Review Article

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Digit-Sucking: A Review of the Literature, Clinical Observations and Treatment Recommendations

Rosemarie A. Van Norman, C.O.M.

The purpose of this paper is to share information about the digit-(thumb/finger) sucking behavior including how it begins; the biological, psychological and physiological connections; how it becomes perpetuated; problems related to prolonged sucking activity; guidelines for referral; and considerations for appropriate patient selection to enhance successful therapy. The basis for this information is a combination of published research and 24 years of clinical experience working with approximately 1500 individuals with sucking habits. Data compiled on 723 individuals will be presented.

Incidence and the Beginnings

Sucking is a very normal, instinctive behavior in healthy infants and is essential to survival. The mouth is the center of the human infant's universe, a means of receiving nutrition and exploring their new world. The sucking and oral fixation provide peripheral stimulation that is a very important aspect of neurological development in learning feel, temperature, texture, color, shape, size and proximity (Annunciato, 1995).

Fetuses are routinely observed via ultrasound sucking their thumbs and fingers in utero and many continue the activity after birth. Most parents will attest that these infants are a JOY to care for because the sucking activity is very soothing and assists the infant in self-calming. Many infants begin digit sucking between three and six months when their motor skills are developed sufficiently to effectively bring their thumb or finger to their mouths at will.

Larsson and Dahlin (1985) estimated the incidence of infant digit-sucking activity in western cultures to be from 75% to 95%. There is a declining incidence with increasing age. Infante (1976) reported 19% of children in the United States continue the behavior after age five. The most comprehensive survey of the incidence of digit-sucking habits was conducted by The United States Division of Health Examination Statistics between 1963 and 1965 (Kelly, Sanchez and Van Kirk, 1973). The study included approximately 8,000 children between the ages of 6 and 11 years which was considered a probable representation of 26 million children in the United States. It found "an estimated 10%" of these children to have active digit-sucking habits. Kellum, Gross, Hale, Eiland and Williams (1994) found 26% of 371 children 6 to 12 years of age to have digit-sucking habits.

The 723 individuals in my data ranged from four and 3/4 years to age 34. Of these, 327 (45%) were six years of age or younger and 396 (55%) were seven years of age or older. The group had 489 females and 234 males. Of these, 597 sucked a thumb, 124 sucked finger(s), one

sucked his/her tongue and one sucked a blanket.

Mimicking

Mimicking is a normal part of child development. It begins very early and continues throughout life. Infants and toddlers often act like little sponges, absorbing and mimicking *everything* they see. Many children begin the digit-sucking behavior by mimicking a playmate or another child at their daycare or preschool setting.

It is not unusual to find several individuals in one family with digit-sucking habits. Frequently, children will start the activity when a new sibling arrives into the family. This type of mimicking may be stimulated by the desire to gain the same special attention given the new baby. The child may initiate sucking on the baby's bottle or pacifier or imitate the baby's thumb or finger sucking. Many behaviors are the result of imitating a *revered* sibling. If an older sibling happens to have a digit-sucking habit, the toddler will often demonstrate his *affinity* for his sibling by exact imitation of the behavior.

Pacifiers

There is a common misconception that children who suck pacifiers will – rarely – suck thumbs or fingers or that the use of a pacifier will prevent digit-sucking. According to data on the last 723 children I have treated for prolonged sucking habits, 243 (34%) initiated habitual sucking behavior on a pacifier. Parents of these children reported that their child initially sucked on the pacifier only, not the pacifier and/or a digit. When the infants who had sucked a pacifier developed the motor skills to effectively bring their thumb to their mouths, and the pacifier was unavailable, they often instigated sucking their thumbs or fingers. The digit is, after all, much handier! This is also true of the toddler who has become accustomed to frequent pacifier-sucking and whose parents decide to discontinue its use. These infants and toddlers have become programmed to habitual sucking activity and digit-sucking nicely replaces the missing pacifier. Pacifier-sucking children may also begin sucking on their tongue, lip, blanket or other object when the pacifier is taken away.

It is also a mistake to assume that pacifiers are harmless. Kohler and Hoist (1973), Larsson (1975), Modeer, Odenrick and Lindner (1982) found an increased incidence of posterior crossbite in the deciduous dentition of Swedish pacifier-sucking children, especially females (Ogaard, Larsson and Lindsten, 1994). The posterior crossbite resulting in constriction of the maxillary arch "is the least likely to correct spontaneously" (Profitt, 1986).

In addition, although there is limited research available

on pacifiers, it seems probable that the development of communication skills could be delayed in children who have a pacifier in their mouths constantly. They may try to vocalize around the pacifier, relinquish the pacifier momentarily or make no attempt to articulate. Passman and Halonen (1979) found that one-year-old infants who were given pacifiers made less effort to follow their mothers, which indicates reduced parent-child interaction and, consequently, communication.

The Biological, Psychological and Physiological Connection

In 1974 John Hughes and Hans Kosterlitz discovered enkephalins and the related compounds endorphins that exist naturally in the brain (Hughes et al. 1975). Harvey Milkman and Stanley Sunderwith, researchers and authors of the book, *Craving For Ecstasy - The Consciousness & Chemistry of Escape*, (1987), explain the biological, chemical and psychological processes of addictive behavior, "Realization that the central nervous system can produce its own narcotics has evolved into a reexamination of the fundamental causes of human behavior." Many pleasurable activities such as, jogging, gambling, sex, sky-diving, eating and digit-sucking can stimulate the brain to produce these chemicals.

The brain has billions of nerve cells which communicate with each other through increased or decreased "neurotransmission." Neurotransmission controls all emotion, perceptions, and bodily functions. Increased neurotransmission produces a mood of excitement or arousal. Individuals who enjoy activities which produce these sensations may become inclined toward risk-taking activities, such as sky-diving, bungee-jumping, mountain-climbing or car racing.

Decreased neurotransmission produces a calming, relaxing sensation. We've all experienced the relaxed, sleepy sensation after a big meal. The enkephalins and related compounds, the endorphins, produced by the brain are responsible for the decrease in neurotransmission. These compounds are the body's opiates or analgesics (to control pain). A person who becomes obsessed with food may utilize over-eating to reduce emotional stress and produce a mood-calming end result. Digit-sucking also falls into this category. Milkman and Sunderwith (1987) explained in their book, "not only do the endorphins and enkephalins reduce pain, they produce a euphoria (feeling of well-being) much like that of opiates. It is known that neuronal pathways associated with pain pass through that portion of the brain known as the limbic system, which is also the seat of emotion and feeling. Therefore, any substance that tends to reduce pain has a *soothing effect* on our emotions."

The infant's first association with *pleasure* is related to sucking and eating. The first source of food is milk which also decreases neurotransmission. Warm milk contains the amino acid tryptophan which the brain

converts into serotonin, which also decreases excitatory neurotransmission and produces a *soothing* effect on the central nervous system. Therefore, modern brain chemistry studies confirm the old folklore of drinking warm milk to aid relaxation and sleep.

Sucking = decreased neurotransmission = endorphin production = pleasure, comforting, soothing relaxation. The connection is made. Thus, it is not hard to understand why thumb/finger or pacifier sucking becomes a tremendous source of pleasure, self-gratification and comfort to the infant.

Normally, the brain maintains a consistent rate of excitatory and inhibitory neurotransmission. This is accomplished through changes in the amount of the brain's enzymes produced which are necessary for the increased or decreased neurotransmission reactions to occur. For example, the individual who requires surgery will have an injection of some form of analgesic (pain-killing) drug to reduce the discomfort of the surgery. The drug stimulates the brain's endorphins to accomplish this goal. However, if the same dose were given regularly over a period of time, the regulatory mechanism of the brain would reduce the potency of the drug. Subsequently, larger doses of the drug would then be necessary to achieve the initial pain-killing effect, resulting in larger amounts of enzyme production required to preserve the balance of brain chemistry.

