國立臺東大學特殊教育學系，特殊教育中心
東臺灣特殊教育學報，民 94，7 期，1-18 頁

Using Functional Communication Training to Reduce Hand Mouthing Behavior in a Student with Multiple Disabilities

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ABSTRACT

The current study employed a single subject methodology and included three experiments that functionally analyzed one multiple disability student's hand-mouthing behavior. The investigator videotaped each condition using a videocassette recorder. Behavioral data were recorded and then analyzed by visual inspection. An analogue functional analysis included demand, attention, alone, and play conditions was used in Experiment 1 to detect the function of the student's hand-mouthing which might be maintained by negative social reinforcement, positive social reinforcement, or sensory reinforcement. An analysis of sensory modalities was conducted in Experiment 2 to further analyze the possible sensory consequences causing the student's hand-mouthing. After preference item assessment, FCT was employed in Experiment 3 to teach the student to express his needs by gesture and to treat his mouthing behavior. Results of the present study demonstrated sensory consequence was one determinant of hand-mouthing in this student. The specific function of this student's hand-in-mouth behavior might be maintained by oral- and hand- tactile stimulation. Furthermore, FCT could be successfully taught to increase the student's communication ability and to decrease his hand-mouthing behavior.

Key words：functional communication training，hand-mouthing，functional analysis，multiple disabilities

INTRODUCTION

Hand mouthing or hand-in-mouth behavior is one kind of habit behaviors occurred in 15% of people with developmental disabilities (Roscoe, 2001). It is a behavior problem often observed in about 7-17% of persons with mental retardation in institutionalized settings (Rast & Jack, 1992). Such behavior is a repetitive and rhythmic behavior that has been defined as the placing of one or more digits of the hand past the plane of lips, insertion of the hand into the mouth, or any contact between the hand and the mouth (Lerman & Iwata, 1996). Chronic hand mouthing can cause tissue damage which results in skin infection (Ball, Campbell, & Barkemeyer, 1980). Such behaviors might affect learning activities if it exhibited at high levels (Reid, Parsons, Phillips, & Green, 1993). Therefore, detecting the functions of hand mouthing and reducing this aberrant behavior becomes an important issue.

Despite a variety of behavioral techniques, such as aversive stimulation (e.g., Friman & Hove, 1987), a respond cost (e.g., Lloyd, Kauffman, & Weygant, 1982), overcorrection (e.g., Doke & Epstein, 1975), timeout (e.g., Bishop & Stumphauzer, 1973), and differential reinforcement of incompatible behavior (e.g., Miner, 1991) being used to reduce hand-mouthing in studies, little attention was paid to the functions of such behavior. Therefore, the effects of treatments have been inconsistent (Lovaas, Newsom, & Hickman, 1987). Further exploration to examine the functions that might exert their control over hand-in-mouth behavior is needed.

Recently studies used analogue functional analyses to detect the functions of hand-in-mouth behaviors. If high levels of hand-mouthing occurred in alone settings would suggest that such aberrant behavior was maintained through automatic reinforcement (e.g., sensory stimulation) (e.g., Lerman & Iwata, 1996; Mazaleski, Iwata, Rodgers, Vollmer, & Zarcone, 1994; Piazza, Adelinis, Hanley, Goh, & Delia, 2000). Consistent with this view, Mason and Iwata (1990) found that one girl with profound mental retardation exhibited higher rates of hand mouthing in the alone condition than in any other conditions. The same results were reported by Irvin, Thompson, Turner, and Williams (1998), showing that the highest levels of hand mouthing occurred when two people with profound mental retardation were left alone in a separate room. These studies suggest a lack of stimulating environments, such as no interactions with other persons and no toys to play can control high levels of hand-mouthing behaviors. In such impoverished stimulating environment, people with developmental disabilities might often exhibit high levels of mouthing responses to provide themselves more sensory stimulation.

If this mouthing behavior was maintained by such sensory stimulation, one treatment approach is based on attempts to eliminate or attenuate the sensory consequences directly produced by hand mouthing. For example, Mazaleski et al. (1994) attenuated the participants' sensory stimulation by placing oven

