Review Article

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Thumb Sucking Management: A Review

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The purpose of this paper is to provide information which will assist the practitioner in forming management guidelines for clients who are habitual thumb suckers. Prevalence, etiology, associated problems, implications for treatment, and treatment options are discussed.

PREVALENCE

Thumb sucking is a common childhood behavior which has been viewed by some as having adaptive value for children up to and often including the fourth year of life (Wright, Schaefer and Solomons, 1979). Estimates of thumb sucking in infants range from 75 to 95 percent (Larsson and Dahlin, 1985) with most children exhibiting the behavior during the first year of life. The prevalence then diminishes with age. Gellin (1978) reported the prevalence rate for thumb sucking to be 13.6 percent in children six years old and 5.9 percent in children seven to 11 years of age. In spite of the substantial reduction in thumb sucking with each year of age, Infante (1976) reported as many as 19 percent of children in the United States continue the practice after their fifth birthday.

Although most studies have noted no significant sex differences in the prevalence of thumb sucking, some investigators have found the activity to be more common among females (Honzik and McKee, 1962). Johnson and Larson (1993) indicate that the nonnutritive-sucking habit is more severe in females than in males. Others believe that thumb sucking is more likely to be found among later born children than in first born (Christensen and Sanders, 1987).

ETIOLOGY

The literature is replete with theories on the etiology and implications of thumb sucking. The common view is that thumb sucking is a natural and normal behavior observed in the fetus, infant, and young child. It satisfies a variety of needs in a variety of situations. According to Ross, Fisher, and King (1957), the sucking response emerges at approximately the twenty-ninth week of embryonic life and is one of the earliest complex behavior patterns exhibited

by the newborn. Some view the behavior as a normal stage of development that should end by the second or third year of life (Ilg and Ames, 1955) or may become a habit (Illingworth, 1987).

Thumb sucking is considered normal for the young child, and provides a satisfying activity that gives the infant a feeling of well-being (Freud, 1938). Friman and Schmitt (1989) believe that thumb sucking is adaptive for many infants and young children because it enhances independent functioning. This is accomplished as the activity permits infants, who are between feedings, holdings, and other interesting events, to occupy themselves and delay the onset of boredom. Other theories hold that the behavior fulfills the need of comfort (Traisman and Traisman, 1958), replaces inadequate sucking activity during feeding time (Bakwin, 1948), and is an attention-seeking device (Christensen and Sanders, 1987; Leung and Robson, 1991). Some children suck their thumb only when falling asleep or during sleep (Ozturk and Ozturk, 1977). In older children thumb sucking may occur during periods of tiredness, boredom, frustration, insecurity, hunger, maternal deprivation, emotional stress, or illness (Illingworth, 1987; Slaughter and Cordes, 1977).

Various stress factors such as parental belovedness, overprotection, strictness, and negligence were significantly higher in thumb suckers. Thumb sucking was related to enuresis and nailbiting but not other habits such as tics, temper tantrums, and head rolling. The probability of thumb sucking behavior increases with the degree of introversion in the child's personality (Peterson and Schneider, 1991).

ASSOCIATED PROBLEMS

Thumb sucking can result in a variety of associated problems of organic and non-organic origin. A child's health, dentofacial structures, social and developmental milestones can be affected. These associated problems may appear in varying degrees and at different ages.

Blisters on the wrists and fingers of new born infants provide evidence of intrauterine sucking. If the habit is practiced frequently post natally, soreness and calluses may occur (Peterson and Schneider, 1991). Thumb

sucking may also lead to an inflammation of the distal phalanx accompanied by a separation of the skin from the proximal portion of the fingernail and an accumulation of bacteria-harboring fluid (Stone and Mullens, 1976).