Many individuals indulge in specific mood-altering activity to reduce tension. If there is a *frequent* need for stress relief, the individual reaches a maintenance stage and no longer indulges in the activity just to achieve the pleasure associated with the activity. The activity is continued to avoid the physical and emotional discomfort associated with the heightened and powerful production of enzymes. Abrupt termination of the activity (withdrawal) can result in very real physical irritation. The intensity of discomfort is subjective and dependent on the individual's *life circumstances*.

Obviously, not everyone who indulges in a pleasurable behavior is going to become obsessed with that behavior. It certainly does not mean that the infant who sucks a thumb will eventually become addicted to it, nor does it indicate an abnormality or emotional problem. When infants are given a pacifier or discover their thumb or finger and the comforting, pleasurable physical *associations* of sucking, they repeat the behavior. With the passing of time, children *unconsciously* indulge in the sucking activity: to relax; when bored, hungry, fearful, excited, apprehensive; to fall asleep; or when physically or emotionally stressed. It is a composite of these "cues" that *stimulate* the desire for the sucking activity. The perpetuation of digit-sucking is contingent upon a *combination* of the number of physical cues and emotional circumstances.

Dental Problems and the Domino Effect

Many assume the most common reasons for malocclusions are genetic tendencies such as discrepancies in tooth to jaw size. Actually, contemporary researchers have not yet determined how much of a given problem is related to genetic factors and how much has been influenced by environmental factors. Lundstrom (1984) summarized several research investigations of this type and concluded that only about 40% of the dental and facial variations that lead to dental malocclusion can be ascribed to hereditary factors. Corruini (1980) considered the genetic influence to be much lower.

It is probable that a substantial portion of the orthodontist's caseload is directly attributed to sucking habits. However, this figure is difficult to ascertain because no broad studies have been done in this area. Nord (1962) reported on his examination of 15,000 children in one orthodontic clinic. He concluded that 60% of the dental malocclusions found in these subjects were *caused by* sucking habits.

The dental literature is replete with the deleterious effects of prolonged sucking habits on normal dental growth and development. According to my data, 94% of the 723 individuals exhibited some degree of dental malocclusion related to their habits. I found it interesting, however, that the majority of parents were primarily concerned about social acceptance with regard to their child's sucking habit and were often unaware of dental consequences.

Webster's Dictionary (1990) defines pathology as "the study of disease and all of its manifestations, especially of the functional and structural changes caused by it." As in all pathology, the "disease" of one part inevitably affects the whole. The tooth is connected to bone. The bone is connected to ligaments and muscles. And all are connected to a *whole person*.

Just as the orthodontist can move teeth with the controlled pressure of orthodontic appliances, pressures applied by a thumb or finger can influence the positions of teeth and the formation of the bony oral structures. The degree of malformation and/or malposed teeth depends on the direction of the force, duration, frequency and intensity of the sucking activity (Graber, 1959; Kelly, Sanchez, and Van Kirk, 1973). Because form and function are reciprocal (Hanson and Cohen, 1973), the oral musculature of the tongue, lips and cheeks must often compensate for or adapt to the malformation to maintain a functional integrity. The oral facial myofunctional disorder may then "accelerate" the developing dental malocclusion (Graber, 1959; Subtelny and Subtelny, 1973).

Some Type/Degree of Dental Malocclusion	679	94%
Anterior Openbite	634	88%
Unilateral or Bilateral Posterior Crossbite	182	24%
Class II Molar Relationship	246	34%

Table 1. *Dental Malocclusions related to sucking documented by Rose Van Norman in a population of 723 Digit-Sucking individuals*

Anterior Openbite, Tongue Thrust and Speech Problems

The most common type of dental malocclusion associated with sucking habits is the anterior openbite (Graber, 1959; Popovich and Thompson, 1973; Campbell-Reid and Price, 1984). The previously mentioned study by Kelly et al. (1973) summarized that "thumbsucking was significantly associated with both severe openbite and overjet, and frequent thumbsucking was significantly associated with severe openbite." In my study, 634 individuals (88%) exhibited varying degrees of anterior openbite dental malocclusion related to their sucking habits.

PHOTO - #1 - ANTERIOR OPENBITE

Profitt (1986) explained how the anterior openbite develops as a result of thumbsucking. According to Profitt, "when the thumb or finger is placed between the anterior teeth, the mandible must be positioned downward to accommodate it. The interposed thumb directly impedes incisor eruption. At the same time, the separation of the jaws alters the vertical equilibrium on the posterior teeth, and as a result there is more eruption of posterior teeth than might otherwise have occurred. Because of the geometry of the jaws, 1mm of elongation posteriorly opens the bite 2mm anteriorly, so this can be a powerful contributor to the development of anterior openbite."

Lopez-Gavito (1985) studied 41 subjects who had traditional orthodontic treatment for an anterior openbite; 35% of these individuals exhibited an openbite of 3mm or more a minimum of nine years and six months post-retention.

PHOTO - #2 - TONGUE THRUST

Rogers (1961) and Werlich (1962) reported that most individuals with openbites also exhibit "tongue thrust." Profitt (1986) explained that the "tongue thrust swallow is a necessary physiological adaptation" to create an anterior oral seal when swallowing. In my study, 708 (97.9%) of the digit-suckers used a tongue thrust swallowing pattern.

Research has shown a high incidence of sibilant distortion or "lisp" in individuals with a "tongue thrust" (Straub, 1960; Fletcher, Casteel, and Bradley, 1961). Hanson and Cohen (1973) also found a significant incidence of dentalization of the lingua-alveolar consonants /s/ and /z/ as well as /t/, /d/, /l/ and /n/ in those individuals displaying a "tongue thrust."

Leech (1958) studied 500 subjects. Of these individuals, 21 had an anterior openbite, all 21 exhibited a "tongue thrust", 9 of the 21 had a "lisp" and 11 had a sucking habit. Hanson and Barrett (1988) felt that a normal swallow is impossible "when the thumb is occupying the space the tongue should occupy." Arlt and Goodban (1976) found that 75% of children are correctly producing the /s/ and /z/ consonants by age four years. Kellum et al. (1994) determined that 79 children out of 371 six- to twelve-year olds were thumbsuckers. Their analyses revealed that "relative to non-thumbsuckers, the thumb suckers made significantly more acoustic errors for /s/ and /z/ sibilants". In my study, 273 of the 723 individuals (38%) exhibited /s/ distortions.

PHOTO - #3 - POSTERIOR CROSSBITE (UNILATERAL)

Thumb- and pacifier-sucking habits can contribute to the development of posterior crossbite (Day and Foster, 1970-71; Stewart et al. 1982; Modeer et al. 1982; Ogaard et al. 1994). In my study, 182 of the 723 individuals (25%) had one or more teeth in unilateral or bilateral posterior crossbite and complete (cuspid to molar) unilateral crossbite was most common.

Profitt (1986) defined the oral facial muscle physiology during the sucking activity that may contribute to the crossbite, "If the thumb is placed between the teeth, the tongue must be lowered, which decreases pressure by the tongue against the lingual (surfaces) of upper posterior teeth. At the same time, cheek pressure against these teeth is increased as the buccinator muscle contracts during sucking. Cheek pressures are greatest at the corners of the mouth, and this probably explains why the maxillary arch tends to become V-shaped, with more constriction across the canines than the molars. Ogaard et al. (1994) found that a reduction of the upper intercanine arch width is "significantly correlated with an increased prevalence of posterior crossbite".