mitts on their hands and then reduced the levels of their hand mouthing effectively. In consistent with Mazaleski et al.'s study, Irvin et al. (1998) decreased the sensory consequences by placing flexible sleeves containing stays to increase rigidity on the arms of 2 participants who engage in hand mouthing. The results of their study revealed that attenuation in sensory consequences could decrease the rates of hand mouthing. The second treatment approach involves providing access to alternatives of stimulation to compete with that produced by hand mouthing. For example, Goh et al. (1995) used functional analyses to study twelve people with developmental disabilities with mouthing behaviors and found nine out of them exhibited high levels of such behavior only in alone settings. Further providing alternative preferred toys for these nine persons effectively reduced the levels of hand-mouthing behavior which presumably might be maintained by sensory consequences. In consistent with the findings of Goh et al.'s (1995) study, Shore, Iwata, DeLeon, Kahng, and Smith (1997) also found sensory reinforcement may contribute to occurrence of hand-mouthing in two students with developmental disabilities. After preferred item assessments, the most favorite objects were employed to compete with hand-mouthing and effectively decreased the levels of such aberrant behaviors in these two students. Favell, McGimsey, and Schell (1982) also supported this viewpoint and found that the hand mouthing of four persons were maintained by oral sensory stimulation, such mouthing behavior were reduced by providing participants with items that provide oral sensory stimulation. (e.g., mouthing toys and popcorn). The third approach to treat stereotypical hand-mouthing behavior may use functional communication training to teach students to request functional equivalence to compete with the outcome of aberrant behavior (Carr & Durand, 1985; Durand & Carr, 1991). For example, Tang, Patterson, and Kennedy (2003) conducted functional analyses of stereotypic behaviors for six students with developmental disabilities and found that sensory consequence was the main reason to maintain such aberrant behavior in one student. After demonstration of one sensory manipulative toy could be effectively used to compete with stereotypic behavior, functional communication training was further employed to teach this student to request such preferred toy. Because sensory consequences derived from manipulating preferred toys could be substitutable for those produced by aberrant behavior, the presence of these toys reduced the levels of such behavior in this student. To sum up, in current literature as mentioned above, hand mouthing behavior maintained by sensory reinforcement could be successfully treated using stuffs, such as mittens to attenuate sensory consequences derived from repetitive mouthing responses. In parallel, providing alternative preferred stimulation to substitute such aberrant behavior was demonstrated to be effective. Moreover, using functional communication training to teach students to express their needs for functional equivalence to compete with this aberrant behavior was also showed to be a good choice in treatment.

On the other hand, after analogue func-

tional analyses, if high levels of hand-mouthing occurred in attention or demand settings would suggest that such aberrant behavior was maintained by social reinforcement (Baumeister & Forehand, 1973). Some researchers also found that social situations may serve as a negative reinforcer to control stereotypy. For example, using analogue functional analyses to assess the functions of hand mouthing in two students with mental retardation, Lalli, Casey, and Kates (1995) have shown that such aberrant behaviors served to escape from task demands in the environment. The students' hand mouthing served as an escape from instructors' demands. This study suggests that such behavior might function as negative social reinforcement to escape or avoid difficult tasks in the environment. If hand mouthing is maintained by social consequences, the extinction for social reinforcement may be needed. One option for treatment might be to provide a break or attention contingent or non-contingent on the absence of hand mouthing (e.g., Goh et al., 1995).

Purpose of the Study

The first purpose of this study was to examine possible functions of one student's hand mouthing maintained mainly by positive and/or negative social reinforcement, and/or sensory reinforcement. Analogue functional analyses were used in Experiment 1 to detect hand mouthing which served as escape from task demand, obtaining attention from the investigator, and producing self-stimulation.

Second, if sensory reinforcement could be demonstrated its effect on this student's hand mouthing behavior, this study would seek to identify specific sensory reinforcers that maintain hand-mouthing. To conduct experimental analyses of possible visual, auditory, oral, or hand sensory consequences that might maintain mouthing behavior, functional analyses in Experiment 2 were used to mask the possible sensory consequences causing such behavior.

Third, if the functions for this student's hand-mouthing were maintained either by social, sensory, or multiple reinforcements, this study would test functional analysis findings via a concurrent operant procedure. Experiment 3 sought to examine the effect of functional communication training developed from prior functional analyses to test specific hypotheses regarding the operant functions of mouthing behavior.

According to these purposes, there were several hypotheses in this study:

Hypotheses of the Study

1.The functions of this student's hand mouthing may be maintained either by sensory reinforcement, positive social reinforcement, or negative social reinforcement.

2.If the student's hand mouthing was maintained by sensory reinforcement, it could be reduced by masking either visual, auditory, oral, or hand sensory consequences.

3.Functional communication training developed from findings of functional analyses and preference assessments may be successfully taught to decrease this student's mouthing behavior.

GENERAL METHOD

The current study used single subject methodologies to investigate one student who exhibited lots of hand-in-mouth behavior. Functional analyses were used to examine possible contingencies which might maintain this student's hand mouthing.

