological system (Loiselle, 1979). The effectiveness of lip and mouth closure techniques on drooling in children with mental retardation and cerebral palsy

has been demonstrated by various studies (Iammatteo et al., 1989; Ray, Bundy & Nelson, 1983; Samelstad, 1988; Yam et al., 2005). However, these are single-case studies with the result cannot be generalized to the whole population.

2.5.2. The Beckman Oral Motor Protocol

Debra Beckman has, since 1975, worked to develop specific interventions to assist movement, activate muscle contraction, and to provide movement against resistance to build strength. These interventions focus on increasing functional response to pressure and movement, range, strength, variety and control of movement for the lips, cheeks, jaw and tongue. (Beckman, 2005)

The interventions needed are determined by an assessment, the Beckman Oral Motor Protocol, The assessment is based on clinically defined functional parameters of minimal competence and does not require the cognitive participation of the individual. During assessment, specific hands on techniques are used to assisted movement and stretch reflexes to quantify response to pressure and movement, range, strength, variety and control of movement for the lips cheeks, jaw, tongue and soft palate. To quantify the parameters, each of them is assessed for several trials and the number of successful trials was recorded in form of percentage of competence, i.e. strength of upper lips is measured for 6 trials, and if the participant give 3 appropriate response in the 6 trials, that participant would had 50% competence for upper lip strength. 80% competence was set to be minimal competence for various oral motor functions. From a retrospective study using Beckman's protocol, significant improvement is found in the strength and range of lips and cheek ($p < 0.01$) (Beckman et al., 2005). Significant improvement is also found in two randomized control trials on evaluating the effectiveness of this approach in

improving suckling infant (Fucile et al, 2002, 2005). Most of the research studies are mainly on children with cerebral palsy or infant, the effectiveness of those techniques towards children with SMH is not extensively investigated.

2.6 Frequency of Treatment

The regularity of treatment is an important factor for the successfulness of both approaches of oral motor treatment (Beckman, 2005; McCracken, 1978). Frequency of treatment in studies various from hourly in the school days, to once a day to demonstrate its effectiveness (Samelstad, 1988; Ray et al., 1983; Iammatteo et al., 1990; McCracken, 1978). Samelstad's study showed that the problems may return once the therapy stopped. None of the studies ever address the effectiveness of implementing the treatment by caregivers, who have the most contact with the child throughout the day. Also, as the carryover effect is unknown, so empowering the caregivers, who are more available for the transitions of the children from one setting to another, is important for drooling management using oral motor therapy.

In the present study, it is trying to investigate the effectiveness of this oral motor therapy on drooling management for children with severe mental handicap when the therapy is carried out by caregivers, with training from professional staff. The frequency is, as Beckman (2005) suggested, 3-5 times a day.

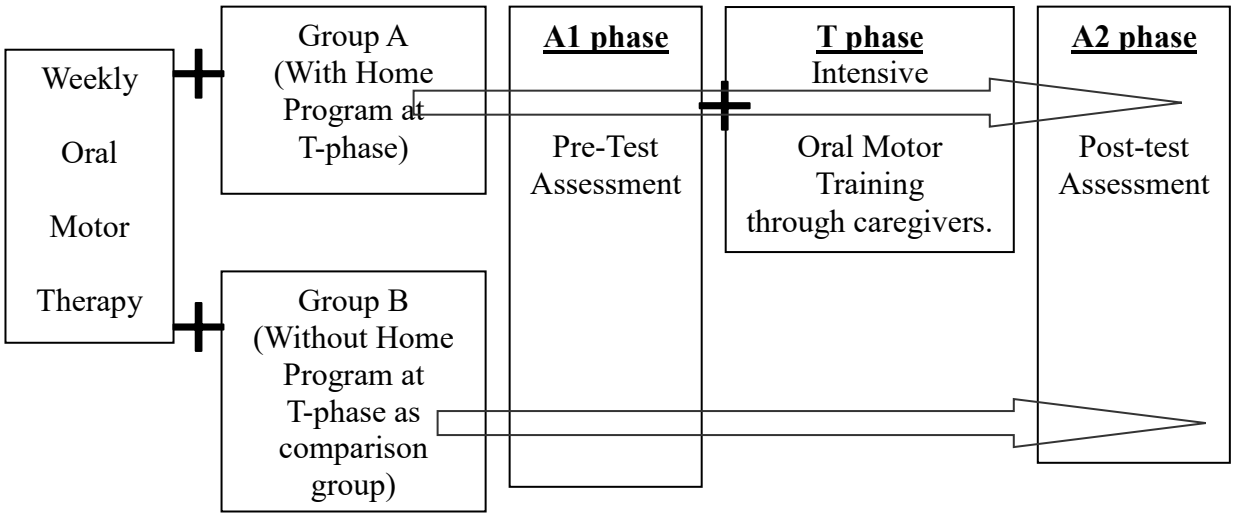
CHAPTER 3. METHODOLOGY

3.1. Research Design

A mixed design repeated measure method was adopted as the research design. All participants came from one special school for children with SMH. In this study, those recruited participants were randomly assigned into Group A or Group B. Both groups received weekly oral motor program in occupational therapy services. Weekly oral motor program is a 35 minutes individual sessions, with Beckman Oral Motor Protocol used as assessment and treatment, which together with Rood's technique to facilitate the oral motor response.

In addition, Group A also received intensive oral motor training provided by the caregiver at treatment phase (T phase). All caregivers were coached with the training techniques and supervised by the registered occupational therapist. There were Assessment phase I (A1 phase), and Assessment phase II (A2 phase) before and after the T phase (Figure 3.1).

Figure 3.1 Flow Chart of the Study Design



3.2. Participants

3.2.1. Selection Criteria

The sample for the study was selected from a special school for student with severe mental handicap, with an age range from 6 – 20 years; and with drooling problem identified by the corresponding teachers of their classes. Those were receiving services from hospital or clinic for the drooling problems were excluded. Drooling problems were defined as any unintentional lost of saliva on or out of the lips. A figure (Figure 3.2) describing the mild level of drooling from the Saliva Instrument Assessment was presented to the teachers to further validates the consensus on this definition.

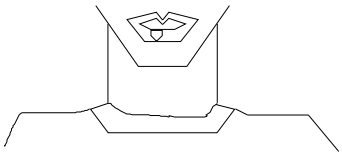


Figure 3.2 Mild amount of saliva on the lips

3.2.2. Sample Size

Eighteen participants were recruited for the study. From the power analysis, alpha=0.0167 (Bonferroni Adjustment: 0.05/3 comparisons), power=0.8 was done on data from 4 single case studies (Samelstad, 1988; Iammatteo, Trombly, & Luecke, 1990), with mean bib weight changes after oral motor intervention is 1.33g (SD: 0.89), sample size (n) of 9 is needed for each group, i.e. a total of 18 participants was just enough for the study.

Twenty-two students who fulfilled the selection criteria with drooling problems were identified by the teachers and the students were invited to participate in the study. Eighteen (82 %) participants' parents gave parental formal written consent to allow their children participate in the study. Two of the students were in hospital for

orthopedic operation. Parents of two other students declined to participate because they chose not to carry out the home program.

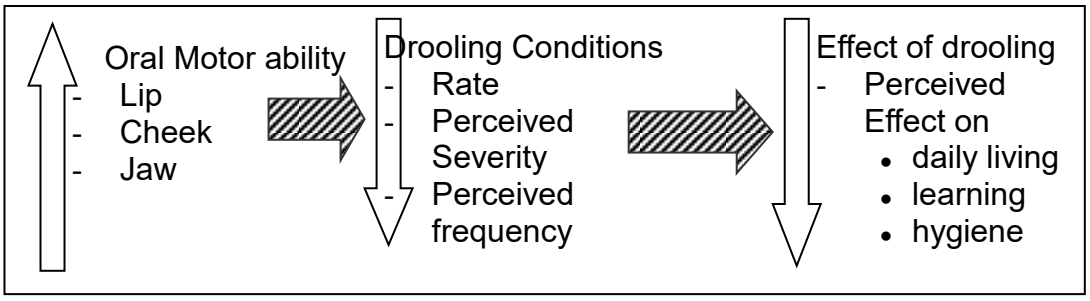
3.3. Measures

3.3.1. Outcome indicators

To evaluate the effectiveness of this program, three aspects were measured: 1) direct indicators which measured the drooling conditions; 2) indirect indicators which included measuring: 2a) oral motor abilities which were assumed to be the cause of drooling; and 2b) secondary effect of drooling which urged the needs for drooling to be handled. Figure 3.3 shows the flow chart of this framework for evaluation (Beckman, 2005; Johnson & Scott, 2004; Yam et al., 2005).