PHOTO #4 - BILATERAL CROSSBITE WITH CROWDED DENTITION

If there are a number of teeth on both (bilateral) sides of the mouth in posterior crossbite, the horizontal growth of the maxillary arch is limited. Therefore, the palate can develop high and narrow. A narrow palate promotes crowding of all the teeth in this arch. When the palate is high and/or narrow, the tongue can no longer be accommodated within the palate or make an efficient lingual-palatal seal, thereby promoting a "tongue thrust" resting posture, swallowing pattern, and associated speech problems.

PHOTO - #5 - UNILATERAL CROSSBITE (WITH MANDIBULAR SHIFT)

A unilateral crossbite can necessitate a lateral shifting of the mandible to maintain a functional relationship between the upper and lower teeth. This lateral shifting may cause and/or contribute to several significant problems:

- 1.) Lateralized /s/ distortion. The tongue is connected to the mandible. When the mandible shifts, the tongue has to go with it. This lateral shifting may contribute to the development or maintenance of a lateralized /s/ distortion resulting from the tongue and air escaping out the side.

- 2.) Bruxing or grinding of the teeth may be the result of the upper and lower teeth striving to maintain a functional relationship. Tooth mobility and gingival recession can be a result of bruxing and grinding (*Current Concepts in Orthodontics & Dentofacial Orthopedics*™ 1988). Ingervall, Mohlin and Thilander (1980) found a positive correlation between posterior crossbite and TMJ problems. This is because the lateral shifting of the lower jaw and bruxing can displace the normal functional relationship of this joint, leading to muscle spasm and fatigue.

- 3.) Accidental laceration or chewing of the inner cheeks. The cheeks can get in the way when the lower arch shifts laterally for biting and chewing.

PHOTO #6 - OVERJET/MAXILLARY PROTRUSION

In my study, 614 of the 723 individuals (85%) exhibited an overjet or maxillary protrusion. The pressure of the thumb or finger against the upper front teeth and bone can cause the teeth and/or the maxillae to develop forward (Kelly et al. 1973; Larsson, 1975; Proffit, 1986). Dental trauma or fractured teeth are twice as frequent in children who have protruding maxillary incisors than those who have normal occlusion (Eisenbaum, 1963). There may be difficulty with articulation of bilabial sounds such as, /p/, /b/ and /m/ because excessively projected maxillary incisors can preclude efficient contact of the upper and lower lips. There may also be difficulty with the sounds /f/ and /v/ because the lower lip cannot make effective contact with protruding maxillary incisors.

If the projection of the maxillary incisors is significant, the upper lip also protrudes and becomes everted. An inordinate contraction of the mentalis may then be necessary to bring the lips together. Because the human body functions in a manner that offers the least physiological resistance, these individuals maintain a lips open rest posture, promoting a low tongue posture and a dull, vacant appearance. If the lower lip rests under the protruding maxillary incisors, the protrusion can be exacerbated when a swallow occurs because of an excessive mentalis contraction to create an oral seal. In addition, these individuals may have difficulty collecting saliva efficiently. The saliva frequently pools in the corners of the mouth and excessive drooling may be a problem.

PHOTO - #7 - CLASS II DENTAL MALOCCLUSION

A Class II (retruded) jaw relationship is often considered congenital. However, the pressures applied by the thumb/finger to the upper front teeth and bone can contribute to its development or exacerbate this type of dental malocclusion (Traisman and Traisman, 1958; Popovich et al. 1973). This may be particularly true when excessive overjet or maxillary protrusion precludes bilabial contact promoting habitually open-lip and low tongue posture. Mason (1988) theorized, "Tongue posture can also explain, in part, the development of a Class II malocclusion in some patients. If a forward tongue position is characterized by overlap of the tongue with the occlusal surfaces of all lower teeth, a situation could result in which the upper teeth are more free to erupt, whereas the lower teeth (including the posteriors) are impeded from erupting. Since teeth tend to erupt not only vertically but also in a mesial (forward) direction, the effect of a slight open mouth posture, with tongue forward and lateral margins spread over the posterior lower teeth, is the eventual creation of a Class II malocclusion. This is related to the added, unimpeded stimulation of the upper teeth to supraerupt in a downward and forward direction (Bateman and Mason, 1984). Hence, a variation in resting tongue posture can create dental eruptive changes in the vertical plane of space that results in a disparity of tooth and jaw position in the horizontal plane (Lowe et al. 1985). This has been demonstrated in obstructive sleep apnea patients by Lowe et al. (1987). A theoretical explanation of tooth eruption control has been proposed by Steedle and Proffit (1985)." In my study, 246 of the individuals (34%) exhibited a Class II molar relationship.

Skeletal Openbite

Anterior openbite, high, constricted palatal vault, posterior crossbite and Class II molar and cuspid relationship are commonly associated with vertical maxillary excess (skeletal openbite) (Linder-Aronson, 1974-75; O'Ryan et al. 1982). Denison (1989) found that openbite recurred in 42.9 % of the subjects that had undergone maxillary surgery and at least nine months of orthodontic treatment after surgery to correct skeletal openbite.

Profitt (1986) associated the development of a skeletal openbite to "adenoid facies" resulting in *mouthbreathing* and "a downward and backward rotation of the mandible during growth. This is accompanied by excessive eruption of the posterior teeth, a tendency toward maxillary constriction, excessive overjet, and an anterior openbite." The description appears to be remarkably similar to Profitt's aforementioned sequence of events that create the anterior openbite due to thumbsucking. Therefore, if one can interpret mouthbreathing as *habitually open-lip posture*, it is probable that sucking habits can also contribute to the development of the skeletal openbite, when excessive overjet, maxillary protrusion and vertical height preclude efficient bilabial contact.

Temporo Mandibular Joint (TMJ) Problems

The previously mentioned study (Ingervall et al. 1980) positively correlated anterior openbite, posterior crossbite and tipped/rotated teeth with TMJ problems. All of these conditions are associated with digit/pacifier-sucking habits, particularly those that are frequent, intense and of long duration.

Hanson and Barrett (1988) illustrated how anterior openbite contributes to TMJ problems due to lack of incisal guidance. "In normal function, protrusion of the mandible causes the lower incisal edges to slide down the lingual surface of upper incisors, instantly disarticulating the molars. This prevents the bumping and scraping of cusps between upper and lower molars. Such incisal guidance is lost to the openbite patients, who must then rely on an abnormal function of the joint itself to separate the posterior teeth, a process that may prove traumatic to the TMJ with constant repetition over a period of years. Failure to disengage the molars before protrusion occurs is equally harmful, with repercussions throughout the stomatognathic system; it has the same effect on the neuromuscular system as a "premature contact" or other occlusal interference. Premature contacts may trigger muscle spasm, and the vicious circle of consequences is thereby reinforced."

Root Resorption

Root resorption is a normal phenomenon in the deciduous dentition to prepare for the eruption of permanent successor teeth. The pressure of the permanent tooth erupting under the primary tooth causes

the roots of the primary tooth to gradually lose root structure, become mobile and eventually exfoliate. Knott and O' Meara (1967) found that 50% of maxillary primary central incisors begin the normal process of root resorption at age 5.8 years to prepare for the emergence of the permanent successor that erupts at around 7 years.

Herd (1971) demonstrated that pulpal involvement, accidental trauma and orthodontic treatment are three possible factors in root resorption of the permanent teeth.

