

THUMBSUCKING AND FALLING ASLEEP*

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A review of the studies on the etiology of habitual thumbsucking reveals either contradictory or inconclusive results. In this study carried out in Turkey, 50 thumbsuckers, 50 non-thumbsuckers, 250 school children and 312 'problem' children were investigated through interviews, questionnaires and other clinical techniques with their mothers. Among variables studied, were aspects of feeding, onset and incidence of thumbsucking, strength of the sucking drive, sex distribution, educational level and occupation of mothers, parental attitudes toward physical contact with children, mother-child relationships, and particular forms of falling asleep. It was found that thumbsucking was etiologically more related to ways of falling asleep than to other factors. An attempt was made to explain the social, psychological and physiological basis of the etiological significance of the falling asleep stage in habitual thumbsucking.

These findings now permit predictive longitudinal investigations to test this accuracy. *Key words:* thumbsucking, sleeping.

Habitual thumbsucking in children has been a subject of interest to pediatricians, dentists, psychoanalysts, psychiatrists and child psychologists. The interest of pediatricians and dentists has gradually diminished because of the general agreement that habitual thumbsucking is not necessarily a source of infection, and that it is not a serious cause of malocclusions¹⁻⁷. In psychiatric and psychoanalytic circles, however, it is still regarded as an autoerotic activity of the child, possibly caused by deprivation of infantile needs. Some investigators believe that it is an entirely normal activity, while others regard it as a manifestation of emotional deprivation and a sign of neurotic predisposition. As

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Milton Senn⁸ has stated: 'Pediatricians and psychiatrists are prejudiced and subjective regarding this activity .

Habitual thumbsucking does not seem to be considered a problem in lower socioeconomic levels or in developing countries. But in societies where there is considerable pediatric and psychiatric practice, it draws the interest not only of professional people but also of families. Parents are often concerned, and they experience guilt or anxiety when they have thumbsucking children, wondering what they have done wrong to cause this.

It is beyond the scope of this paper to discuss, in detail, studies on thumbsucking, but a brief survey is indicated. Since Freud's⁹ writings on infantile sexuality, thumbsucking has been viewed by psychoanalysts as an autoerotic activity and as indisputable evidence of oral sexuality. The first important study on its etiology was made by David Levy¹⁰, who concluded that an insufficient sucking experience during infancy as a result of spontaneous withdrawal from sucking, a too rapidly flowing breast or bottle, forced withdrawal after a set short period of time, or diminished feeding time was etiologically responsible. Levy^{11,12} was able to find experimental support using dogs and chicks. Childers and Hamil¹³, Simsarian¹⁴, Fredeen¹⁵, Sears and Wise¹⁶ and Sewell and Mussen¹⁷ gave evidence contradicting or failing to support these findings, whereas Davis¹⁸, Roberts¹⁹ and Klackenberg⁴ supported Levy's theory of an insufficient sucking experience in infancy. Halverson²⁰ pointed out the existence of natural suitable media to reinforce the necessary conditions favouring a conditioned pattern of non-nutritive sucking, but he gave no specific etiological explanation. Similarly, Palermo's⁶ interesting paper can assist in understanding the mechanism of the learning process in habitual thumbsucking, but not in explaining its etiology. Deprivation of breast feeding was stressed by Mead^{21,22} and Ribble^{23,24}, but found little or no support from other investigators such as Levy, Davis, Sears and Fredeen. Ribble also pointed out that inadequate mothering may be a factor in thumbsucking. Many psychiatrists and psychoanalysts tend to accept this view in varying degrees, and some highly esteemed textbooks consider it a neurotic manifestation caused by emotional deprivation^{25,26}. Kunst²⁷ suggested that an increased hunger drive may stimulate non-nutritive sucking, and that emotional deprivation, as hunger would, could induce thumbsucking. On the other hand, Childers and Hamil¹³ studied problem children and found no relation between thumbsucking and emotional deprivation or neurotic tendencies. Gesell²⁸ wrote that thumbsucking had nothing to do with sexuality, and he also thought that Levy's findings were unconvincing. He thought thumbsucking to be a normal developmental phenomenon resulting from local irritation (like teething), maturation of hand-mouth coordination, fatigue and non-specific frustrations. Ilg and Ames²⁹ also regarded it as a natural activity, but they gave no explanation as to why some children become habitual

thumbsuckers and others do not. Benjamin Spock^{30,31}, besides giving credit to Levy, states that there may be other factors, like a constitutionally strong sucking drive. Reference to constitutional factors, although not explicitly stated, can also be found in the writings of Freud⁹, and English and Pearson²⁵.

Social anthropological writings of Mead^{21,22}, Orlansky³², and Davis and Havighurst³³ are also inconclusive. Even if there are differences in the incidence of thumbsucking among children of different cultures or sociocultural levels, it is obvious that only the way a child is reared can be etiological, and not the social level or the culture itself.