Organic

Organic problems are common, particularly when thumb sucking persists after age 4 (Wright, Schaefer, and Solomons, 1979). Occlusal problems include open bite, overjet, and close-mouth malocclusions. These become more difficult to treat over time (Campbell-Reid and Price, 1984). Atypical root resorption (Rubel, 1986), mucosal trauma (Phelan, Bachara, Satterly, 1979), and abnormal facial growth (Moore, McNeil, and D'Anna, 1972) have also been associated with thumb sucking. While dental occlusion problems are often mentioned as a result of thumb sucking, Barrett and Hanson (1978) acknowledge that some children suck their thumbs in a way that does not appear to alter dental occlusion. Organic problems are not limited to the dentition. Finger sucking has reportedly been responsible for digital malformation (Madhok, 1989). Addressing the topic of orofunctional disorders, Barrett and Hanson assert that "a normal swallow is not possible so long as the finger or thumb is in the mouth" (Barrett and Hanson, 1978, p. 118).

Nonorganic

Several nonorganic problems can also be associated with thumb sucking. Thumb sucking increases the chances of accidental ingestion of harmful substances (Turbeville and Fearnow, 1990). Thumb sucking also appears to interfere with selected aspects of speech production. Kellum, et. al. (1994) observed that thumb suckers exhibited significantly greater frequency of acoustic errors for /s,z/ when compared to a matched control group. In addition, if thumb sucking persists into school age and occurs in the school setting, it can preclude children from responding to questions during formal activity and interfere with spontaneous speech during informal free time. This behavior also restricts the use of manipulative materials and can be accompanied by inattention to planned activity (Christensen and Sanders, 1987). Children who suck their thumbs are often subjected to negative peer or parent attitudes toward the behavior (Illingworth, 1987) and these negative attitudes can be compounded by related habit disorders which often accompany thumb sucking (Friman, 1990).

IMPLICATIONS FOR TREATMENT

The literature contains conflicting views on the necessity of treating thumb sucking. The controversy apparently stems from widely held beliefs pertaining to the vulnerability of children who thumb suck. One point of view is that direct treatment of thumb sucking leads to its perpetuation and worsens overall child behavior.

Other literature merely states direct treatment will not work (Illingworth, 1987). Recent studies indicate that specific guidelines are followed, the most critical of which is using a supportive (rather than punitive) approach. Direct treatments for thumb sucking are often successful (Friman and Leibowitz, 1990). Assuming that thumb sucking treatment is beneficial, it is incumbent upon the therapist to consider several factors prior to commencing a thumb sucking treatment program.

The therapist must determine at what point thumb sucking is no longer a harmless activity that fulfills a childhood need and has become a potential risk. According to Friman and Schmitt (1989), thumb sucking should not be treated until its potential risks outweigh its potential benefits, which rarely occurs before age four. Treatment may not be indicated even after age four either because the sucking is infrequent or because it has a function important enough to outweigh its risks. For example, when children experience substantial loss (e.g., parent, playmate, pet), fear, or pain, they sometimes employ thumb sucking as a temporary adaptive coping strategy (Klein, 1971). Each child who is being considered for thumb sucking treatment should be evaluated on the possible negative consequences from the developmental, social, and orthodontic perspectives. The age of the child and severity of the thumb sucking habit, the concern and motivation of the child and primary caregivers, the impact on dentofacial development, and psychological implications should be addressed prior to administering a treatment program. The general consensus is that when thumb sucking occurs in children under 3 years of age the behavior is not a serious problem and in most instances will not warrant professional intervention (Christensen and Sanders, 1987).

On the basis of the age-related development of dentofacial deformities, some investigators have suggested that treatment begin at four years of age. Unfortunately, such recommendations presuppose that all sucking habits are the same and involve the same risks for each child. The more pragmatic approach is to determine the time of treatment specific for each habit.

Practitioners agree that the older the child is the more difficult it becomes to treat the thumb sucking habit (Bachara, 1962; Johnson and Larsson, 1993). Van Norman (1992) takes the position that children should not be treated before they have reached the age of 5, stating:

To succeed with the task of overcoming a digit-sucking habit, a child must first be motivated to want to stop the sucking behavior. This motivation will then facilitate the necessary willingness, on the part of the child to accept responsibility for discontinuing the sucking habit. To accomplish these goals, the child must be at least 5 years of age in terms of intellectual and emotional development in order to communicate and motivate effectively. (Van Norman, 1992, p. 30)

Closely related to age of the child is the severity of the habit. The older the child is the longer the behavior will have been practiced. However, frequency, intensity, and duration of each episode of sucking will vary from child to child.