Figure 3.3

Conceptual framework for evaluating the effectiveness of drooling management



1) The cause of drooling – the oral motor function assessment,

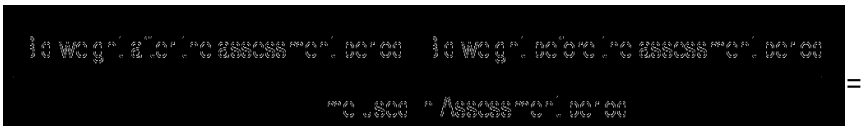
■ Beckman Oral Motor Protocol

The Beckman Oral Motor Protocol (BOMP) was implemented by occupational therapist, who was certified to use the protocol, to assess the oral motor function, which was assumed to be the cause of drooling. As structure and reflex abnormality are not targeted to be intervening in this study, so only data for the

range and strength of lips, cheeks, and jaw will be further analyzed and discussed.

2) The drooling condition:

- Frequency scale and severity scale from Saliva Assessment Instrument were used as a subjective measure for the drooling conditions rated by their caregivers.
- Drooling Rate was measured to serve the purpose of objective measure for drooling. Absorbent Bib was used to quantify the drooling condition by collecting the amount of saliva drooled in 30-minute session for 2 times in a month during the assessment phase. The two 30-minute sessions were perceptual motor training lessons, which were sedentary in nature that participants did not have to move around and more than 30 minutes after meal. And Teachers, aides, parents were refrained from giving food or liquid to the participants and from making any verbal reference to the participants' drooling during the time the amount of saliva was being measured (Ray et al., 1983; Samelstad, 1988). Weight changes of each bib divided by the time used is the drooling rate. Data were collected with the same method in A1 phase and A2 phase.


= Drooling rate

3) The effect of drooling on the children's occupation

- Four-point Likert scales were used to collect caregiver perceptions on the effect of drooling on the participants' daily living, learning and hygiene. The scale used was 0 as Not affected, 1 as mildly affected, 2 as moderately affected, and

3 as severely affected.

3.3.2. On-going monitoring

Monitoring was engaged by a homework record sheet, noting down the response of the participants, and the number of trials that training was done. The use of log record can increase compliance of caregivers (Taylor, Dodd, McBurney, & Kerr-Graham, 2004).

3.4. Procedure

3.4.1. Prescription of Oral Motor Therapy Techniques

The technique prescribed was according to the Beckman Oral Motor Protocol Assessment, and the observational assessment adopted by a previous study using the Rood's Technique (Iammatteo, Trombly, & Luecke, 1989; Ray, Bundy, & Nelson, 1983; Samelstad, 1988; Yam, Yang, Abdullah, & Chan, 2005) (Table 3.1).

Table 3.1.The chosen oral motor therapy techniques: (Beckman, 2005, Morris, 1977; Loiselle, 1979)

Indication	Criteria	Techniques
Decreased Lip strengthen/ range	<80% competence in BOMP in lip strength/ range; Or Lips Opened in resting position	Resistive lip stretching. (Appendix IIIc) Icing/ vibration will be considered for extreme weakness (Appendices IIId, IIIe)
Decreased Cheek range	<80% competence in BOMP in Cheek range.	C-stretch. (Appendix IIIb) Icing/ vibration will be considered for extreme weakness
Decreased Cheek strengthen	<80% competence in BOMP in Cheek strength	Resistive Chewing (Appendix IIIa). Icing/ vibration will be considered for extreme weakness
Decreased Jaw strength	<80% competence in BOMP in jaw strength; Or Mouth Opened in resting position;	Resistive Chewing (Appendix IIIa). Icing/ vibration will be considered for extreme weakness.

BOMP – Beckman Oral Motor Protocol

3.4.2. Intervention Implementations

Intervention (T Phase) consisted of two parts. Part 1 firstly increased the awareness of the problems and knowledge on the drooling and oral motor therapy and then was followed by one to one demonstration, and coaching on oral motor techniques. Part 2 included the regular review sessions to discuss and clarify the details and problems in implementation. This structure was commonly used as part of the caregiver training programs (Coon, Thompson, Steffen, Sorocco, & Gallagher-Thompson, 2003; Cullen & Barlow, 2004; Nerenberg, 2002). **Part 1:** Caregivers who is defined as those that is responsible for taking care the participant for more than 5 hours a day after school

time, it can be parents of the participants, domestic helpers of the participants' family, or house-parents responsible for that particular participant. Caregivers of the students were scheduled to have a 35-minute introduction and individual coaching on the use of the oral motor techniques, which was tailored to meet the specific needs of each child. At the beginning of the individual coaching session, the caregiver was being briefed on the follow issues: 1. Introduction of the importance of managing drooling, 2. Introduction of the rationale oral motor therapy and other intervention that is available. 3. The role and importance of caregivers in the process. 4. Demonstration of the techniques by the therapist on the caregivers, and on the participant. 5. Practice of the techniques by the caregivers on the therapist until the force and movement is safe and correct, and then caregivers can practice on the participant under supervision of the occupational therapist. In addition, each caregiver received a Homework Package that included the tools for the therapy, and guidelines and an instructions sheet with oral motor therapy techniques diagrams. We instructed the caregivers to implement the program 3 – 5 times a day, which is recommended by Beckman (2005). **Part 2:** Caregivers of the students were then attended once a week review sessions for those prescribed oral motor techniques.

CHAPTER 4. RESULT

4.1. Demographic data

Twenty two out of a total of Fifty-four students with SMH, i.e. 40.74%, were being identified as having drooling problem. Eighteen children from school for students with severe mental handicap and drooling problems participated in this study from a special school for students with severe mental handicap. The age range of Group A (Weekly Oral Motor Training + Home Program, n = 9) was 8 – 20 years, with a mean age of 11.78 years (± 3.70 years). The age range of Group B (Weekly Oral Motor Training Only) was 9 – 20 years, with a mean age of 14.22 years (± 4.21 years). There were 5 males, and 4 females in Group A and 6 males, 3 females in Group B.

4.2. Drooling Conditions

4.2.1. Objective measures

4.2.1.1. Rate of drooling

The drooling rate was measured before the beginning of the intervention programs, and by the end of the programs. There was no significant difference between Group A and Group B for the pre-test data (t=1.574, df=16, p=0.135). Two-way repeated measure ANOVA showed significant interaction effect of Group A and Group B, before and after intervention (F=5.628, df=1, p=0.031). Post-hoc analysis showed significant difference found the changes of rate of drooling in the treatment and comparison group (t= -2.372, df=16, p=0.031) (Table 4.1).

Table 4.1. Two way ANOVA repeated measure and post-hoc t-test on Drooling Rate

Two way ANOVA repeated measure on Drooling Rate

Interaction effect	**F**	**p-value**
[Groupings (GpA & B) X Timing (pre & post)]	5.628	0.031*

Post-hoc t-tests on Drooling Rate

	Mean (SD)			
	Group A	**Group B**	**t**	**p-value**
Pre-test	0.269 (0.303)	0.098 (0.119)	1.574	0.135
Post-test	0.106 (0.035)	0.127 (0.042)	-1.432	0.171
Changes (post-pre)	-0.206 (0.299)	0. 044 (0.102)	-2.372	0.003**

df=16; * $p < 0.05$; ** $p < 0.01$

4.2.2. Subjective measures

4.2.2.1. Caregiver Perceived Severity of Drooling

There was no significant difference in the mean caregiver perceived severity of drooling between the pre-test data of the treatment group and that of the comparison group (p=0.091). Significant improvement was found in the treatment group as compared to comparison group (p=0.003) (Tables 4.2a).

4.2.2.2. Caregiver Perceived Frequency of Drooling

There was no significant difference in the mean perceived frequency of drooling between the pre-test data of the treatment group and that of the comparison group (p=0.169). Borderline significant difference was found in the changes after the intervention between the treatment group and the comparison group (p=0.057) (Tables 4.2b).