Frantz (1965) studied the root resorption of a group of openbite patients under orthodontic treatment compared to a control group. There was no increase of frequency of resorption; however, there was a significant increase in severity of resorption in those patients with openbite.

Newman (1975) studied 47 individuals who exhibited moderate or severe apical shortness of tooth roots on their pre-orthodontic treatment radiographs. Study casts were located on 43 of these individuals; 23 (52.3%) of these study casts exhibited a pre-treatment openbite. Newman also found that females have approximately three to four times the root resorption of males. Massler and Perrault (1954) also found a higher percentage of root resorption in females and the resorption was more severe in females. Newman's (1975) study demonstrated that the maxillary central incisors were the most susceptible to severe root resorption and severe resorption was characterized by "greater mobility and, at times, total exfoliation."

Taylor and Peterson (1983) randomly selected and studied the occlusal radiographs of 98 children aged two to four years. The purpose of their study was to determine if the force applied in digit sucking could also be a factor in root resorption. They found that 59% of the patients with digit-sucking habits demonstrated atypical root resorption patterns on the primary maxillary central incisors compared to only 8% of those without digit-sucking habits demonstrating such atypical root resorption. In their discussion they stated, "It is possible that exfoliation-related root resorption might be hastened and/or accentuated by digit-sucking habits."

Rubel (1986) studied radiographs of the primary maxillary central incisors of 82 thumb/finger-sucking children. All of these radiographs exhibited varying degrees of root resorption. The children ranged in age from two years one month to five years three months and one case of a seven year nine month-old who had delayed eruption. The average age was four years. He concluded that "digit-sucking has an effect upon the normal process of apical root resorption of the maxillary primary central incisors in children as young as two years one month of age which can be noted radiographically."

Digit-sucking has been demonstrated to be a significant etiological factor in the development of premature root resorption in the primary dentition. Root resorption is both more severe and more frequent in those individuals with an anterior openbite. Although digit-sucking was not considered as an etiological factor in

Newman's (1975) or Massler and Perrault's (1954) research, it is reasonable to assume that digit-sucking may be significant since anterior openbite is a common result of this activity. Honzik and McKee (1962) found digit-sucking to be more common in females than males. Digit-sucking has also been found to be more severe in females than males (Johnson and Larson, 1993) and root resorption has been found to be more severe in females than males. Therefore, it is probable that digit-sucking may play a significant role in the development of undesirable root resorption in the permanent dentition of females because more females have prolonged and more severe sucking habits. This would be particularly true for those females who develop anterior openbite as a result of the sucking habit. However, male digit-suckers who develop anterior openbite would also appear to be at risk of developing root resorption.

Linge and Linge (1983) demonstrated that root resorption of the maxillary incisors was more likely in individuals starting orthodontic treatment after age 11 than those starting treatment before age 11. This is because cellular responses are slowed down and the alveolar bone becomes denser with age, thus, it takes longer to move teeth. Newman's (1975) study established that teeth that exhibit pre-treatment resorption are twice as likely to experience further resorption of the apex with orthodontic treatment. The degree of resorption is related to the severity of the malocclusion and the duration of orthodontic treatment. Therefore, It would be important to try to eliminate digit-sucking habits prior to the eruption of permanent maxillary incisors to mitigate the severity of the malocclusion and avoid root resorption of the permanent maxillary incisors. This would be particularly important if there is radiographic evidence of root resorption of the primary maxillary incisors and an openbite dental malocclusion.

In addition, Milne and Cleall (1970) reported a forward tongue positioning into open spaces created by exfoliating primary maxillary incisors and subsequent speech distortion, both of which improved after permanent maxillary incisors erupted. Moyers (1973) stated, "If a primary tooth is lost prior to the onset of permanent eruptive movements, the permanent tooth is very likely to be delayed in its eruption, since the alveolar process may re-form atop the successor tooth, making eruption more difficult and slower." Therefore, the individual who exfoliates a tooth due to premature root resorption due to a digit-sucking habit prior to the onset of normal eruptive movements is likely to experience an abnormally extended period of time with an anterior openbite, associated tongue thrust and speech distortion. Another undesirable consequence of delayed eruption of permanent teeth after the loss of primary teeth may be drifting of adjacent teeth and extrusion of opposing teeth.

The Learning Process

Many concerned parents are counseled, "Your child will stop the sucking when they start school because of peer pressure." It is true that many children will not suck in front of their peers in the classroom setting. However, because of oral fixation, frustration and in an effort not to suck, these children often begin *chewing* on things in the classroom such as pencils, clothing and fingernails. Subsequently, they end up with *two* oral habits, sucking *and* chewing. In my study, 201 of the 723 individuals (28%) with digit-sucking habits also had active fingernail-biting habits. The fingernail-biting may begin as a substitute behavior in those environments where the sucking activity would be socially unacceptable.

The learning process can be adversely affected in the child who sucks in the classroom. Writing, manipulative skills, general class participation and interaction can be limited by the activity (Christensen and Sanders, 1987). Sucking can put the child in a trance-like state, interfering with the ability to focus on subject matter. Communication may be limited if a child has a digit in the mouth frequently or has speech problems as a result of the habit, dental malocclusion or associated "tongue thrust."

The child who is trying to control a sucking habit in the classroom can become agitated and have difficulty sitting still. Their exasperation can also lead to disruptive and combative behavior. Parents frequently comment on improved behavioral and scholastic achievement observed by their child's teacher, post-elimination of a sucking habit.

If the child is able to inhibit his or her sucking at school, this does *not* mean the sucking habit is *stopped*. Many children resume their sucking almost *instantaneously*, while riding home in the car or when they arrive at home after school.

Tongue Thrust Swallowing Pattern	708	98%
Misarticulation /s/ Distortion	273	38%
Fingernail Biting	210	28%

Table 2. Associated Oral Behaviors documented in a population of 723 Digit Sucking individuals.

Physical Problems

Digit-sucking can cause calluses on the digit (Peterson and Schneider, 1991). Warts may be stimulated by excessive moisture. The thumbnail or fingernail may become sore and infected by bacteria-harboring fluid (Stone and Mullens, 1976). The pressure of sucking can cause fingers to develop crooked (Rankin et al. 1988; Bloem et al. 1988 and Madhok, 1989). Excessive viral/bacterial infections may be experienced as a result of continual placement of the digit in the mouth. The accidental ingestion of harmful substances is increased in digit-sucking children (Turbeville and Fearnow, 1976).

Emotional Problems

The human smile is a precious and important means of communication and social interaction. It is the ultimate positive response one human being can give to another. It says, "I like you. I want to know you. You are valuable." A beautiful smile lights the face, warms the heart and lifts the spirit of all with whom it is shared. It is impossible to separate the value of an attractive smile and effective communication skills from the development of healthy self-esteem.

Billions of dollars are spent in the United States for plastic surgery, orthodontic treatment, contact lens, cosmetics, diet programs, etc. to enhance physical beauty because we humans covet the approval and acceptance of other humans. This accord with humanity is essential to our physical and emotional health. Research has found that in our culture, physical beauty augments our desirability as a friend, companion, lover and even our ability to obtain a good job (Dion, Berscheid and Walster, 1972; Shaw, 1981).