Student and Settings

Vincent was enrolled in a special school which included one teacher and one teacher assistant in each class. He was selected because of his high levels of hand-in-mouth behavior that were exhibited throughout the day. He was an 8-year-old boy classified as having multiple disabilities. He could walk and go to restroom with assistance. Vincent frequently depended on others for his care. He often ate soft diet with a spoon. He can hardly speak single words and follow simple one-step direction. Additionally, he often displayed high levels of hand mouthing responses in his classroom.

1.Measures

The dependent variables were hand-mouthing behaviors. His mouthing behavior was defined as "Contact or insert his hand into his mouth." or "Put either his thumb or finger(s) into his mouth" The investigator videotaped each condition using a videocassette recorder and a stopwatch. Two observers recorded the frequency of hand mouthing responses by employing a 15-s partial interval sampling method. All data were converted to percentage of 15-s intervals during which this aberrant behavior occurred.

2.Interobserver Agreement

Before conducting the functional analysis, two graduate students in special education were trained for 3 hr to use the observational system and reached a 90% agreement criterion, and then served as observers for all sessions. These two observers recorded data independently and compared with data sheet simultaneously. Across experiments an average of 25% sessions (range, 20% to 33%) was scored for interobserver agreement. An agreement was computed using an interval-by-interval agreement method to assess percentage agreement for the frequency of hand-mouthing behaviors (Kazdin, 1982). Interobserver agreement was computed by dividing the number of agreements by the number of agreements plus the number of disagreements and multiplying by 100%. The interobserver agreement for Vincent's hand-mouthing behavior is 95% (85% to 100%) in Experiment 1, 97% (90% to 100%) in Experiment 2, and 91% (85% to 100%) in Experiment 3.

EXPERIMENT 1: ANALOGUE FUNCTIONAL ANALYSIS

Method

Procedure

Before functional analysis was conducted, Vincent was observed in classrooms to analyze possible antecedent and consequence events. He was observed eight hr across activities for two day.

A multielement design (Sidman, 1960) was used to assess the occurrence of hand mouthing across four conditions: (a) attention, (b) demand, (c) alone, and (d) play (Iwata, Dorsey, Slifer, Bauman, & Richman, 1982/1994). Each condition was presented once per day for 5 min

with a random sequence occurring each day. Sessions were conducted at the same time each day. All sessions were videotaped by a graduate student and recorded by two graduate students using data sheets. The graduate student positioned video camera facing the student from approximately 2 m, repositioning it if the participant moved. In order to avoidance of being sensitive to manipulative settings for the participant, behavioral data collected were not adopted in formal analyses until two weeks later. These manipulative conditions were used to identify possible operant functions that the hand mouthing might serve. During the Attention condition, Vincent was seated beside the investtigator. When seated the investigator read a book, while Vincent was provided with toys. If hand mouthing occurred, the investigator provided 5 s of social comments to him, telling him not to engage in such disruptive responses, and provided physical contact. After the 5 s of social comments elapse, the next occurrence of hand mouthing occasions a similar consequence. All other responses exhibited by Vincent were ignored. During the Demand condition, the investigator sat beside Vincent and delivered a verbal demand every 10 s (e.g., "Put the blocks in the cup"). Correct responses were immediately praised and incorrect or no responses resulted in a partially physical prompt after 10 s elapsed. Any occurrence of hand mouthing responses resulted in 30 s cessation of task demands. During the Alone condition, Vincent was seated on a chair in the room. No social interaction or activities occurred during this condition. During the Play condition, Vincent was seated beside the investigator. Vincent was provided with various toys identified by the teachers as being preferred and was praised every 30 s in the absence of hand mouthing (occurrences of stereotypical hand mouthing was ignored).

Results

Figure 1 displays the results of the functional analysis for Vincent's hand mouthing responses. Throughout 36 sessions Vincent exhibited a high frequency of hand mouthing in the Alone, Demand, and Attention condition.

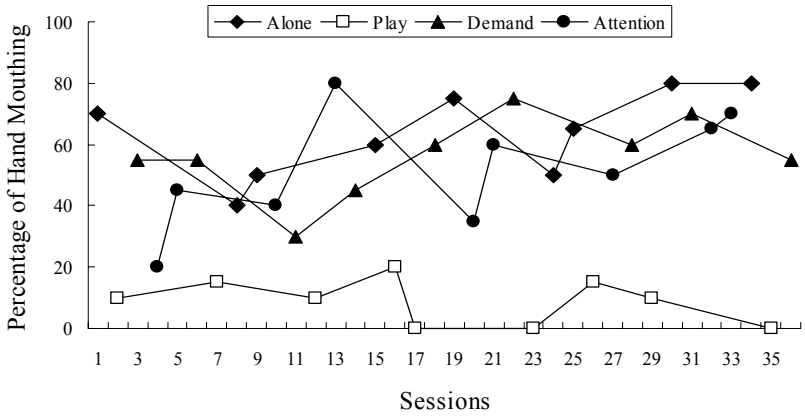

Figure 1. Vincent's percentage of intervals engaged in hand mouthing in analogue functional analysis