Table 4.2a. Mann-Whitney U Test on Caregiver Perceived Severity of Drooling

Caregiver Perceived Severity of Drooling

	Group A	Group B	Mann-Whitney U	p-value
	Mean Rank			
Pre-test	11.50	7.50	22.500	0.091
Post-test	8	11.0	27.000	0.217
Changes (post-pre)	5.94	13.06	8.500	0.003**

Measurement Scale : (0-No, 1-Mild, 2-Moderate, 3-Severe, 4-Profound)
** $p < 0.01$

Table 4.2b. Mann-Whitney U Test on Caregiver Perceived Frequency of Drooling

Caregiver Perceived Frequency of Drooling

	Group A	Group B	Mann-Whitney U	p-value
	Mean Rank			
Pre-test	11.06	7.94	26.500	0.169
Post-test	8.94	10.06	35.500	0.635
Changes (post-pre)	7.33	11.67	21.000	0.057#

Measurement Scale : (0-Never, 1-Occassional, 2-Often, 3-Always)
borderline significance close to $p < 0.05$

4.3. Oral motor ability

The oral motor ability was measured by the Beckman Oral Motor Assessment Protocol. Figure 4.1 shows the oral motor abilities of Group A and Group B before and after the intervention phase. Due to the inequality of baseline oral motor abilities between Group A and B (table 4.3), Analysis of Covariance (ANCOVA) was used to examine the post-test difference of oral motor abilities with pre-test baseline scores as covariates. According to the result of ANCOVA, There was significant difference between group A and group B in eight oral motor abilities variables, except the upper and lower protrusion range, right upper cheek range, left and right cheek strength, and the left and right jaw strength of motor abilities of Group A and Group B, with baseline oral motor abilities being the covariance, shows that there was significant

difference on lower lip strength (F=8.827, df=2, p=0.003), right lower cheek range (F=16.714, df=2, p=0.000), left upper cheek range (F=5.022, df=2, p=0.021), left lower cheek range (F=30.699, df=2, p=0.000), right cheek strength (F=9.640, df=2, p=0.002), left cheek strength (F=3.796, df=2, p=0.046), right jaw strength (F=9.868, df=2, p=0.002), and left jaw strength (F=6.701, df=2, p=0.008) (Table 4.4).

Table 4.3. Independent T-test on pre-test data of Oral Motor Abilities

Oral Motor Abilities: Before Intervention Phase (Pre-test)

	T-test for Equality of Means		
	T	Df	Sig. (2-tailed)
Lip			
Upper Lip Strength	-.157	16	.877
Lower Lip Strength	-.918	13.068	.375
Upper Lip Protrusion Range	-3.000	8.000	.017*
Upper Lip Elongation Range	-.250	16	.806
Lower Lip Protrusion Range	-2.530	8.000	.035*
Lower Lip Elongation Range	-1.512	8.000	.169
Jaw			
Left Jaw Strength	-1.275	11.404	.228
Right Jaw strength	-.800	10.851	.441
Cheek			
Left Upper Cheek Range	-.684	16	.504
Left Lower Cheek Range	.606	16	.553
Right Upper Cheek Range	-2.405	11.321	.034*
Right Lower Cheek Range	-.753	16	.463
Right Cheek Strength	.673	16	.511
Left Cheek Strength	.925	16	.369

* $p < 0.05$

Figure 4.1

Oral motor abilities of Group A (experimental group) & Group B (comparison group), Before (pre-test) & After (post-test) intervention phase

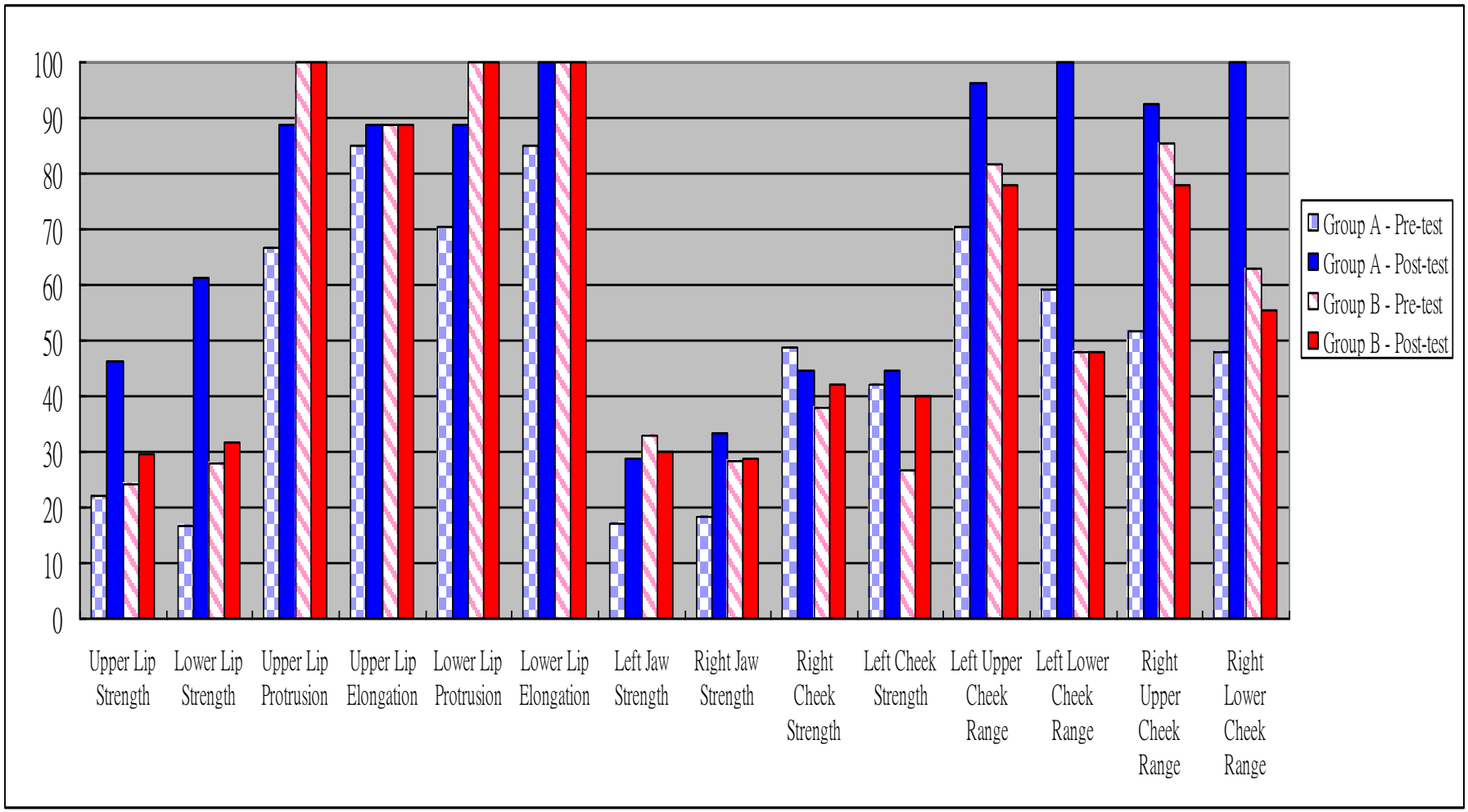


Table 4.4. ANCOVA on post-test data of Oral Motor Abilities

ANCOVA on post-test data of Oral Motor Abilities
(with pre-test data as covariates, df=2)

	p-value		p-value
Lip			
Upper Lip Strength	0.076	Upper Lip Protrusion Range	0.204
Lower Lip Strength**	0.003	Lower Lip Protrusion Range	0.177
		Upper Lip Elongation Range	0.196
		Lower Lip Elongation Range#	/
Cheek			
Right Cheek Strength**	0.002	Left Upper Cheek Range*	0.021
Left Cheek Strength*	0.046	Left Lower Cheek Range**	0.000
		Right Upper Cheek Range	0.074
		Right Lower Cheek Range**	0.000
Jaw			
Left Jaw Strength **	0.008		
Right Jaw strength **	0.002		

Mean difference between post-test data of low lip protrusion range is 0
* $p < 0.05$; ** $p < 0.01$

4.4. Secondary effect of drooling on daily life, learning and hygiene.

Caregivers perceived effect of drooling on learning, daily life, and hygiene was measured. Figure 4.2 shows the Caregiver perceived effect of drooling on learning, daily living and hygiene of Group A and Group B before (pre-test) and after (post-test) intervention phase.