The face is the seat of human beauty. Unsightly, malpositioned teeth detract from facial attractiveness. Several studies have confirmed that a pleasing smile is considered a valuable attribute in all human cultures and at all social levels (Stricker et al. 1979; Cons et al. 1983). Protruding, irregular and malposed teeth are a social handicap and can, therefore, impact negatively on one's psychological health (Jenny, 1975; Morris et al. 1977; Graber, 1981). Crooked teeth convey the impression of diminished intelligence. This tenet was verified when teachers participated in several studies that demonstrated a student's dental and facial appearance can make a difference in the teacher's expectations and, therefore, progress in school (Adams and Cohen, 1974; Richman, 1978; Tobiasen et al. 1987).

Fletcher (1975), Wright, Schaefer and Solomons (1979), and Illingworth (1987) reported that digit-sucking children are often subjected to negative peer and parental attitudes as a result of the behavior.

The acquisition of appropriate socialization skills is very important to the development of emotionally-healthy children. Children can be cruel and they may ostracize a child with a sucking habit. Friman and Schmitt (1989) demonstrated that parents of school-age children should be concerned about the sucking behavior at school. The study found that first-graders rated children who sucked their thumbs to be less happy, less attractive and less likable. It also demonstrated that the first-graders were less likely to choose a thumb sucker as a friend.

Hair twirling/pulling (resulting in patches of baldness) can result in negative response from those in the digit-sucking child's environment (Friman, Finney and Christophersen, 1984; Friman and Hove, 1987). The same is true of genital fondling and nose-picking, behaviors that also sometimes are allied with digit-sucking. These conjoined behaviors generally terminate without any focus, when the digit-sucking habit is eliminated.

Children are extremely vulnerable emotionally, especially in the first 8 years of life when their fragile *self-esteem* is just developing (Erikson, 1963). They depend heavily on their parents' reactions to know if they are worthwhile and loved. All children experience occasional rejection or negative response from those in their environment. If they can always depend on their parents' affirmation that they are loved and valued, they will be resilient and their self-esteem will not suffer significant damage.

Children who encounter *repeated* negative reaction and criticism *over a long period of time* conclude the worst about themselves and can suffer deep emotional wounds. Many children experience negative response as a result of their digit-sucking behavior for *many years* from almost *everyone* in their environment *including parents*, siblings, relatives, peers, teachers, day-care providers and even total strangers. Multiple trauma and insult to an innocent child's developing self-esteem can become an enormous burden. Eventually, the child's self-image is crippled. They begin viewing themselves as being bad; having no value. In time, they can become withdrawn and anxious, or angry and aggressive.

Healthy self-esteem is the essential and crucial ingredient to the quality of human existence and is the pivotal influence in every aspect of success or failure in life. It gives us the courage and stamina to pursue our dreams and empowers us to endure life's hardships and remain intact. Healthy self-esteem enables us to have a communion with and respect for all *other* living things in our environment.

The Confusion

Many conscientious and loving parents unwittingly erode their child's self image and entrench the sucking habit. This is due to several factors. Parents frequently become concerned about the possible dental ramifications or because the behavior is considered socially unacceptable. Digit-sucking children are — erroneously — often perceived as being emotionally insecure. This perception suggests faulty parenting ability and places a stigma on the child and the parents. In addition, the information available to parents on this topic is often confusing and inadequate. Depending on the source of reference, the confusion results in one of two perspectives, both of which are frequently carried out in an extreme manner. Parents often decide that they should ignore the behavior and wait for their child to quit when he/she is "ready." Or, they often develop an exaggerated sense of urgency to eliminate it at an inappropriate age or time. They begin using various remedies, including gentle reminders, charts, prizes, bribes, Band-Aids™, socks, gloves and splints. When these technique fail, frustration sets in and punitive measures are taken; these include various foul-tasting liquids painted on the offending thumb, nagging, ridiculing, denying privileges, humiliating or shaming the child. Thus, the problem is compounded as

the child increases the sucking because the negative methods are "cues" that stimulate the desire for MORE sucking and the subsequent relief which results from the sucking activity.

Simply telling a child, "get your thumb (or finger) out", applying "yucky" substances or apparatuses to the child's digit or arm, and/or inserting an appliance in his/her mouth to eliminate a habit will be of little value for many children because the thumb or finger is attached to — a whole, emotional human being with distinctive, unique circumstances.

Guidelines for Referral

For those professionals entrusted with the care of children, "Ignore it, your child will quit when he/she is ready," is correct advice for parents of infants, toddlers and preschoolers with sucking habits. Many of these youngsters will discontinue the sucking behavior on their own with little or no intervention. However, the behavior should *not* be ignored *indefinitely*. The following guidelines should be considered as parameters as to the *need* for appropriate intervention:

- Is the child five-years-of-age or older?
- Does there appear to be a dental malocclusion (anterior openbite, overjet, Class II (retruded) mandible relationship, posterior crossbite or narrow palate) developing that may be related to the sucking habit?
- Does the child brux or grind his/her teeth which may be related to a posterior crossbite or anterior openbite dental malocclusion?
- Does the child complain of clicking or locking of the jaws, headaches, pain in the ear, neck or shoulder, vertigo (dizziness) or tinnitus (ringing in the ear) that may be related to temporo mandibular joint problems?
- Does the child have lacerations on the inner cheeks that may be related to a unilateral posterior crossbite dental malocclusion and subsequent lateral shifting of the lower jaw?
- Are the front teeth protruding, thereby promoting the potential for fracture and/or trauma to these teeth, or negative peer response?
- Does the parent feel that drooling is a problem? (This may be related to excessive protrusion of the upper front teeth which inhibits efficient saliva collection and promotes the pooling of saliva in the corners of the mouth.)
- Does the child use a lips open resting posture, conveying a dull, vacant appearance that may be related to an openbite, excessive vertical development or excessively protruding incisors, which limit bilabial contact?
- Is there radiographic evidence of root resorption on the primary or permanent maxillary incisors?
- Does the child have difficulty biting with the front teeth or avoid certain types of food as a result of an openbite and/or overjet dental malocclusion which interferes with biting and chewing ability?

- Does the child complain of frequent stomach aches which can be related to inadequate chewing of foods?
- Does the child have calluses, infected fingernails, or fingers growing crooked as a result of a sucking habit?
- Does the child experience frequent viral and/or bacterial infections which may be related to the frequent placement of the thumb or fingers in the mouth?
- Does the child exhibit articulation errors on /s/, /z/, /sh/, /ch/, /j/, /t/, /d/, /l/, /n/, /p/, /b/, /m/, /f/, /v/ or /r/ ?
- Is the child exposed to negative response from peers, parents, siblings, or others in their environment as a result of articulation problems?
- If the child has articulation problems and is receiving speech therapy, how *long* has the child been in speech therapy? If the child has been in therapy for an extensive amount of time, perhaps the sucking habit, associated dental malocclusion and subsequent oral facial myofunctional disorder may be limiting the success of therapy.
- Does the sucking activity take place during the day as well as at bedtime?
- Does the child avoid spending the night with friends because of fear that their sucking activity during sleep will be discovered?
- Does the sucking activity take place across two or more settings such as home and school or in the presence of others outside the immediate family?
- If the sucking activity takes place at school, is it affecting scholastic achievement or socialization skills?
- If the sucking activity does *not* occur in the classroom, are there any problems with difficulty sitting still, disruptive behavior, chewing clothing, pencils, hair, fingernails, etc.?
- Is the child exposed to negative response and/or antagonism from peers, parents, siblings, or others in their environment as a result of the sucking activity?
- If there is negative response, does the child appear to be excessively withdrawn, anxious, angry, or aggressive?
- Does the child have a conjoined behavior, such as hair pulling (causing hair loss), nose picking or genital fondling resulting in negative response from those in the child's environment?
- Does the child frequently retreat to the sucking behavior to avoid confrontation rather than asserting himself/herself?