Chronicity is a good indicator of severity. It is defined by Friman and Schmitt (1989) as a habit that occurs across two or more setting (e.g., home and school) and both day and night. Another indicator of severity is whether the child sucks the thumb in the presence of other individuals outside of the family constellation.

An important factor in treatment considerations is the impact of the parent/caregiver on the child's sucking habit. A number of studies designed to test treatment modalities demonstrated better treatment results when there was strong cooperation from significant others. Family cooperation, although not affecting the severity of the habit directly, decreases the difficulty of treatment and, therefore, the severity of the habit (Johnson and Larson, 1993). Conversely, if excessive parental/caregiver reaction is present, despite reassurance that the habit is normal and harmless at the child's age, some intervention, albeit for the parent/caregiver, is indicated. In certain situations thumb sucking may be aesthetically offensive (Azrin, Nunn, and Frantz-Renshaw, 1980) and despairing attempts to stop the habit are usually successful in making the child miserable.

The most frequent indication for intervention is the presence of a dental problem related to thumb sucking (Infante, 1976). The most common of these being occlusal disorders including open bite, overjet, and close-mouth malocclusions. Less frequent indications include the presence of alopecia due to hair-pulling covarying with thumb sucking or digital deformity resulting from high intensity sucking (Madhok, 1989).

At the turn of the century influential health experts theorized that thumb sucking was a symptom of underlying psychopathology (Freud, 1938). This point of view prevails in some literature today. The empirical status of the position is still unclear because the findings from relevant studies are mixed. Friman, Larzelere and Finney (1994) conducted one of the most recent empirical studies exploring the relationship between chronic thumb sucking and behavior problems reflective of psychopathology. They concluded that their results provided little support for the theoretically derived notion that thumb sucking is necessarily a symptom of psychopathology. Over the intervening years since the theory of underlying psychopathology was proposed it appears that the habit has been viewed with less concern and despair as evidenced by the increasing number of treatment programs found in the literature.

A final indication for treatment is when children specifically ask for assistance with quitting.

TREATMENT OPTIONS

For some children who suck their thumbs, the practitioner may choose not to treat the behavior in favor of planned ignoring. Friman and Schmitt (1989) state that most thumb sucking in childhood is harmless, self-limited, and does not require directed intervention. But adult reactions to thumb sucking can exacerbate the habit due to the potentially reinforcing effects or punitive attention. Thus, even though no direct intervention is planned, parents/caregivers should be counseled by the provider about the potential benefit of ignoring thumb sucking. It is further advised that a 1-month moratorium on attention to thumb sucking (negative or positive) is an important part of any intervention program. The moratorium reduces tension between parent and a child which may have developed through earlier confrontations. In some cases the moratorium can eliminate the habit without further treatment!

The majority of treatment options fall under the general headings of operant, sensory, or habit awareness.

OPERANT PROCEDURES

Programs employing operant procedures include contingency reinforcement contracting and habit reversal.

Contingency reinforcement/punishment.

Contingency reinforcement contracting consists of reward and punishment made contingent on habit cessation or the lack of habit cessation, respectively. A number of investigators have employed punishment using time-out from positive reinforcement (Baer, 1962; Bishop and Stumphauzer, 1973; Illingworth, 1987; Kauffman and Scranton, 1974; Knight and McKenzie, 1974; Shirbroun, 1974). The philosophy of time-out punishment is the withdrawal of a positive reinforcement during episodes of thumb sucking and the reinstatement of the positive reinforcer with cessation of thumb sucking. The positive reinforcement and setting vary among studies but usually consist of watching television or story reading by the parent in the home. Thus it is claimed that this method is easily adapted to the home setting (Baer, 1962; Bishop and Stumphauzer, 1973). Kauffman and Scranton (1974) successfully treated thumb sucking within the home setting where the behavior was punished by contingent termination and resumption of reading. Baer (1962) presented cartoons to a 5-year-old boy in a laboratory setting. The boy was punished for thumbsucking during alternate cartoons by turning off the cartoons for as long as his thumb remained in his mouth. Results revealed that contingent withdrawal and representation of the cartoons controlled thumb sucking rate. Following up on the Baer (1962) study, Bishop and Stumphauzer (1973) examined thumb sucking behaviors

using time-out from positive reinforcement, and time-out with instruction. Results indicated that both conditions stopped thumb sucking. Generalization appeared greater for the time-out instructed subjects.