4.4.1. Caregiver perceived effect of drooling on learning

There was a significant difference in the pre-test data regarding the mean effect of drooling on learning between the treatment group and that of the comparison group (p=0.033). Significantly more changes in treatment group were found than in the comparison group (p=0.013) (Table 4.5).

4.4.2. Caregiver perceived effect of drooling on daily living

There was no significant difference pre-test data in the mean effect of drooling on daily living between the treatment group and that of comparison group (p=0.237). The changes in treatment group was significantly greater than that in then comparison group (p=0.013) (Table 4.5).

4.4.3. Caregiver perceived effect of drooling on hygiene

There was no significant difference pre-test data in the mean effect of drooling on hygiene between the treatment group and that of comparison group (p=0.339). The changes in treatment group were not significantly better than that in the comparison group (p=0.141) (Table 4.5).

Figure 4.2 Effect of drooling on learning, daily living and hygiene of Group A & Group B, Before (pre-test) & After (post-test) intervention phase

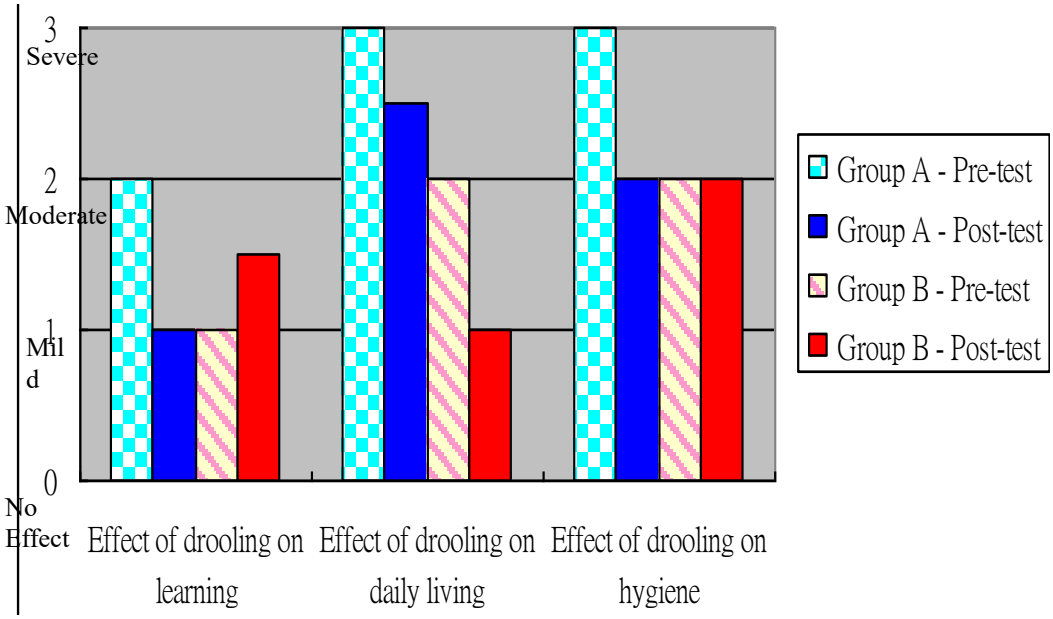


Table 4.5. Mann-Whitney U Test on Caregiver Perceived Effect of Drooling on Learning; Daily Living; and Hygiene

×

	Group A Mean Rank	Group B	Mann-Whitney U	p-value
Pre-test	12.06	6.94	17.500	.033
Post-test	8.83	10.17	34.500	.562
Changes (post-pre)	6.50	12.50	13.500	.013*

Caregiver Perceived Effect of Drooling on Daily Living

	Group A Mean Rank	Group B	Mann-Whitney U	p-value
Pre-test	10.89	8.11	28.000	.237
Post-test	11.11	7.89	26.000	.174
Changes (post-pre)	6.50	12.50	13.500	.013*

Caregiver Perceived Effect of Drooling on Hygiene

	Group A Mean Rank	Group B	Mann-Whitney U	p-value
Pre-test	10.61	8.39	30.500	.339
Post-test	8.78	10.22	34.000	.539
Changes (post-pre)	7.83	11.17	25.500	.141

Measurement Scale :

(0-Not affected, 1-mildly affected, 2-moderately affected, 3-severely affected)

* $p < 0.05$

CHAPTER 5. Case Studies

Case 1

Gender: Male, Age: 13, Diagnosis: Severe Mental Handicap.

Oral Motor Ability:

	A1 phase		A2 phase	
	Computed Score (% of competency)		Computed Score (% of competency)	
	Upper 上	Lower 下	Upper 上	Lower 下
Range - Protrusion	33.33333333	33.33333333	100	100
Range - Elongation	33.33333333	33.33333333	100	100
Strength	33.33333333	33.33333333	66.66666667	100
	Left 左	Right 右	Left 左	Right 右
Strength	40	30	35	30
	Left 左	Right 右	Left 左	Right 右
Range - Upper	33.33333333	33.33333333	100	100
Range - Lower	33.33333333	33.33333333	100	100
Strength	60	60	40	20

Drooling Conditions

	A1 phase	A2 phase
Rate of drooling	**94.77mg/ min**	**.49mg/ min**
Severity perceived	**4 (Profuse)**	**2 (Moderate)**
Frequency perceived	**2 (Often)**	**1 (Occasional)**

Secondary Effect

	A1 phase	A2 phase
On Living	**3 Severe**	**1 Mild**
On Learning	**3 Severe**	**1 Mild**
On Hygiene	**3 Severe**	**1 Mild**

Treatment Plan

Goals	Prescription of intervention technique
Improve lip range	Resistive Lip stretch
Improve lip strength	Vibration on midline of the lips
Improve jaw & cheek strength	Resistive Chewing
Improve cheek range	C-stretch

Discussion of Case 1:

4 techniques is taught to the caregivers and recommended to implement 3-5 times per day. As he is living in school hostel, deal to the limited manpower the treatment can only be done one time before lunch and one time before dinner. However we still can observe a good improvement in terms of drooling, Also tongue movement of the child is also limited to Anterior-Posterior (A-P) movement only, do not have tongue tip evaluation and side to side movement, which can be attributed to the poor jaw strength as shown in the data above. The lack of improvement on jaw strength may be due to insufficient training.

Case 2

Gender: Female, Age: 13, Diagnosis: Severe Mental Handicap.

Oral Motor Ability:

	A1 phase		A2 phase	
	Computed Score (% of competency)		Computed Score (% of competency)	
	Upper 上	Lower 下	Upper 上	Lower 下
Range - Protrusion	33.33333333	33.33333333	100	100
Range - Elongation	33.33333333	33.33333333	100	100
Strength	33.33333333	33.33333333	83.33333333	83.33333333
	Left 左	Right 右	Left 左	Right 右
Strength	35	25	90	90
	Left 左	Right 右	Left 左	Right 右
Range - Upper	33.33333333	33.33333333	100	100
Range - Lower	33.33333333	33.33333333	100	100
Strength	60	60	80	80

Drooling Conditions

	A1 phase	A2 phase
Rate of drooling	**0.5mg/ min**	**0.08mg/ min**
Severity perceived	**4**	**4**
Frequency perceived	**2**	**2**

Secondary Effect

	A1 phase	A2 phase
On Living	**2**	**3**
On Learning	**3**	**2**
On Hygiene	**3**	**2**

Treatment Plan

Goals	Prescription of intervention technique
Improve Oral Awareness	Gym Massage
Improve lip range	Resistive Lip stretch
Improve lip strength	Vibration on midline of the lips
Improve jaw & cheek strength	Resistive Chewing
Improve cheek range	C-stretch

Discussion of Case 2:

As compared to Case 1, the oral motor abilities improvement is much greater, and from daily observations, the drooling problem at school time was subsided. Gum massage is used to increase oral awareness, because of the infrequent of swallowing, and unawareness of the pooling of saliva. But parents still reported to have profuse drooling problems at home, with only the effect on hygiene and learning is improved. As drooling is affected by also contextual factors and behavioral factors, the posture, seating system of the child at home could affect her ability in controlling saliva; some children may use drooling as a mean to seek attention. In this case, as we are working closely with parents, and caregivers, so we could identify the discrepancy of performance between school and home quickly. And then we can discuss caregivers to see if it is necessary to arrange for home visit, and arrange for caregivers to visit the child's school life.