If after a thorough evaluation of the above factors, it is determined that intervention is appropriate, a referral should be made to a Certified Member of the International Association of Orofacial Myology (I.A.O.M.). A Certified Member of the I.A.O.M. has had additional supplementary training, passed a written and clinical proficiency examination and is prepared to help these youngsters in a *positive* way. The I.A.O.M. is the only international

accrediting organization of this therapeutic specialty. Many Certified Orofacial Myologists around the world have been working successfully for many years with non-invasive, motivational programs to help youngsters discontinue digit-sucking habits.

Umberger and Van Reenan (1995) discuss treatment options based on operant procedures, sensory procedures, and habit awareness/motivation approaches.

Considerations for Successful Treatment

Over the years, I have worked with thousands of parents and their children with sucking habits. They have been responsible for my learning experience and have given me the clues to direct my search for appropriate solutions. Previous publications (Van Norman, 1984, Van Norman, 1985 and Van Norman, 1992) provide additional information on specific treatment techniques.

My motivational program to help youngsters eliminate their sucking habits is designed to help children discontinue their sucking habits quickly, without coercion and in a fun, positive way. It generally involves a weekly visit for three weeks, a six-week and a six-month recheck visit. I utilize progress charts, prizes, a puppet sock for bedtime and Band-Aids™ for daytime reminders. Of the last 723 individuals that I have treated:

79% STOPPED AFTER ONE VISIT
AN ADDITIONAL 8% STOPPED AFTER 2 WEEKS
TOTAL SUCCESSFUL WITHIN 2 WEEKS = 87%

I acknowledge that many of the individuals that I have treated do not come back for their six-month recheck visit. With both parents working outside of the home, I have found it is often difficult to make telephone contact to get them back into my office for this appointment. In addition, life is hectic in today's world. Many parents simply do not want to take the time to come in and I am sure that many feel the problem is handled and that's that!

I do send a reminder when it is time for the six-month recheck visit and I also make it *very clear* verbally and with written follow-up instructions to contact me *immediately* if they have any problems with relapse. The statistics presented are based upon these premises.

The first and most important goal of my program is to help the child take *ownership* of their habit. This enables them to take *responsibility* for it, which then allows them to let it go. This is accomplished through appropriate motivation. I use dental models, photographs, compassion and simple friendly personal persuasion to instill confidence that they can overcome the habit if they so desire. The child is given the assurance and option of retreat *without dishonor*. This atmosphere of safe encounter eliminates fear and apprehension and allows the child to explore the options. It is the child who makes the decision to participate in this program *autonomously*.

I work very closely with these families. The parents understand and address the *whole* behavior through

education and careful preplanning. It is important that parents realize that they cannot eliminate their child's habit *for* them. Over the years, I have had many parents try to follow their child around constantly policing the replacement of the adhesive bandages, etc. and enforcing compliance of the non-sucking activity. What does this teach the child? It teaches them that they do not have a choice, they are not in control, and the habit is their *parents' responsibility*. Worse yet, it tells them that their parents do not have faith in their capabilities which, of course, diminishes their faith in themselves. The child may achieve several weeks without sucking under these circumstances and receive the promised reward. There is a high probability, however, that the child will gradually relapse to the sucking behavior as the parents drop their guard. This is not surprising because behavior controlled by outside dominance usually only lasts as long as the enforcer is present. Therefore, parents are *not* required to police or enforce the child's cooperation or progress.

Parents are required to be *available*, particularly during the first couple of difficult days and at bedtime during the first week or two. They are to be observant and offer assistance *without being intrusive*. Their primary role is one of an *empathetic and positive support system*.

Timing - A Crucial Consideration

Research has shown that just as there are predictable stages of physical growth, children also develop emotionally and intellectually in fairly predictable, patterned stages that are remarkably similar from child to child (Erikson, 1963 and Flavell, 1963). Unfortunately, many parents do not have a basic understanding of this developmental reality.

Adequate cognitive and emotional development are crucial considerations when determining an appropriate *time* to initiate a program to eliminate a sucking habit. The child must be *developmentally* capable of the following essential skills:

- An understanding of cause and effect relationships.
- The ability to grasp another person's point of view.
- A comprehension of the concepts of time in terms of past, present, and future.
- Some appreciation of intrinsic values.
- The ability to discriminate between right and wrong.
- The capacity to practice some degree of self-control and self-denial.

To explain this concept further, can you imagine sending a three-year-old to kindergarten? Most three-year-olds would not be developmentally ready to succeed with the tasks encountered in kindergarten. They would be fearful, apprehensive and frustrated. This is why we wait until children are five years of age to send them off to elementary school. Age five is also generally a good time to consider the initiation of a program to eliminate a sucking habit. Most five-year-olds have reached the age of reasoning and are developmentally ready intellectually and emotionally to facilitate effective communication,

comprehension, motivation, cooperation and self-control.

Preschoolers have limited capacity to assume or grasp another person's point of view. They are egocentric which means that they believe that they and their desires are all important and the primary concern of everyone else around them. Their own perspective, which is quite different from an adult's, is all they can manage.

The thought processes of preschoolers are dominated by sensory impressions. They understand the pleasure they derive from their sucking activity and have limited capacity to appreciate adults' desire for them to quit.

It is difficult for these youngsters to understand abstract concepts, logical reasoning and cause-and-effect relationships. Comments about appearance and crooked teeth have little impact on this age group. Preschoolers tend to be our darling little slob! They put their shoes on the wrong feet, select the wildest combinations of clothing and then put them on inside out and backwards. They couldn't care less about runny noses, remnants of last night's pizza on their faces or hair standing on end!

Promising a surprise for one or two weeks without sucking may motivate the preschooler to participate in the program, however, the concept of time in terms of past and future is difficult for the preschooler to comprehend. They live their lives in very small increments of time, minute by minute, hour by hour. Thus, they only understand the here and now and have great difficulty sorting out the notion of yesterday, today and tomorrow. When you promise a surprise next week, you may as well be talking about 100 years from now in terms of preschooler's understanding. Parents learn not to tell a child of this age group that they are going to the zoo or for some other FUN outing too far in advance or it would be a nonstop barrage of, "Is it time, is it time, is it time to go yet?"

A preschooler forgets the *reason* for stopping a thumb-sucking habit from one minute to the next, but remembers about the surprise. As previously mentioned, they are oriented toward self-gratification and the need for this gratification is *immediate*. These young children know nothing about patience, self-control or self-deprivation. They are the little ones screaming at the grocery store because mom won't let them have that candy bar!

There is a strong *association* between the sucking activity and sleep. Nearly all individuals, regardless of their age, become heavily dependent on the activity and the subsequent tranquilizing effects to relax and fall to sleep. This difficulty is compounded in preschoolers because nightmares are common and normal with this age group. Their "fantasy oriented" stage of development allows their vivid imaginations to conjure up all kinds of monsters in the night. It is unreasonable to expect these children to give up the comfort of their sucking activity during this scary developmental stage.

Preschoolers can be cajoled into trying not to suck by the promise of a surprise. They will then frequently hide under their bed, a blanket or in any inconspicuous spot

and sneak a little suck. They will often deny the transgression. In the minds of preschoolers, they are not deliberately lying because they have not reached the stage of development that gives them the ability to make moral judgments. Preschoolers do not understand the difference between right and wrong nor do they have the same perception of being dishonest that an adult or older child would have. They simply do not want to miss out on the promised surprise and their "fantasy oriented" stage of development makes it difficult for them to sort out what they *wished* had happened from what really happened.