Though Gesell and Ilg³⁴, English and Pearson²⁵, and Ribble^{23,24} have pointed out the relationship of thumbsucking to sleep, none has referred to a possible etiological connection. Gesell and Ilg wrote that if thumbsucking were related to sleep, its habitual pattern would be strong, and that it would therefore be abandoned by the child rather late or with more difficulty. Ribble emphasized the importance of the infant's need to suck while going to sleep, and even suggested that rhythmic stimulation like rocking, lullabies, or sucking while the child goes to sleep may be helpful in preventing thumbsucking. In spite of these statements, however, which come close to explaining the etiological connection between sleep and thumbsucking, Ribble seemed to be inclined to view thumbsucking as a product of inadequate mothering or insufficient sucking.

This brief survey shows that the etiology of thumbsucking is still unknown. Our clinical and sociocultural observations suggested that there might be a direct etiological relation between thumbsucking and the ways children are allowed or induced to fall asleep. Therefore, the following study was made a preliminary step to explore this point together with other variables already investigated. The study will be continued through predictive longitudinal observations and recording.

Material and Methods

This study is based on data obtained from interviews, questionnaires and clinical evaluation. The subjects are described as follows: *Group I* (TS) consisted of 50 habitual thumb and/or finger suckers between ages one and seven. No atypical forms, such as excessive finger-mouth playing tendencies were included. *Group II* (NTS) consisted of 50 children between ages one and seven, who did not suck their thumbs or fingers to any striking degree. We considered a child as an habitual thumbsucker if he had made it a habit at least beyond 12 months of age. The mothers of groups I and II were interviewed in detail to obtain information for the variables listed below. These children were randomly selected from the pediatric clinic of the Hacettepe University Children's Hospital in Ankara, Turkey.

None had applied for psychiatric examination or therapy and there were no pacifier users in these two groups. The social status, education and occupations of the parents of groups I and II were heterogeneous. *Group III*, the group of 'non-problem' children, comprised a total 250 children aged between 4 and 12, who were from a kindergarten and an elementary school in Ankara. None of these children had any psychiatric referral or treatment. *Group IV*, the group of 'problem' children, comprised 312 children between the ages of 4 and 14, who had been evaluated by the Child Psychiatry Unit of Hacettepe University Faculty of Medicine for various behavioral problems. Organic, psychotic and mentally retarded children were excluded. Evaluation of these children had been made by detailed family and developmental histories, therapeutic follow-up, and projective and psychometric tests. The subjects in groups III and IV were of urban middle or upper-middle class families.

In addition to these groups, a summary of a detailed study of seven families will be given in this paper to illustrate the presence of thumbsucking among siblings with particular reference to the variable that emerged as being significant.

The following variables were investigated: (1) ways of feeding, e.g. breast, bottle, cup; (2) duration (in months) of the specific way of feeding; (3) sucking until satisfaction versus time-limited sucking; (4) scheduled versus non-scheduled feeding; (5) strength of the sucking drive; (6) onset of thumbsucking; (7) sex distribution; (8) educational level of parents; (9) occupation of mothers; (10) attitudes toward physical contact and playing with children at home; (11) presence of serious disturbances in the mother-child relationship in problem children; (12) incidence of thumbsucking in problem and non-problem children; (13) the pre-sleep situation and ways of putting the child to sleep during infancy, e.g. sleeping alone after feeding, sleeping alone with a bottle, sleeping on the mother's lap while feeding, practice of rocking and lullabies.

Results and Discussion

Our findings regarding the relationship between thumbsucking and breast feeding are presented in Tables I and II, which show that the TS group had a significantly shorter period of breast feeding than the NTS group.

A comparison of the duration of breast feeding in thumbsuckers and non-thumbsuckers shows that there is a significant difference ($\pm = 4.00$, $p < 0.01$). Whereas, a comparison of total duration of breast and bottle feeding in both groups shows no significant difference (± 0.31 , $p > 0.05$). This finding can give the impression that there are more thumbsuckers among children weaned earlier from the breast in comparison to those weaned later.

TABLE I: Distribution of Thumbsuckers (TS) and Non-thumbsuckers (NTS) According to Form and Duration of Feeding

TS				NTS			
Duration (months)	Essentially breast fed	Essentially bottle fed	Mixed feeding (breast-bottle)	Duration (months)	Essentially breast fed	Essentially bottle fed	Mixed feeding (breast-bottle)
0	8	13	21	0	5	34	39
1-3	12	0	0	1-3	1	0	0
4-6	16	0	0	4-6	9	0	0
7-9	9	3	3	7-9	11	2	1
10-12	2	14	11	10-12	10	4	4
13 >	3	20	15	13 >	14	10	6
Total	50	50	50	Total	50	50	50

TABLE II: Comparison of Thumbsuckers (TS) and Non-Thumbsuckers (NTS) With Respect to Duration of Breast and Bottle Feeding

	TS		NTS	
	$\bar{X}$	S.D.	$\bar{X}$	S.D.
Duration of breast feeding (months)	4.92	4.075	10.28	7.146
Duration of breast and bottle feeding (months)	13.58	6.271	13.98	6.528

This may seem to support Ribble and Mead who attributed the absence of thumbsucking in certain families or cultures to prolonged breast feeding in infancy. To arrive at a sound conclusion on this issue, however, the onset of habitual thumbsucking must be considered. If it usually starts and continues before weaning from the breast, then absence or shortage of breast feeding could not be a factor in its etiology. How can early or late weaning be related to thumbsucking if the habit is found to be acquired while the child is still on breast feeding?