For all of the sessions a mean of 63% (range, 40% to 80%) of intervals contained hand mouthing in the Alone condition, a mean of 9% (range, 0% to 20%) of intervals contained hand mouthing in the Play condition, a mean of 56 (range, 30% to 75%) of intervals contained hand mouthing in the Demand condition, and a mean of 48% (range, 20% to 80%) of intervals contained hand mouthing in the Attention condition. The results indicated that the function of Vincent's hand mouthing might be maintained by multiple sources of consequences including sensory and social reinforcement. It seems to be reasonable to further find out what specific sensory sources contribute to such aberrant behavior in order to reduce it. Therefore, Experimental 2 was further conducted to examine the sensory properties of Vincent's mouthing behavior.

EXPERIMENT 2: ANALYSIS OF SENSORY MODALITIES

Method

The second study further analyzed high levels of hand-mouthing behaviors occurring in the Alone condition identified in Experiment 1 to assess specific sensory functions that caused these behaviors. The same definitions of hand-mouthing responses, measures, settings, and interobserver agreement in Experiment 1 were conducted through this study.

Procedure

Experiment 2 used functional analyses to assess the possible sensory consequences of hand-mouthing for this student. A multielement design was used to assess the occurrence of hand-mouthing across five conditions: (a) Alone, (b) Auditory masking, (c) Hand-Tactile masking, (d) Oral-Tactile masking, and (e) Visual masking conditions. During the Auditory masking condition, Vincent was seated alone on the chair. A pair of plastic safety earplugs was put in his ears to mask possible auditory consequences produced by sucking fingers. During the Hand- Tactile masking, a pair of gloves was used for him to cover hand-stimulation effects possibly produced by hand-mouthing responses. During the Oral-Tactile masking, antiseptic gauze worn over mouth was used for him to cover oral-stimulation effects possibly produced by hand-mouthing responses. During the Visual masking condition, the investigator and the target student were seated next to each other. One pair of plastic safety goggles was used to mask the visual effects for Vincent. The goggles were held in place by an elastic band that wrapped around the back of Vincent's head and attached at the sides of the goggles. During the Alone condition, Vincent sat on a chair and received no social interaction or activities. Each condition was presented once per day for 5 min with a random sequence occurring each day. Sessions were conducted at the same time each day.

Results

Figure 2 displays the results for Vincent's analysis of sensory modalities. Throughout 35 sessions Vincent exhibited a high frequency of hand-mouthing within the Alone, Auditory, and Visual masking conditions, but a lower frequency of hand-mouthing in the Oral- and

Hand- Tactile masking condition. The results suggest that tactile stimulation, especially hand stimulation is functioning as reinforcer for Vincent. For all of the sessions a mean of 54% (range, 30% to 75%) of intervals contained hand-mouthing in the Alone condition, a mean of 41% (range, 20% to 55%) of intervals contained hand-mouthing in the Auditory masking condition, a mean of 45% (range, 20% to 60%) of intervals contained hand-mouthing in the Visual masking condition, a mean of 14% (range, 5% to 30%) of intervals contained hand-mouthing in the Oral-Tactile masking condition, and a mean of 5% (range, 0% to 15%) of intervals contained hand-mouthing in the Hand-Tactile masking condition.