CHAPTER 6. DISCUSSION

Regarding other clinical data that may influence Saliva Flow Rate (SFR), previous studies had shown that males have higher saliva output than females (Billings, Proskin, & Moss, 1996; Thomson, Chalmers, Spencer, & Ketabi, 1999) even in children populations (Bretz et al., 2001; Crossner, 1984). Some publications point out that SFR increases with age in children and adolescent populations (Bretz et al., 2001; Crossner, 1984). In this study, comparisons of their demographic data suggest that the two groups were similar in terms of age and gender, which increase the comparability of Group A experimental group and Group B comparison group.

6.1. Pre-test Conditions

The result of assessment done at the beginning showed that participants in both the experimental and comparison groups had similar drooling rate measured, similar severity and frequency of drooling as perceived by their caregivers.

Among the oral motor variables, the baseline measures of lower and upper protrusion range and right upper cheek range had significant difference between Group A experiment group and Group B comparison group.

Among those pre-test data, no significant difference was found between Group A experimental group and Group B comparison group for effect of drooling on daily living and hygiene, whereas there was a significant difference for effect of drooling on learning.

6.2. Effectiveness of oral motor home program

Both objective measurement on the drooling rate of the participants and the perceived severity of drooling by the caregivers were found to have significant

improvement after the home program. The frequency of drooling by the caregivers was found to have borderline significant improvement. Both objective and subjective measurements showed significant improvement in drooling rate and severity after the program. This allows cross validation of the research outcomes and results of the home program intervention.

The oral motor ability was measured by the Beckman Oral Motor Assessment Protocol. Eight oral motor abilities (lower lip strength, left lower and upper cheek range, and right lower cheek range, right and left cheek strength, and right and left jaw strength) showed statistically significant more improvement in Group A experimental group than that in Group B comparison group. When a person was in sitting position, gravitation force pulled the lips and jaw downwards, thus the mouth would open (Beckman, 2005). The improvement in lower lip strength, and jaw strength is important for lip and mouth closure which is associated with drooling, and swallowing problems (Lespargot, Langevin, Muller, & Guillemont, 1993). The cheeks, the side of the face forming the lateral wall of the mouth, consist of buccinators, masseter, part of temporalis, zygomaticus major, risorius, levator, and depressor annuli oris. Kang et. al.'s study showed that the end of the parotid duct is part of the buccinators, thus suggesting the role of buccinators in regulation of salivary production and flow of the parotid duct which account for around 25 % of total saliva productions. The improvement in cheek range and cheek strength as a result of stretching may associate or account for the more improvement in drooling of Group A experimental group than that of Group B comparison group (Kang et al., 2006).

The oral motor abilities of most participants in Group A, the experimental group, showed improvement, except for right cheek strength that showed a decline in

performance, However, in Group B, participant's oral motor abilities including left jaw strength, left upper cheek strength, right upper cheek range and right lower cheek range showed a decline in performance. The decline in performance could be attributed to the decline in oral motor function due to disuse, as people tend to develop compensatory strategy for their weak muscle and limited range to achieve the function of feeding. So only in treatment situation can facilitate the participant to use their weak muscle and challenge their range of motion, thus when the rate of strengthening is slower than the rate of weakening, decline in strength would occur; when the rate of stiffness development is faster than the mobilization and lengthening effect of stretching, decline in range would occur (Beckman, 2005).

6.3. Secondary Effect of drooling

It was found that there were significantly more improvement in Group A than in Group B for effect of drooling on daily living and learning. This result was consistence with Van der Burg's study on effect of salivary flow reduction on daily life and care. (Van der Burg, Jongerius, Van Hulst, Van Limbeek, & Rotteveel, 2006). As both variables reflect how well the children can control their saliva during functional activities, this result would indicate a positive functional effect for the home program in managing of drooling. However, there is a lack of significant improvement on effect of drooling on hygiene between Group A and Group B may indicate that 1) improvement of drooling was not large enough to help improvement on hygiene; 2) effect of drooling on hygiene is not an sensitive variables for measurement of drooling.

6.4. Difficulties found in weekly review session

In the first week of review, all caregivers demonstrated good skills in implementations. The major difficulty reported is “slippery hand”. From a caregiver’s opinion, she put a towel on the table, and then every times when the hands come out from the mouth, she will first put the hand on the towel to let it absorb some of the water. One of the caregivers is found to be forgotten to cut the finger nails in the 2nd review sessions, and she knew it immediately when she was asked to do gum massage on herself.

6.5. Compliance

. During school time, all group A students would receive at least 1 time of intervention before the lunch. For those living in school hostel, they will have the training for one more time before the dinner. For those time at home, We rely on the homework record log sheet (appendix VI) as the mean to know how many times they have done it at home.

CHAPTER 7. CONCLUSION & RECOMMENDATIONS

7.1. Conclusion

Purpose of this study was to examine the effectiveness of oral motor home therapy on drooling of children with severe mental handicap. We compare the effectiveness of Group A experimental group, with oral motor home program and Group B comparison group once a week oral motor therapy. The research hypothesis was that “there is no difference in drooling, oral motor abilities, and effect of drooling between Group A experimental group, and Group B Comparison Group”.

In terms of drooling conditions, Group A showed significantly more improvement for objective measure, the drooling rate, as well as the subjective measures, including the severity of drooling and frequency of drooling. Eight variables (Lower lip strength, Left upper and lower cheek range, right lower cheek range, right and left cheek strength, and right and left jaw strength) in the oral motor aspect were shown to have significantly better ability in Group A experimental group than in Group B comparison group after the treatment phase. For the secondary effect of drooling, impact of daily living and learning were having more significant improvement in Group A experimental group that in Group B comparison group.

7.2. Recommendations for further study

Drooling is a multifaceted function. Its causes include oral motor control, swallowing efficiency, and sensory perceptions. The therapy used in this study mainly focused on the sensory and motor aspects of the orofacial parts, however children who drool may be caused by their swallow difficulties (Sochaniwskyj, Koheil, Bablich, Milner, & Kenny, 1986). So it is worth to have further study on comprehensive drooling management program with assessment and intervention

focus on improving the swallowing effectiveness and frequency included.

In addition, it is suggested to further investigate the long term effect of the oral motor therapy on drooling, feeding, and swallowing in order to enhance our knowledge for broaden and more precise use of oral motor therapy.

7.3. Recommendations for the field practice

In this study the home program done in two stage.

Stage 1 includes:

i. Introduction of the oral motor and drooling problems (1. Introduction of the importance of managing drooling, 2. Introduction of the rationale oral motor therapy and other intervention that is available. 3. The role and importance of caregivers in the process).

ii. Demonstration, practice of the techniques on therapist, practice of techniques on the clients under close supervision from therapist.

iii. Homework Package (Appendix B) that includes the tools for the therapy, and guidelines and instructions sheet with oral motor therapy techniques diagrams.

Stage 2 includes:

i. A weekly monitoring and reviewing of the techniques.

In this study, important and valuable implications on management of drooling through oral motor therapy for school-age children could be found. May these research findings be meaningful to the education and rehabilitation field and able to help children with severe mental handicap and their caregivers to have a prosperous life.

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Appendix Ia

CONSENT TO PARTICIPATE IN RESEARCH

Title of the study:

Effectiveness of oral motor therapy on drooling in children with severe mental handicap

Principal Investigator:

Mr. CHAN Tsz Man

(HK Registered Occupational Therapist, Caritas Lok Kan School Occupational Therapist)

Dr. Karen Liu

(Assistant Professor, Department of Rehabilitation Sciences, The Hong Kong Polytechnic University)

Content of the study:

The aim of this study is to examine the effectiveness of oral motor therapy on drooling in children with severe mental handicap. Participated students will be involved in Beckman Oral Motor Assessment, and with the drooling severity recorded by bib weight measurement. An oral motor intervention program will be planned accordingly. As the treatment received is the same as regular OT service at special school, so no extra potential for risk on for the children after joining the study. Caregiver/ Parent of the participated students will be required to fill in a questionnaire before and after the intervention period. If necessary, caregiver/ parent will be requested to implement oral motor training program in the routine.

Project contribution

Establish evidence-based therapy to address the drooling problems and oral motor needs of the children with severe mental handicap (SMH).