All too often, after the prize is given the preschooler will tend to relapse back to the sucking behavior. It's not hard to understand if you realize that all these idiosyncrasies are typical of the preschoolers cognitive and emotional development. Unfortunately, many parents do not understand the reasons behind the relapse. They continue prodding the child to discontinue the habit and often, as previously mentioned, the methods develop into negative, punitive approaches which only serve to stimulate *more* sucking until the child is satiated and sucking *constantly*.

Many preschoolers are very articulate and it is easy for the parent to assume that the child is more mature than he/she actually is. The problem is that if parents and others press these children beyond their limits or capabilities, the result will be "burn out" and frustration to the point that the child will resist any part of a program to eliminate a sucking habit now and *in the future*. This is because each time they try and fail, they lose self-confidence and eventually come to *believe they cannot* overcome their habit.

Children's thought processes and perceptions of the world around them are quite different depending on their stage of cognitive and emotional development. This development occurs in stages and is age related. It is extremely important not to attribute adult expectations or depth of comprehension to a child who is unable *developmentally* to understand. Setting goals or tasks that a child cannot accomplish, understand or achieve can lead to a lasting sense of self-doubt and shame. And that ... is too great a risk to take.

Individual Circumstances and When To Initiate Treatment

Children come to depend on the sucking activity as a source of solace in times of stress and this dependency becomes more profound, the longer the sucking habit is present. This does not mean that the child is emotionally insecure or the parents are incompetent. In fact, the majority of children that I have treated over the years have come from loving, caring families. One must view the stress factors from a *child's perspective*. Normal everyday events, such as the arrival of a new sibling or starting a new school, will stimulate *increased* sucking activity. Careful consideration must be given to picking just the

right time when the child *and parents* are not experiencing excessive stress or *change* in their lives. A family move, death, divorce, starting kindergarten or first grade are just a few examples that require an appropriate period of adjustment prior to initiating treatment. In addition, professional counseling is definitely important *prior* to addressing the sucking behavior *if* there is intense, persistent familial conflict.

Monitor Closely

I want the children to experience success *immediately*, otherwise they may become frustrated and want to quickly give up the task. This is especially important for young children who have not fully developed the attribute of patience. For this reason, I monitor the children very closely, especially during the first week. The children phone me daily during this time period. This is a tremendous aid to keep the children properly focused. I can offer the empathy, positive support and encouragement that is so important, and intercept potential problems before they get out of hand.

If the child is having a number of *deliberate* lapses to the sucking activity during the first two weeks, I stop treatment IMMEDIATELY! Of course, one must be able to discern the accidental from the deliberate or those that are due to parental inconsistencies. A deliberate lapse would be when the child begins to suck on another thumb or finger (different from their original favorite), hiding in the closet and sucking, refusing to utilize reminders, etc. These types of lapses indicate the child is not motivated or *ready* to give up their habit. This reluctance could be due to a myriad of different reasons. Intellectual and emotional development may not be sufficient or there may be some troublesome, stressful situation that makes it too difficult to give up the comfort of the behavior at *this* particular time. I have found that belaboring the issue does not accomplish anything except frustration, antagonism (between parent and child), possibly further *entrenchment* of the behavior and "burn out."

Again, I offer the option of retreat without dishonor. I generally tell these youngsters, "It's very important to pick just the *right time* to work on getting rid of these old habits. I don't think that now is a very good time because you are having such a hard time keeping that old thumb/finger out. Let's not worry about it for a while and when you feel like you would like to try again, let me know and I will be glad to try to help you as much as I can." This approach lets the child "off the hook," allows them to "save face" and keeps the door OPEN! Very often, when the child realizes that no one is going to coerce or plead with them to continue, they decide they really *do want* to keep trying. They sometimes beg me to give them another chance. In this case, I say, "O.K. if you are really sure you *want* to do this. However, if you have one more *deliberate* slip we had better stop for awhile, O.K.?" This puts the responsibility where it belongs ... *with the child*.

If the child decides to terminate treatment, I encourage

parent(s) to DROP THE SUBJECT and give the youngster a *total* reprieve from further attention to the behavior. There is nothing to lose with this approach and everything to gain. Very often these youngsters come back in a few days, weeks or months and express a desire to *seriously* address their habit. This is because they have no fear of reprisal. They know it will be an atmosphere of safe encounter and that *they* are in control.

Why Some Children Fail to Discontinue Their Sucking Habits

The following problems are some of the obstacles to successful treatment in the order of their significance:

1. Burn Out

Out of frustration, parents had unwittingly entrenched the child's behavior. They had been trying "everything" to eliminate the habit and often for many years prior to coming for treatment. Frequently, they had begun before the child was developmentally capable of understanding why the sucking behavior was a problem. Again, as previously described, the methods generally began with gentle reminders, charts and prizes. When these methods failed, punitive approaches ensued including the nasty tasting stuff on the offending thumb/finger, nagging, shaming and belittling, until the child was sucking "constantly." A power struggle and an environment of antagonism and conflict then developed between parent(s) and child. Again, these youngsters were "burned out" and consequently, resisted any further attempts to eliminate their sucking habits.

2. Inappropriate Timing

Inappropriate timing in terms of cognitive and emotional development or in relationship to stressful circumstances in the child's environment.

3. Parental Inconsistency

Failure to follow through with treatment recommendations, particularly in relationship to the bedtime sucking activity. The hand going to the mouth is frequently absent or very minimal, during the daytime, after the first week. Therefore children and parents mistakenly assume the sleeping habit is also under control. Consequently, they become overconfident and do not utilize the bedtime reminders consistently or for a long enough period of time to assure elimination of the sleeping habit. If the nighttime sucking continues, the habit reestablishes itself, until the child begins sucking during the daytime as well. Unfortunately, once the bedtime reminder is removed, the child is likely to resist having to return to wearing it. This is because children have a difficult time understanding that they do not know what they are doing in their sleep and perceive the relapse to the sucking during sleep as a failure and lose self-confidence.

TABLE 3. POST TREATMENT QUESTIONNAIRE

Male _____ Female _____ Age _____

Did your child use a pacifier? _____ To age _____

Did your child use the pacifier *and* suck thumb/finger concurrently? _____

Are you aware of any speech problems? _____

If so, what sounds were distorted? _____

Has your child had speech therapy? _____ How long? _____

What methods had you tried to get your child to discontinue their sucking habit?

How soon after beginning my program did your child begin to discontinue the sucking habit? _____

Do you feel the discontinuance of the sucking habit led to emotional problems? _____

Do you feel your child gained in self-esteem and self-confidence as a result of being able to "kick" the sucking habit? _____

Do you feel the program was worthwhile? _____

Would you recommend the program to other parents with a child with a thumb/finger-sucking habit? _____

ADDITIONAL COMMENTS: _____

May I utilize the information on this questionnaire to educate other parents and/or professionals about the positive behavior modification technique for the elimination of thumb/finger-sucking habits?

Yes _____ No _____

Parent(s) Signature _____

Is There Emotional Trauma As A Result of Giving Up the Sucking Behavior?

Parents feel the children are more active, happier, proud of their accomplishment and gain in self-confidence and self-esteem as a result of being able to "kick" the habit. However, some parents report increased irritability and difficulty falling to sleep at bedtime during the first week of treatment.