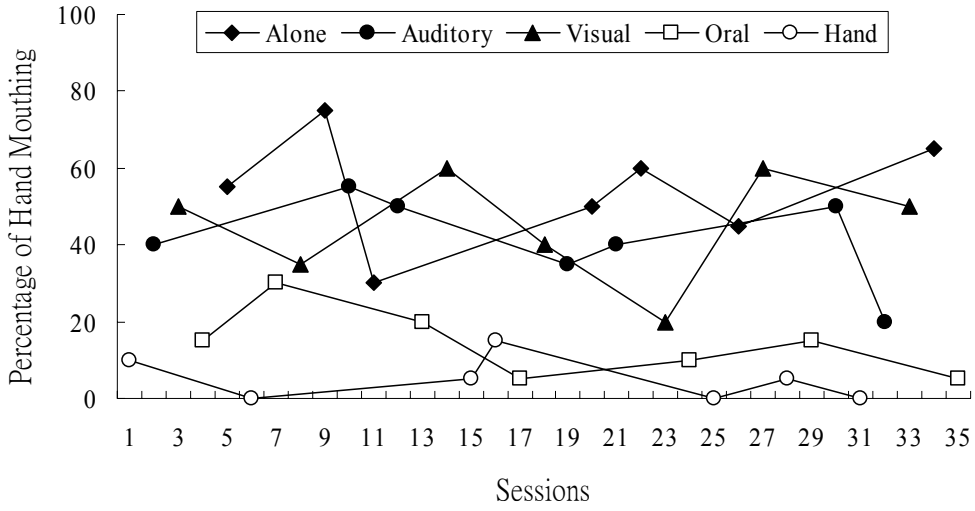

Figure 2. Vincent's percentage of intervals engaged in hand mouthing in analysis of sensory modalities

EXPERIMENT 3: TREATMENT OF HAND MOUTHING

Method

The third study further analyzed Vincent's possible preferred tactile stimulation in order to compete with his high rates of mouthing behaviors occurring in the Alone condition identified in Experiment 1 and 2. Additionally, this study also analyzed if hand-mouthing served distinct and separate functions via functional communication training.

1.Assessing Preference

Object preference ratings were determined by presenting five different kinds of objects possibly used for tactile stimulation in a horizon row. No instructions were given; the experimenter waited for the student to choose an object. The preference sessions began by seating the student with objects in front of him. Five preassessment sessions were conducted. The student had free access to the stimuli for 30 min each session. Stimuli for Vincent were chosen according to the reports of his classroom

teachers. All stimuli in Vincent's preference assessment consisted of sensory manipulative toys or items. Preference was assessed using a multiple-stimulus without replacement (MSWO) procedure (DeLeon & Iwata, 1996). The experimenter presented 5 items to Vincent in a linear array. Vincent was permitted to choose one stimulus item from the array. After a particular stimulus was chosen, he had 10s access to the item, after which time the trials resumed. This procedure continued until all items were chosen, or until no choice was made. This procedure was repeated 3 times. Preference was determined as the percentage of times an item was selected. The most preferred stimulus (a puzzle) was incorporated into functional communication training during the treatment evaluation phase. A single subject methodology was then used to detect the treatment effects for functional communication training. The research design and procedure for conducting functional communication training were addressed below.

2.Research Design

A mixed design with an ABAB withdrawal embedded within a multiple baseline design across operant functions was used to assess the effects of functional communication training on Vincent's hand mouthing. The percentage of the time intervals with hand-mouthing was the dependent variable. Functional communication training developed from Experiment 1 and 2 was the independent variable. All sessions were taken across three conditions including Attention, Demand, and Alone stimulation conditions. Thus, through observation and data records, the effects of treatment on hand-mouthing behaviors were assessed.

3.Procedure

Baseline. Possible operant functions identified in Experiment 1 were incorporated into baseline. The three conditions were Alone, Demand, and Attention conditions were used to test the possibilities that multiple functions were served by Vincent's mouthing behavior. The procedures of these three conditions conducted in this phase were the same as Experiment 1. The student was exposed to baseline condition until his data were stable. The same hand-mouthing responses and measures as Experiment 1 were conducted.

Functional communicational training. During this phase, a treatment procedure, functional communication training, developed from the result of functional analyses in Experiment 1 and 2 was applied to Vincent's mouthing responses. An alternative behavior was selected to occasion a similar consequence for each response-reinforcer relation estab- lished in baseline (Carr & Durand, 1985; Durand & Carr, 1991). Vincent was taught alternative responses that would replace his hand-mouthing responses for hand stimulation, escape, and attention. After the initial baseline was established, intervention began. The investigator decided that the first functional communication training would be used during the Alone condition. During this intervention condition, Vincent was seated in his chair, while investigator sat next to him providing no interaction with him. Following Vincent's hand gesture, the investigator would use functional communication training to physiccally and verbally prompt him to request to play the most preference object (a puzzle) by making the sign for a puzzle (e.g., "Vincent. If

you want to play the puzzle, what do you do?"). After Vincent signed for a puzzle, the investigator would show him the puzzle for 20 seconds. Con- sequences for his hand-mouthing behaviors were the same as those in the baseline condi- tions. The physical prompts were faded until Vincent's percentage of intervals with sign communication was 15% higher than the average of those in baseline phase lasting three sessions.