Consent:

I, _____, parent of my *son/ daughter ,_____, have been explained the details of this study. I voluntarily consent for my *son/ daughter to participate in this study. I understand that I can withdraw from this study at any time without giving reasons, and my withdrawal will not lead to any punishment or prejudice against me. I am aware of any potential risk in joining this study. I also understand that my personal information will not be disclosed to people who are not related to this study and my name or photograph will not appear on any publications resulted from this study.

I can contact the Principal investigator, Mr Chan Tsz Man at telephone 25285991, or the supervisor Dr Karen Liu at telephone 27664801 for any questions about this study. If I have complaints related to the investigator(s), I can contact Mrs Michelle Leung, secretary of Departmental Research Committee, at 27665397. I know I will be given a signed copy of this consent form.

Signature (subject): Date:

Signature (witness): Date:

Appendix Ib

香港理工大學康復治療科學系科研同意書

科研題目：口肌訓練對治療嚴重智障學童的流涎(流口水)的成效研究

科研負責人：陳子文先生（註冊職業治療師，明愛樂勤學校職業治療師）

導師：廖佩儀博士（香港理工大學康復治療科學系）

科研內容： 本計劃目的在於研究口肌訓練對治療嚴重智障學童的流涎(流口水)的成效，參與學生將獲 BECKMAN 口肌的評估，以及透過量度指定時間內流出口水的重量檢視學童的流涎情況。參與學生的照顧者/ 家長需在訓練前後填答一份問卷，然後會被分批安排學習口肌訓練技巧。參與的學生在評估過後便會接受口肌訓練，如有需要，照顧者/ 家長需按照治療的指示於日常生活中替學生進行訓練。

對項目參與人仕和社會的益處：從口肌訓練對治療嚴重智障學童的流涎(流口水)的成效，提供嚴重智障學童一個治療流涎(流口水)的訓練模式。

潛在危險性：由於所進行的口肌訓練乃校本職業治療服務的一部份，所以學生將不會因參與是項研究而造成額外的危險.

同意書：

本人 _____（家長姓名)已瞭解此次研究的具體情況。本人願意兒子/女兒 _____ 參加此次研究，本人有權在任何時候、無任何原因放棄參與此次研究，而此舉不會導致我受到任何懲罰或不公平對待。本人明白本人的資料將不會洩露給與此研究無關的人員，學生的名字或相片不會出現在任何出版物上。

本人可以用電話 2528 5991 來聯繫此次研究課題負責人，陳子文先生 或 致電 27664801 聯繫此次研究導師 廖佩儀博士 。若本人對此研究人員有任何投訴，可以聯繫梁女士（部門科研委員會秘書)，電話：27665397。本人亦明白，參與此研究課題需要本人簽署一份同意書。

簽名（參與者家長)： _____ 日期：_____

簽名（證人)： _____ 日期：_____

流口水情況評估問卷

Appendix II

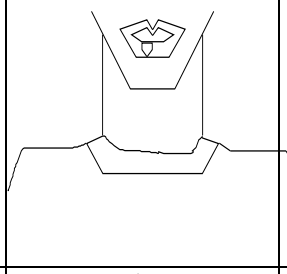
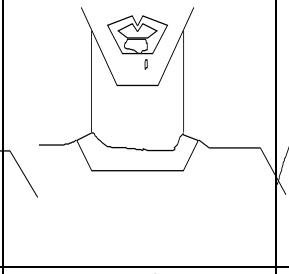
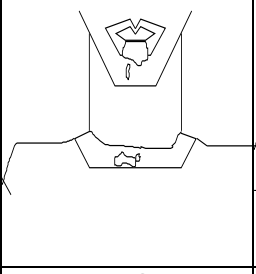
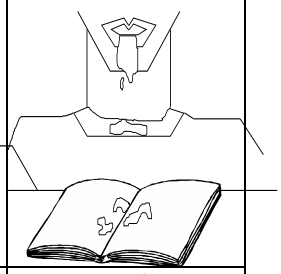
學生：_____ **填表日期：**_____ **填表人（關係）：**_____（_____）

希望能抽空按你對學生的了解詳細填妥以下問卷，以便能讓我們更有效掌握學生現時的情況，提供更適切的治療。謝謝！

在　線上適合的位置劃上“ O ”

學生流口水的嚴重程度

一般情況下：

沒有				
0	**1**	**2**	**3**	**4**
沒有發現口水在唇的外圍	發現口水在唇的外圍	發現口水在下巴位置	發現口水在衣服上	發現口水在檯面的物件上
（沒有）	（輕微）	（中度）	（嚴重）	（極度）

學生流口水的頻密程度

沒有	間中	經常	不斷
0	1	2	3

流口水問題對學生學習的影響

沒有	間中	經常	不斷
0	1	2	3

學生：_____　　填表日期：_____　填表人（關係）：_____（　）

學生的流口水問題對學生生活有甚麼影響？

_____

_____

_____

流口水問題對學生生活的影響

沒有	輕微	中度	嚴重
0	1	2	3

學生的流口水問題對家人生活有甚麼影響？

_____

_____

_____

學生的 流口水問題 對 家人生活的影響

沒有	輕微	中度	嚴重
0	1	2	3

學生的 流口水問題 對個人衛生的影響

沒有	輕微	中度	嚴重
0	1	2	3

學生的 流口水問題 會否在一日當中的某些時間特別嚴重（如：早上，午飯前/ 後，晚上）？

否/ 會 _____

學生的 流口水問題 會否在一星當中的某些日子特別嚴重 ？
(如：星期一/ 星期二/ 星期三/ 星期四/ 星期五/ 星期六/ 星期日)

否/ 會_____

學生的 流口水問題 會 否在一年當中的某些時候特別嚴重（如：夏天/ 冬天）？

否/ 會 _____

謝謝 ！ ~完~

職業治療 – 口肌訓練
Occupational Therapy – Oral Motor Training
Resistive chewing 抗阻力咀嚼運動

Appendix IIIa

Aim: Improve the cheek strength and range, masseter strength

Tools :

P- Grabber 

General Reminder:

- For the purpose of hygiene, surgical gloves should be used
- For the comfort of the student, caregiver should have his/her finger nails cut
- To prevent being bite by the student, always keep your fingers outside the gum, and never move around in between the teeth.
- When student do not cooperate/ refuse, stop and let him/ her rest for a while and try again later.

Method

1. place the item between the upper and lower teeth at the level of the molar

2. maintain contact between the teeth for a maximum of 20 seconds

3. if no chewing occurs, provide assisted capital flexion with middle finger

* another method is providing pulsating pressure up into the upper jaw with the item at a rate of 1 pulse per second

Specific Reminder :

- if the tongue is position in protrusion: place the item to the most posterior area of mouth
- if the tongue is position in retraction: place the item to the anterior lateral area of mouth
- if the tongue moves only to 1 side: place the item on the other side
- if the jaw is so tonic that the item cannot be placed between the teeth: do gum massage first
- if the jaw is open too wide, or the power for closure is too weak: place the item between upper and lower molar, then use the finger pad to provide pressure to the inferior border of the gum, behind the last tooth, to initiate chewing
- if gagging occurs, move the item anterior

職業治療 – 口肌訓練
Occupational Therapy – Oral Motor Training

Appendix IIIa

Resistive chewing 抗阻力咀嚼運動

目標: 提高面頰肌肉的活動幅度及力度，及咀嚼肌肉的力度

用具 ：

P- 牙膠

一般注意事項:

- 為了保持衛生，進行前請戴上手套。
- 為了學生的舒適，不要留長指甲，進行前需確保指甲已修剪好。
- 為了避免照顧者被咬傷，進行時需確保手指維持於牙肉以外的位置。
- 若學生不合作／抗拒，可暫停讓學生休息一會後再繼續。

步驟

1. 把訓練用的牙膠放在上下臼齒之間

2. 提示兒童開合口咀嚼約 20 秒

3. 如兒童未能自行咀嚼，可用中指輕托一下下巴以協助，每秒 1 下

* 另一方法是用牙膠以 1 秒 1 下的速度輕輕推向上臼齒

技巧執行時注意事項：

- 如有吐舌現象: 把牙膠放在上下排牙齒的最後位置
- 如有舌頭後縮現象: 把牙膠放在上下排牙齒較前及較外側的位置
- 如舌頭只停留在口腔的一邊: 把牙膠放在另一邊的臼齒上
- 如顎關節太緊而未能把牙膠放在上下臼齒之間: 先進行牙齦按摩以協助開口
- 如顎關節太鬆或咬合力量太弱: 先把牙膠放在上下臼齒之間,再用食指按壓臼齒後面的牙齦位置以刺激合顎
- 如有嘔吐反射: 把牙膠放在臼齒較前位置