When thumb sucking is associated with another response, such as trichotillomania (hair pulling), doll holding, ear pulling, etc., treatment of either habit may result in cessation of the covarying response. Friman (1990) treated eight thumb sucking children who had concurrent object attachment. Treatment eliminated thumb sucking in eight subjects and seven of the children subsequently lost interest in their attached object.

Habit reversal. Habit reversal consists of teaching some competing response such as clenching the thumbs between the fingers. Whenever the children are tempted to suck, experiences those activities antecedent to thumb sucking, or is actually thumb-sucking, they are instructed to engage in the competing behavior for a count of 50.

Azrin, Nunn, and Frantz-Renshaw (1980) treated 32 children who were thumb suckers by teaching competing reactions, identifying the habit prone situation, arranging social support by the family, providing a response contingent period of competing reactions, and identification of response precursors. They also compared habit reversal with the commonly used method of painting the thumb and fingers with a bitter tasting substance. The habit reversal method was more effective in eliminating thumb sucking than the use of the bitter tasting substance. About half of the children receiving the habit reversal training stopped sucking entirely, compared to 10% of the control children.

Christensen and Sanders (1987) compared habit reversal and differential reinforcement of other behaviors (DRO) on the parameters of generalization, maintenances, and negative side-effects. Thirty children who sucked their thumbs or fingers excessively were randomly assigned to a habit reversal, DRO or wait-list control group. Both procedures effectively reduced thumb sucking in both a training setting and in two generalization settings. Differences between habit reversal and DRO were not statistically significant but the parents evaluated habit reversal somewhat more favorably than DRO.

SENSORY PROCEDURES

These procedures are designed to interrupt the sensory feedback experiences with thumb sucking and can be divided into appliance therapy and response prevention.

Use of appliances. This form of treatment involves the use of orthodontic appliances to attenuate or interrupt the sensory feedback. Many appliances have been designed to accomplish habit cessation, such as the palatal crib, palatal arch, - lingual spurs, and Hawley retainer with and without spurs (Haryett, Hansen, and

Davidson, 1970). When the effectiveness of the palatal arch and palatal crib with spurs were compared, the palatal arch had no effect, but the palatal crib with spurs eliminated thumb sucking in almost all children if worn for several months. However, the palatal crib did produce emotional problems and difficulties in speech as well as eating. Some providers recommend the use of an appliance only if the child is over six, has a malocclusion, and has failed in other treatment attempts (Friman and Schmitt, 1989).

Response prevention. Response prevention includes the use of chemical aversion treatment or digital and hand wraps (Luciano, 1988). Friman, Barone, and Christophersen (1986) instructed parents to coat their children's thumbs with an aversive chemical (Stop-zit) once in the morning when the children awoke, once just before bedtime, and once each time they observed an instance of thumb sucking, day or night. A fading procedure was used to discontinue the treatment. Thumb sucking rapidly reduced to zero rates following the intervention for all seven children following the fading procedure and the rates were maintained at 3 and 6-month follow-ups for all the children.

Azrin, Nunn, and Frantz-Renshaw (1980) compared the habit reversal treatment of thumb sucking for 18 children with aversive taste treatment administered to 14 children. The habit reversal method was more effective in eliminating thumb sucking than the use of a bitter tasting substance. About half of the children receiving the habit reversal training stopped sucking entirely, compared to 10% of the children receiving the bitter taste treatment. These results are congruent with conclusion of Johnson and Larson (1993) who assert that "the use of aversive chemicals on the thumb or finger is relatively ineffective in habit attenuation compared with the habit reversal treatment" (Johnson and Larson, 1993, p. 395).