Teaching Vincent appropriate responses to obtain the investigator's attention was taught in a similar manner as requesting the preferred toy to play. During the Attention condition Vincent was seated in his chair, while the investigator sat next to him reading a book. Following a hand-mouthing response, the investigator would use functional communication training to physically and verbally prompt him to get attention with the sign for attention (e.g., "Vincent. If you want to get my attention, what do you do?"). If Vincent signed for attention, the investigator would give him praise and feedback for 5 seconds (e.g., "Vincent, I like the way you draw my attention."). The physical prompts were faded until Vincent's percentage of intervals with sign communication was 15% higher than the average of those in baseline phase lasting three sessions.

Teaching Vincent to ask for a rest from a difficult task was the last step for intervention. After Vincent displayed his mouthing behavior during the Demand condition, the investigator would physically and verbally prompt him to request a break with the sign for break (e.g., "Vincent. If you want to take a rest, what do you do?"). After Vincent signed for a break, the investigator would give him a break for 30 seconds. The physical prompts were faded until Vincent's percentage of intervals with sign communication was 15% higher than the average of those in baseline phase lasting three sessions.

Results

Figure 3 displays the results for Vincent's functional communication training in the Alone, Attention, and Demand conditions. In the Alone condition, Vincent's mean percentage of hand-mouthing responses occurring during the first baseline was 56% (range, 45% to 65%). After 8 sessions of teaching Vincent using sign to request a puzzle, his aberrant behavior was decreased to a mean percentage of 8% (range, 0% to 25%). However, at this time, after 5 sessions of teaching him use sign to gain attention from others, his levels of hand- mouthing behavior was still high in the Attention condition (M = 48%; range, 35% to 60%). Therefore, it was reversed to baseline in the Alone condition again. Vincent's mean percentage of hand mouthing responses occurring during the second baseline was 52% (range, 35% to 70%). After another 10 sessions of teaching Vincent use sign to request the puzzle, his hand-mouthing behavior was dramatically decreased to a mean percentage of 6% (range, 0% to 15%) in this condition. In contrast, in the Attention condition, his mean percentage of mouthing behavior occuring during the baseline was 46% (range, 30% to 65%). Following teaching Vincent for requesting a puzzle, the functional communication training for drawing other's attention was introduced to him.