職業治療 – 口肌訓練
Occupational Therapy – Oral Motor Training
C-stretch C-面頰伸展

Appendix IIIb

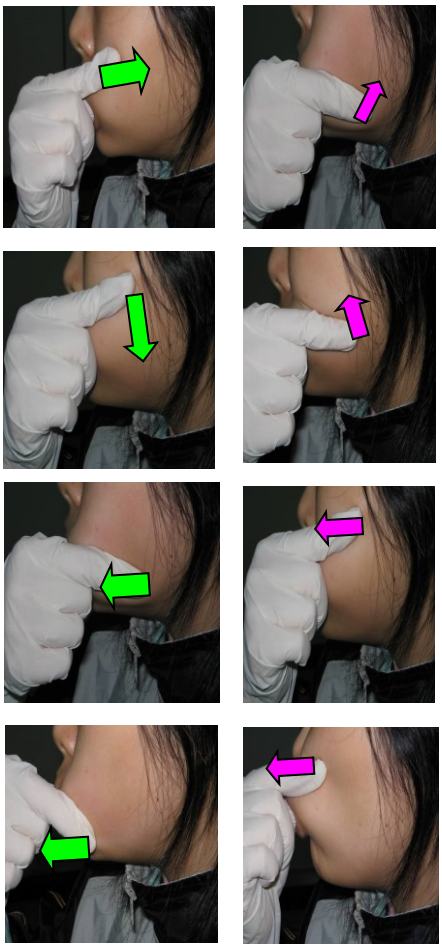
Aim: Improve the posterior jaw resting and cheek range

General Reminder:

- For the purpose of hygiene, surgical gloves should be used
- For the comfort of the student, caregiver should have his/her finger nails cut
- To prevent being bite by the student, always keep your fingers outside the gum, and never move around in between the teeth.
- When student do not cooperate/ refuse, stop and let him/ her rest for a while and try again later.
- Force to be used is the minimum amount that just keep your fingers contacting the skin.

Method

1. pinch grasp the left cheek with right thumb and index finger
2. with thumb inside and finger outside the cheek
3. place the thumb inside the lower corner of the mouth, with the thumb pad in contact with the inner cheek and the back of the thumb in contact with the lower gum
4. slide and stretch from front to back, keeping the thumb parallel to the lower gum
5. at the ramus, stretch the finger and thumb up to the level of the upper gum
6. with the outside hand, 2 fingers. Stretch the tissue directly beneath the index finger for 3 times, release the outside hand
7. each time 3 repetitions
8. repeat the same procedure on the right side of the cheek.



Specific Reminder :

- Check if any oral ulcer before start the training, and avoid touch the part with ulcer. If it is not possible to avoid touching it, or the no. of ulcer location is more than 2, then stop this training, until the ulcer is heal.
- 3 repetition on both sides = one training. Don't perform training more than 5 times every day.

Appendix IIIb

職業治療 – 口肌訓練
Occupational Therapy – Oral Motor Training
C-stretch C-面頰伸展

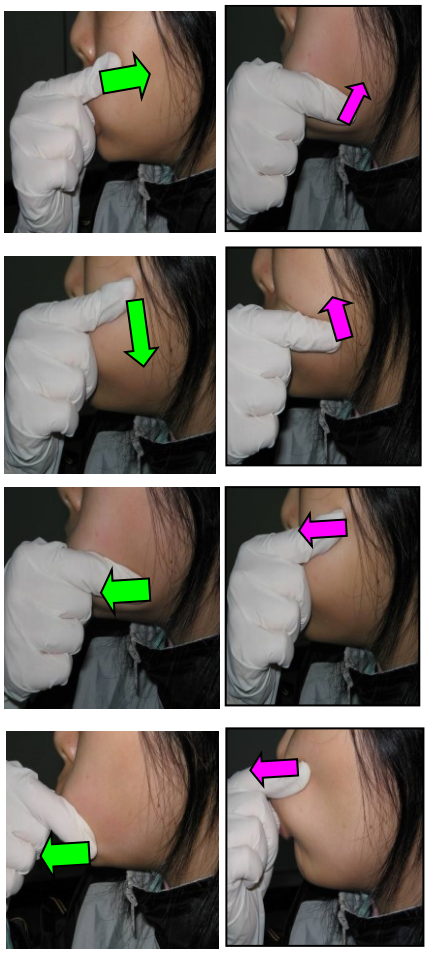
目標: 提高面頰肌肉及咀嚼肌肉的活動幅度

注意:

- 為了保持衛生，進行前請戴上手套。
- 為了學生的舒適，不要留長指甲，進行前需確保指甲已修剪好。
- 為了避免照顧者被咬傷，進行時需確保手指維持於牙肉以外的位置。
- 若學生不合作／抗拒，可暫停讓學生休息一會後再繼續。
- 進行時的需把指力控制在僅足以維持手指接觸皮膚的力度。

步驟

1. 用右手拇指及食指拿捏左邊面頰，拇指在內，食指在外。拇指放在下齒齦位置，手指正面貼著面頰，手指甲貼著齒齦
2. 兩隻手指沿下齒齦由前向後滑動及伸展面頰肌肉至下齒齦的後端(保持拇指與齒齦平行)
3. 兩隻手指再由下顎後端向上拉展至上顎後端位置
4. 用左手（食指及中指）在下齒齦後端位置向下拉展 3 下使咬肌伸展，然後放鬆
5. 右手拇指及食指再向下移動至下齒齦後端
6. 用左手（食指及中指）在上顎後端位置（面頰外）向上拉展 3 下，然後放鬆
7. 完成以上程序便完成 1 次，重複 3 次
9. 以同樣方法進行右邊面頰的訓練



技巧執行時注意事項：

- 先檢查口腔，如發現唇瘡／傷口，進行時需避免觸碰該部位，如沒法避免或唇瘡／傷口多於兩處，便需暫停此訓練直至傷口痊癒。
- 重複 3 次全套動作在左右兩側便完成一次訓練，每日的訓練不宜多於 5 次（3 – 5 次為理想）。

Appendix IIIc

職業治療 – 口肌訓練
Occupational Therapy – Oral Motor Training
Resistive lip stretch 抗阻力唇部伸展

Aim: Improve the lip range and strength

General Reminder:

- For the purpose of hygiene, surgical gloves should be used
- For the comfort of the student, caregiver should have his/her finger nails cut
- To prevent being bite by the student, always keep your fingers outside the gum, and never move around in between the teeth.
- When student do not cooperate/ refuse, stop and let him/ her rest for a while and try again later.
- Force to be used is the minimum amount that just keep your fingers contacting the skin.

Method

1. pinch grasp the upper lip with thumb and index finger
2. with the thumb on the outside and finger on the inside of the lip
3. compress the tissue between the finger and the thumb with gentle firm pressure
4. move the thumb down 3/8" as the finger moves up 3/8" (rolling)

* another method is move the thumb to the right 3/8" as the finger moves to the left 3/8" (gliding)

5. the pressure is provided at 3 points on the upper lip and 3 points on the lower lip (clock face 10, 12, 2, 4, 6, 8)
6. stretch at each of the 6 points is one cycle
7. A total of 3 cycles for steps 1 to 6.

Specific Reminder :

- Check if any oral ulcer before start the training, and avoid touch the part with ulcer. If it is not possible to avoid touching it, or the no. of ulcer location is more than 2, then stop this training, until the ulcer is heal.
- 3 to 5 times every day.