To my knowledge, I have never had a child begin another aberrant behavior as a result of discontinuing a sucking habit. However, as previously mentioned, approximately 28% of the individuals in my data present with fingernail-biting *and* digit-sucking habits. Those

children that also have fingernail-biting habits may increase this behavior while they are trying to discontinue the sucking activity. Parents are counseled *not* to bring attention to the fingernail-biting. Otherwise, the child is likely to become frustrated and give up completely. It is important to work with *one* behavior at a time. When the child is well past the sucking habit, the fingernail-biting habit can then be addressed.

Table 3 is a questionnaire which I have the parents complete post-treatment. It is generally given to the parents at the six-week recheck appointment. I have accumulated approximately six hundred of these questionnaires.

Before and After Treatment

5 year old before treatment

5 year old 6 months post treatment

7 year old before treatment

7 year old 6 months post treatment

9 year old before treatment

9 year old 6 months post treatment

9 year old before treatment

9 year old 6 months post treatment

7 year old before treatment

7 year old 6 months post treatment

7 year old before treatment

7 year old 6 months post treatment

9 year old before treatment

9 year old 6 months post treatment

Without exception, the parents who completed this questionnaire felt the program was worthwhile (100%) and would recommend it to other parents with a child that has a prolonged sucking habit (100%).

Some of the most common and frequent comments are:

- "I wish I had known about this program sooner. It would have spared my child the guilt, anxiety and pain of the other methods we tried."
- "I can't believe it! After all the 'things' we tried to get our daughter to discontinue her sucking habit. It was so wonderful to watch her take immediate responsibility for following through with all of your recommendations. Your intervention eliminated the tension and antagonism that had developed because we no longer had to police the situation. She is so proud of her accomplishment. Your program turned a

very negative situation into a POSITIVE one!"

- "We have tried many similar techniques with our child and nothing worked! I think the two aspects of your program that really helped us the most were you being a third-party in this situation and always having the necessary consistency."
- "I am amazed at what a difference a third-party can make! I am certain that I would not have had the same success if I would have tried the same program on my own."
- "My child has gained self-esteem and self-confidence as a result of being able to kick the habit."

Is There Any Improvement in Dental Occlusion As A Result of Discontinuing A Sucking Habit?

There is often a noticeable improvement in the position

of the teeth, particularly when treatment is initiated during the early stages of mixed dentition (5, 6 and 7 years old). Many children will still require orthodontic treatment. The elimination of a sucking habit is not intended to replace the need for orthodontics. However, elimination of the habit can certainly mitigate the severity of many problems. The following pictures demonstrate improvement observed after the elimination of a sucking habit, without any orthodontic treatment or orofacial myofunctional therapy.

Dental Habit Appliances and Insurance Benefits

There is an alternative to the behavior modification approach described in this article. Dental habit appliances are a mechanical and invasive approach to the elimination of digit-sucking habits. Some are simple reminder devices that are either removable or cemented to the teeth. Others are based on aversive conditioning. One such appliance, commonly referred to as the "hay rake" is cemented to the upper teeth and has prongs pointed downward that are designed to inflict pain on the offending digit as though it were not connected to a...whole human being.

Few studies have proven the efficacy of habit appliances. Two studies (Korner and Reider, 1955; Traisman and Traisman, 1958) inserted the "hay rake" type of appliance on a total of seven children. Only one of the seven discontinued the sucking habit. These studies described the results as "psychologically distressing" because the children "exhibited drastic new symptoms such as night terrors, day wetting, speech disorders, refusal to eat solids, belligerency, and irritability." This is not surprising; the thumb/finger, as well as the tongue, can be lacerated or impaled on such devices. Some youngsters yank the appliance from their mouths damaging teeth and pulling gingiva out with it. Others push it upward to enable continued sucking activity until the appliance is embedded in the palate. Hanson and Barrett (1988) gave an apt description of these appliances: "these devices are basically merely ornamented forms of punishment; beneath the paint and bandages, they remain as crude as a hit in the head."

Treatment to eliminate sucking habits is allowed on many dental insurance programs for procedures supervised or provided by a licensed dentist. The treatment is listed as "Removable inhibiting appliances to correct thumbsucking" ADA (American Dental Association) insurance code #8210 or "Fixed (cemented) inhibiting appliances to correct thumbsucking" ADA insurance code #8220. The existence of the benefit of testimony that treatment to eliminate these habits is deemed by the insurance companies to be "medically necessary" because they can be a significant source of dental pathology. However, this is a vacuous benefit because many dentists do not utilize them.

Many individuals have been referred to me by their

pediatrician or speech pathologist because they were developing severe dental malocclusion due to sucking habits. These individuals were receiving regular dental care; however, no recommendation had been made for the use of an appliance. Surely, it would be unconscionable to ignore developing pathology if appliances were a definitive means of eliminating these habits. It is probable that many dentists do not recommend appliances because parents are repulsed by the concept of mechanical, invasive or punitive methods to eliminate the sucking activity. Undoubtedly, many dentists are concerned about the negative response that children have to these devices; thus, damaging the relationship between the dentist, the child and the parents.

Obviously, there is a real dilemma here. Again, dental insurance benefits are generally only provided for procedures supervised or provided by a licensed dentist. However, the use of appliances is the principal treatment modality taught in the dental curriculum for sucking habits; and the majority of dentists do not utilize these devices. Field and Jacobsen (1989) estimated that 50% to 90% of the population will not seek and/or undergo procedures that are not covered by insurance. Therefore, many children will not have the option of effective treatment.

Summary

Prolonged digit-sucking habits can have a negative impact on dental, speech, physical and emotional development. Children can be helped to eliminate their sucking habits quickly, without coercion, and in a positive way. Admittedly, most of my data is based purely on clinical observation. However, clinical observation is the basis for classical scientific investigation. I welcome this investigation; it is long overdue.

Much of the literature available to parents appears to take a rather cavalier attitude with regard to the dental consequences of sucking habits. Parents are frequently left with the impression that *no harm* is done to the teeth. This perspective is based on the assumption that most children stop the sucking behavior before permanent teeth erupt into the mouth. Therefore, any dental malocclusion in the primary teeth will often be transitional or will spontaneously self-correct. However, as demonstrated by Kelly, et al (1973), millions of children do not discontinue their sucking habits before permanent teeth erupt. In addition, stress levels in today's world are probably significantly greater than when this study was done. Because stress is a powerful stimulus for the sucking activity, it is highly probable that if a similar study were done today, it would produce a substantially greater number of individuals with prolonged sucking habits.

The active pursuit of insurance benefits for the Certified Orofacial Myologist providing therapy for the elimination of these habits will be germane to prevention. Research is needed to accomplish this goal including:

investigation of the incidence of prolonged digit-sucking habits; the impact of these habits on the entire stomatognathic system, speech development and emotional health; efficacy of treatment (including psychological response) both through the utilization of habit appliances and motivational therapy.

The Certified Orofacial Myologist provides many valuable therapeutic programs to enhance dental and speech development. In the words of our president, Marge Snow at the 25th Anniversary of the founding of The International Association of Orofacial Myology, "we are morally and ethically challenged with making this treatment available to everyone". Roberta Pierce (1988) in her paper, "Treatment For The Young Child" wrote, "The overall goal is to create as normal an environment as possible so as to facilitate normal growth and development." The early elimination of digit-sucking habits is one of the most important therapeutic services offered by the Certified Orofacial Myologist because it provides the most benefit toward prevention and the well-being of the whole person. Treatment after the pathology is fully developed is invasive, not cost-effective and does not provide as good a clinical result. Little mouths deserve a big chance to grow healthy and straight.

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*EDITOR'S NOTE: Additional information will be available in a book to be published in 1998, *Helping the Thumb-Sucking Child: A Comprehensive Guide for Parents* by Rosemarie Van Norman.