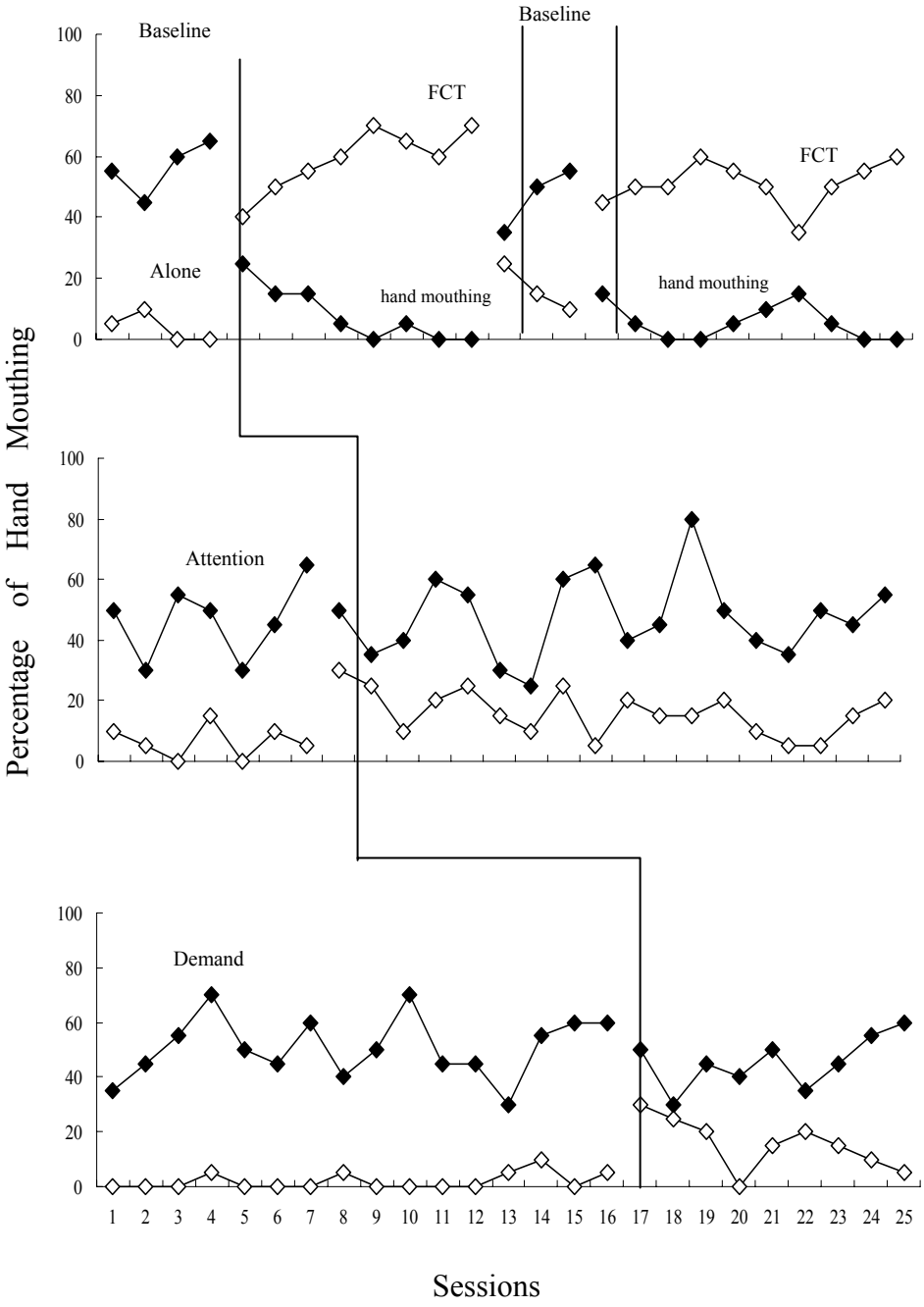

Figure 3. Vincent's percentage of hand mouthing during functional communication training

After 18 sessions of teaching Vincent use sign to get attention from others, the mean percentage of his mouthing behavior was 48% (range, 25% to 80%). As regard to the baseline in the Demand condition, his mean percentage of hand-mouthing responses was 51% (range, 30% to 70%). Following the intervention in the Attention condition, Vincent was taught to ask a break from difficult task. After 9 sessions of teaching Vincent use sign to request a break, the mean percentage of his mouthing behavior was 46% (range, 30% to 60%).

On the other hand, Vincent's communication responses showed an inverse pattern to that for his mouthing behavior only in the Alone condition. In this condition, Vincent's mean percentage of communication responses occurring during the first baseline was 4% (range, 0% to 10%). After 8 sessions of teaching Vincent using sign to request a puzzle, his communication behavior was increased to a mean percentage of 59% (range, 40% to 70%). When it was reversed to baseline in the Alone condition again, Vincent's mean percentage of communication responses occurring during this second baseline was 17% (range, 10% to 25%). After another 10 sessions of teaching Vincent use sign to request the puzzle, his communication behavior was dramatically increased to a mean percentage of 51% (range, 35% to 60%). In contrast, in the Attention condition, Vincent's mean percentage of communication responses occurring during the baseline was 6% (range, 0% to 15%). After 18 sessions of teaching Vincent using sign to get attention from others, his communication behavior was increased to a mean percentage of 16% (range, 5% to 30%). As regard to the Demand condition, his mean percentage of communication responses occurring during the baseline was 2% (range, 0% to 10%). After 9 sessions of teaching Vincent using sign to request a break from difficult task demand, his communication behavior was increased to a mean percentage of 16% (range, 0% to 30%).

The results from Experiment 3 suggest that despite of suspecting multiple operant functions for Vincent's mouthing behavior only access to preferred hand stimulation (a manipulative puzzle) functioned as a reinforcer and established an alternative response. The results further clarify undifferentiated patterns of prior functional analysis conducted in Experiment 1 and suggest that such patterns should not be interpreted as identifying multiple functions of hand-mouthing behavior. Instead, it was showed that such aberrant behavior was only functioning for sensory consequences, especially for hand stimulation.

DISCUSSION

Results of the present study showed that sensory consequences, especially hand stimulation could be a main determinant of hand-mouthing behavior in Vincent, suggesting that such behavior occurred frequently in a lack of environmental stimulation without antecedent and consequent events. The findings of this study were also supported by several researches (e.g., Goh et al., 1995; Lerman & Iwata, 1996; Mazaleski et al.,1994; Piazza et al., 2000) which have shown that hand mouthing behavior functions to obtain sensory reinforcers. For example, Shore et al. (1997) conducted study to

analyze the functions of hand-mouthing in two students with developmental disabilities and found that both students' repetitive mouthing behavior served to obtain sensory consequences.