職業治療 – 口肌訓練
Occupational Therapy – Oral Motor Training

Appendix IIIc

Resistive lip stretch 抗阻力唇部伸展

目標: 提高唇部的活動幅度及力度

注意:

- 為了保持衛生，進行前請戴上手套。
- 為了學生的舒適，不要留長指甲，進行前需確保指甲已修剪好。
- 為了避免照顧者被咬傷，進行時需確保手指維持於牙肉以外的位置。
- 若學生不合作／抗拒，可暫停讓學生休息一會後再繼續。
- 進行時的需把指力控制在僅足以維持手指接觸皮膚的力度。

步驟

1. 用拇指及食指拿捏住上唇，拇指在唇外，食指在唇內
2. 兩隻手指以滾動式拉展上唇:拇指向下移 3/8”; 食指向上移 3/8”

* 另一方法為兩隻手指分別向相反方向左右來回移動 1/8”拉展上唇

沿上下唇各 3 個位置(共有 6 個)做伸展運動，即 10, 12, 2, 4, 6, 8 點鐘位置

3. 完成上下唇的伸展便完成 1 次,重複 3 次
4. 一天內 需完成 3 – 5

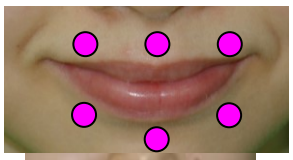
技巧執行時注意事項：

- 先檢查口腔，如發現唇瘡／傷口，進行時需避免觸碰該部位，如沒法避免或唇瘡／傷口多於兩處，便需暫停此訓練直至傷口痊癒。
- 重複 3 次全套動作在上下唇便完成一次訓練，每日的訓練不宜多於 5 次。

Appendix IIId

職業治療 – 口肌訓練
Occupational Therapy – Oral Motor Training
Vibration around the lip 唇邊震動按摩

Aim: facilitate lip closure

General Reminder:	
➢ For the purpose of hygiene, surgical gloves should be used ➢ For the comfort of the student, caregiver should have his/her finger nails cut ➢ To prevent being bite by the student, always keep your fingers outside the gum, and never move around in between the teeth. ➢ When student do not cooperate/ refuse, stop and let him/ her rest for a while and try again later. ➢ Force to be used is the minimum amount that just keep your fingers contacting the skin.	
Method	
1. Place vibrator on the specific points around the lip for 3 to 5 seconds to elicit lip closure 2. the left point of upper lip, 1…2…3…4…5…, move to the midline1…2…3…4…5…,then move to the right point, 1…2…3…4…5… 3. The right point of the lower lip, 1…2…3…4…5…, move to the midline, 1…2…3…4…5…, then move to the left point, 1…2…3…4…5…	  1  2  3  4  5  6

Appendix IIId

職業治療 – 口肌訓練

Occupational Therapy – Oral Motor Training

Vibration around the lip 唇邊震動按摩

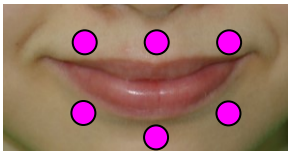
目標: 引發合唇動作

注意:

- 為了保持衛生，進行前請戴上手套。
- 為了學生的舒適，不要留長指甲，進行前需確保指甲已修剪好。
- 為了避免照顧者被咬傷，進行時需確保手指維持於牙肉以外的位置。
- 若學生不合作／抗拒，可暫停讓學生休息一會後再繼續。
- 進行時的需把指力控制在僅足以維持手指接觸皮膚的力度。

步驟

1. 將小型震動按摩器放在唇邊指定的位置 3 至 5 秒以引發合唇動作
2. 上唇的左邊 ,1…2…3…4…5…, 移到中間 1…2…3…4…5…,移到右邊 1…2…3…4…5…
3. 下唇的右邊 1…2…3…4…5…, 移到中間 1…2…3…4…5…,移到左邊 1…2…3…4…5…
4. 每次圍著唇邊做 3 至 5 圈



1

2

3

4

5

6

Appendix IIIe

職業治療 – 口肌訓練

Occupational Therapy – Oral Motor Training

Vibration at the midline of the lips 唇部中線震動按摩

Aim: facilitate lip closure

General Reminder:	
➢ For the purpose of hygiene, surgical gloves should be used ➢ For the comfort of the student, caregiver should have his/her finger nails cut ➢ To prevent being bite by the student, always keep your fingers outside the gum, and never move around in between the teeth. ➢ When student do not cooperate/ refuse, stop and let him/ her rest for a while and try again later. ➢ Force to be used is the minimum amount that just keep your fingers contacting the skin.	
Method	
4. place vibrator at the midline of upper and lower lip for 3 to 5 seconds to elicit lip closure, 1…2…3…4…5… 5. repeat for three to five times	

職業治療 – 口肌訓練

Occupational Therapy – Oral Motor Training

Appendix IIIe

Vibration at the midline of the lips 唇部中線震動按摩

目標: 引發合唇動作

注意:	
➢ 為了保持衛生，進行前請戴上手套。 ➢ 為了學生的舒適，不要留長指甲，進行前需確保指甲已修剪好。 ➢ 為了避免照顧者被咬傷，進行時需確保手指維持於牙肉以外的位置。 ➢ 若學生不合作／抗拒，可暫停讓學生休息一會後再繼續。 ➢ 進行時的需把指力控制在僅足以維持手指接觸皮膚的力度。	
步驟	
5. 將小型震動按摩器放在上下唇的中線位置 3 至 5 秒以引發合唇動作, 1…2…3…4…5… 6. 重覆做 3 至 5 次	

Equipment Lists

Oral Motor Tools

Grabber	For resistive chewing (Appendix IIIa)	 Ark's Grabber
Vibrators	For vibration around lips and mid-line of the lips (Appendix IIId, IIIe)	 Ark's z-vibe

Measurement Instruments/ Tools

Absorbent Bib	For collection of saliva drooled	
Electronic Beam Balance	For measurement of bib weight	 

Others

Plastic Mouth Model	For caregiver education 1. About oral Structure 2. Resistive chewing (Appendix IIIa)	

Beckman Oral Motor Protocol (an example)

	職業治療 Occupational Therapy					
	Beckman Oral Motor Protocol					
	學生姓名：		班別：	禮	離校學年：	
	本學年：	2005-2006	出生日期：		年齡：	
	治療師：		填寫日期：	29-Nov-05		
		Raw Scoring初步分數		No. of trial	Computed Score電腦分數 %	
Lip唇		Upper上	Lower下		Upper上	Lower下
	ROM - Protrusion前伸幅度	1	3	3	33.33333333	100
	ROM - Elongation外展幅度	1	3	3	33.33333333	100
	Strength力度	2	3	6	33.33333333	50
Jaw下顎		Left左	Right右		Left左	Right右
	Strength力度	6	7	20	30	35
	Resting Range靜止幅度	REDUCED			0	
	Lateral Shift	nad	nad		nad	nad
	A-P Shift	nad	nad		nad	nad
Tongue舌		Left左	Right右		Left左	Right右
	Against pressure 反推動力	3	3	3	100	100
	Towards Pressure 跟隨	0	0	3	0	0
	Upper gum上齒齦	0	0	3	0	0
	Cheek臉頰	0	0	3	0	0
	Lower gum下齒齦	0	0	3	0	0
	Mid-blade舌中葉	0		3	0	
	Tongue Tip舌尖	0		3	0	
	Tongue base alignment舌根位置	BN	MO		0	moderate
Cheek臉頰		Left左	Right右		Left左	Right右
	ROM - Upper活動幅度(上)	1	1	3	33.33333333	33.33333333
	ROM - Lower活動幅度(下)	1	1	3	33.33333333	33.33333333
	Strength力度	0	0	5	0	0

Appendix VI

Homework Record sheet

職業治療 – 口肌訓練　Occupational Therapy – Oral Motor Intervention

訓練記錄表　Training Record

訓練日期 Intervention Period:　　學生姓名 Name:

日期 Date / 技巧 Techniques							
震動咀唇及面頰 (D/ R/ N)	18/12（一）	19/12（二）	20/12（三）	21/12（四）	22/12（五）	23/12（六）	24/12（日）
	表現:	表現:	表現:	表現:	表現:	表現:	表現:
	25/10（一）	26/10（二）	27/10（三）	28/10（四）	29/10（五）	30/12（六）	31/12（日）
	表現:	表現:	表現:	表現:	表現:	表現:	表現:
	1/1（一）	2/1（二）	3/1（三）	4/1（四）	5/1（五）	6/1（六）	7/1（日）
	表現:	表現:	表現:	表現:	表現:	表現:	表現:
	8/1（一）	9/1（二）	10/1（三）	11/1（四）	12/1（五）	13/1（六）	14/1（日）
	表現:	表現:	表現:	表現:	表現:	表現:	表現:
	15/1（一）	16/1（二）	17/1（三）	18/1（四）	19/1（五）	20/1（六）	21/1（日）
	表現:	表現:	表現:	表現:	表現:	表現:	表現:

<u>表現 Performance</u>

D: 完成 done

R: 學生抗拒而未能完成 attempt to do but can't be done because of refusal

N: 未有進行 didn't attempt to do