A single case study was reported by Allen, Flegle, and Watson (1992) in which a treatment device was designed to eliminate thumb sucking and associated hair pulling. It was created by an interdisciplinary treatment team involving a behavioral psychologist and two occupational therapists. Initial treatment efforts employing aversive taste treatment, rewards, and monitoring had failed with this particular child. One of the occupational therapists was asked to fabricate a reliable device that could not be removed by the patient and that would disrupt, but not prevent, thumb sucking. The device was made out of low-temperature thermoplastic material. A loose circumferential thumb post with a comfortable web space was formed. Approximately one half of the distal phalanx of the thumb was left uncovered so that it was possible to oppose each finger and grasp while the device was in place. Straps were attached with sufficient tension to make the connections extremely difficult to fasten or unfasten with one hand.

The thumb post was worn daily during all activities

and was removed contingent on 24 consecutive hours without thumb sucking. The thumb post was immediately replaced if an instance of thumb sucking was observed. Thumb sucking was gradually eliminated, and hair pulling also diminished.

The thermoplastic thumb post was no longer employed after 6 weeks, and thumb sucking and hair pulling did not return. A 12-month follow-up revealed the same results.

Johnson and Larson (1993) reported that implementation of faded use of thumb wraps (cotton taped to the thumb or finger) has shown excellent results in treating thumb sucking on the unconscious or nocturnal level. The use of band-aids, mittens, socks, and tape placed over the fingers or hands are considered of questionable value in discouraging thumb sucking. The use of reminders (e.g., tape on thumb or finger, puppet sock, etc.) have been used effectively in programs using positive behavior modification (Pierce, 1994; Van Norman, 1985).

Various designed dental appliances constructed to assist the child who wants to stop thumb sucking have been found to be quite effective, even for an intense habit (Haryett, Hansen, and Davidson, and Sandilands, 1967).

HABIT AWARENESS

Habit awareness is more than merely understanding the cause and effect of thumb sucking. It evolves from the idea that motivation arises from the realization of a positive outcome. More frequently, behavior (i.e., motivation) is maintained longer from the realization of a positive outcome than from the threat of a negative consequence (Johnson and Larson, 1993).

Motivational approaches. Motivational approaches may incorporate additional procedures (e.g., habit reversal, contingency reinforcement, etc.) but the primary focus of the provider is to motivate the child through positive means to want to terminate the habit.

Luciano, Vilchez, and Herruzo (1992) successfully eliminated thumb sucking in a 5-year-old boy using a combination of habit awareness and habit reversal techniques. Contrary to the customary motivational approach of explaining the positive outcomes, the providers described the negative social and physical aspects as well as the advantages of not sucking his thumb. The program was designed for the school setting. Thumb sucking decreased slowly when the treatment was implemented, and after four months the teacher and other kindergarten staff reported no thumb sucking.

Van Norman (1985) employs positive motivation techniques in concert with positive behavior modification to persuade the child to want to terminate the thumb sucking habit. The following quote is representative of what is considered the critical phase of therapy:

My goal at this point is to establish open communication, camaraderie, and rapport with the child. I assure him that the digit sucking behavior is

very normal in infants and children. That old thumb or finger is just so delicious that it simply becomes a habit and, much of the time, he is totally unaware that he sucks it. Motivation to discontinue the habit is based solely on his interest in his own dental growth and development, then instilling in him the confidence that he can overcome the habit if he so desires. I utilize dental models, "before and after" photographs of other children's teeth, audio visuals, and, most importantly, compassion and simple friendly personal persuasion. (Van Norman, 1985, p. 19)

Van Norman (1985) recommends simply ignoring thumb sucking until the child is old enough to reason, which is usually about age 5 or 6. During this wait and see period of time many children will discontinue the habit themselves due to increased activity in playing and the start school.

SUMMARY

There appears to be a general consensus that thumb sucking is normal in infancy and early childhood. If the habit persists into the fifth year and beyond there is an increased chance that associated problems will develop with dental problems leading the list in referrals. It should be noted that associated problems may occur at earlier ages depending on the severity and intensity of the habit. Earlier intervention also might be warranted due to parental concern or at the request of the child.

The management practices reviewed have all demonstrated to be effective to some degree at given points in time and with certain children. Most approaches fall under the general headings of operant conditioning, sensory attenuation, and habit awareness. The procedures within these approaches that appear to be the most effective interventions for thumb sucking include monitoring, motivation, and sensory feedback components.

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