With respect to the analogue functional analysis conducted in Experiment 1, the present data seemed undifferentiated for Vincent, because high levels of hand-mouthing occurred during the Alone, Attention, and Demand conditions. One possible explanation is that his hand-mouthing served multiple functions and only stimulation provided in the Play (control) condition could compete with his handmouthing successfully. This is consistent with ecent studies conducted by Lohrmann-O'Rourke and Yurman (2001) and Vollmer, Marcus, Ringdahl, and Roane (1995) who demonstrated hand-mouthing behaviors occurred at high levels across almost all assessment conditions. However, these patterns of hand-mouthing responses occurred might also suggest that none of the alternative activities available during all but play assessment conditions could compete with the sensory reinforcers maintaining hand-mouthing behaviors, and the functions of hand-mouthing might be merely under control of sensory reinforcement. That is, specific types of antecedents and consequences selected for the most of the assessments may not be relevant to the actual maintaining factors in the environments. This explanation was supported by Experiment 3 which showed Vincent's hand-mouthing was merely maintained by sensory consequence (hand stimulation). Such perspective was further supported by Iwata et al. (1994) who have shown three subjects exhibited extremely high levels of self-injurious behaviors during almost all assessment conditions and suggested that these behaviors were maintained by sensory reinforcement.

Moreover, specific sensory consequences were detected in our study and showed that hand stimulation was one source to execute its impact on Vincent's hand-mouthing behavior. This finding was further supported by a prior study (Goh et al., 1995) which has shown that hand stimulation contributed to occurrence of repetitive hand-mouthing behavior because most of preferred toys picked up by subjects in their study were used for hand manipulation and stimulation. On the other hand, it is uncertain whether oral stimulation was strongly influencing Vincent's mouthing behavior as well. Despite of better masking effects in hand stimulation than those in oral stimulation as demonstrated in Experiment 2 the preferred object (one puzzle) provided in our study could be used for hand stimulation or oral stimulation for Vincent at times. Therefore, it is still difficult to determine exact sources of stimulation for Vincent's hand-mouthing. Unless specific sensory sources of stimulation could be successfully determined to reduce handmouthing behavior, it is hard to jump to the conclusion that hand-stimulation is a mere reason contribute to such behavior.

Another issue raised is whether appearance of the preference item acted as an alternative sensory stimulation or an incompatible response for Vincent's hand-mouthing behavior. The data from the analogue functional analysis in Experiment 1 indicated that the function of Vincent's hand-mouthing might be maintained

by sensory reinforcement. Additionally, different preferred objects were assessed and intervened via functional communication training in Experiment 3. Providing preference objects may be incompatible to occurrence of hand-mouthing only when the subject was trained to select and manipulate objects and obtained reinforcement later. However, in this case, Vincent had free choice to decide to request playing with the preferred item or continuously engaged in his hand-mouthing responses. It is unlikely for him to play with a preferred object in order to compete with engaging mouthing behavior by himself. On the contrary, he could get the sensory reinforcement from manipulation of objects to substitute those consequences derive from engaging in hand-mouthing responses. This is further supported by the findings of the functional communication training implemented in Experiment 3. In the intervention sessions, functional communication replaced Vincent's mouthing behaviors with more appropriate communicative behaviors when provided a reinforcer (preferred object). The reinforcer (preferred object) used in the functional communication training acted as an equivalent to that maintained by hand-mouthing behavior and reduced such aberrant behavior.

Finally, we could draw temporary conclusions that sensory consequences, especiallly oral and hand stimulation contributed to occurrence of mouthing behavior for this student in the current study. Additionally, functional communication training could be successfully taught to reduce mouthing behavior and to increase communicative responses. Some suggestions for future studies were provided as follows. First of all, more studies have to be conducted to attest specific sensory consequence related to mouthing responses, in addition to general sensory consequences in order to draw more specific functional treatments. Secondly, more studies to replicate the effectiveness of functional communication training on disruptive behavior, especially hand-mouthing for students with developmental disabilities are needed.

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以功能溝通訓練來減低多重障礙學童的含手行為

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摘　要

本研究共有三個子研究，採單一受試研究法，以一位有含手行為(hand mouthing)的多重障礙學童為研究對象。使用數位攝影機全程錄下其含手的行為，事後進行觀察、紀錄、以及視覺檢查的分析。研究一、以類似功能分析（analogue functional analysis）從操弄要求、注意、獨處、以及遊戲四種情境，來分析該學童含手的功能是社會負增強、社會正增強、或感官增強所造成的。研究二、進一步地分析造成該學童含手行為的感官型態，研究三、先進行偏愛物的評量，再以功能溝通訓練教導該學童以手勢來表達需求，以此對含手行為進行介入。研究結果顯示：感官的增強是學童反覆含手行為的主要原因之一，而口部或手部的觸覺感官後果可能是該學童含手行為的功能。此外，功能溝通訓練可以增加該學童的溝通能力，並可有效地降低其含手行為的次數。

關鍵字：　功能溝通訓練、含手行為、功能分析、多重障礙