Our investigation of breast-fed and bottle-fed children in regard to the onset of thumbsucking shows that among 50 thumbsuckers (TS) there were 13 children who were breast fed, and 11 of these children started thumbsucking before weaning from the breast. Eight were bottle fed and all of them started thumbsucking before weaning from the bottle. Twenty-nine children were both bottle and breast fed, and 20 of them started thumbsucking before weaning. Statistical analysis of this data ($X^2 = 8.595$, $p = < 0.01$) indicates that most habitual thumbsucking starts before weaning from the breast or bottle. Our finding

in this respect is in accordance with Levy, as reported earlier. Other explanations must therefore be sought to explain why there are more thumbsuckers among children relatively early weaned than those who are late weaned. This will be explained later.

Another important variable is scheduled versus demand feeding. It has been proposed, particularly by Levy, that long-interval scheduled feedings lead to a reduction in the child's sucking experience, causing non-nutritive sucking. In our study, a comparison of TS and NTS, according to scheduled versus demand feeding, shows that among 50 TS, 34 children were fed with scheduled form and 16 with demand form. Among 50 NTS, 23 children had scheduled feeding, and 27 were fed on a demand basis. Thus, there are significantly more schedule-fed than demand-fed children among TS ($X^2 = 4.08$, $p < 0.05$). In order to conclude whether or not scheduled feeding is an important factor, it is necessary to compare the number of TS with NTS in the total schedule-fed children. Among 57 schedule-fed children, there were 34 TS and 23 NTS. As the difference between these figures is not statistically significant, some other explanation must be sought for the finding that there are more schedule-fed children among TS than among NTS. This point too will be discussed later.

As for the length of individual feeding sessions, in Turkey, generally there are no limitations to the duration of breast or bottle feeding, and the mothers of our subjects stated that they invariably allowed their children to suck for as long as they wanted. This can be termed sucking-until-satisfaction. Only one mother said that she had tried to feed her baby with prescribed timing for the first three months and that her child was not a thumbsucker. Of 100 children, 99 were fed by the traditional sucking-until-satisfaction way, and of these, 50 were thumbsuckers and 49 were not. This does not support the findings of Levy, Davis, Roberts, Klackenberg and Yarrow³⁵ Besides, the view that thumbsucking is related to hunger (Gesell, Kunst) is not supported, since many children who are fed on demand and until satisfaction still become thumbsuckers.

Although it is extremely difficult to obtain reliable data on the strength of the sucking drive of infants, mothers were questioned carefully on their children's sucking appetite and strength. Information obtained on 91 subjects was clustered into two groups: good sucking drive and weak sucking drive. Of these 91 children, there were 42 TS and 36 of them (85.7 percent) were considered to have a strong sucking drive and six (14.3 percent) were considered to have a weak sucking drive*. Although these figures are not convenient for statistical comparisons, their percentages suggest that the NTS group do not have a sucking drive any weaker than the TS group.

* The authors have two children who had a strong sucking drive in infancy. Neither of them used pacifiers, nor were they thumbsuckers.

Sex distribution among TS and NTS did not show a significant difference. There were 27 females and 23 males in the TS group, and 22 females and 28 males in the NTS group. These figures support Levy's report that sex is not an important variable in habitual thumbsucking.

Another variable, the educational level of the parents, was investigated to see if there was any connection between TS and the maternal educational level, which is also reliably reflective of the sociocultural level in Turkey. In the TS group there were no illiterate mothers; 26 were high school and 15 were university graduates. In the NTS group there were 11 illiterate mothers, 16 high school graduates and five university graduates ($\chi^2 = 16.32$, $p < 0.05$). Although a significant difference was found between the two groups, the educational level could not be an etiological factor in itself, and it could only lead us to further questions. For example, mothers of higher education usually work, and, therefore, they may not always be at home. In the TS group, 11 were working mothers, 36 were housewives and the occupations of three mothers were unknown. Of the mothers in the NTS group, 10 were working mothers and 38 were housewives. These figures indicate that there is no significant difference between the number of working mothers and the number of housewives in both groups. Thus, it was felt that absence from home due to work could not be a related factor. The significance of the differences in educational levels will be explained later.

We tried to find out if there was any relation between thumbsucking and parental attitudes toward approval of physical contact and affectionate play with the child. The parents who took their children on their laps, played with them frequently, and who reported favoring such close contacts, were grouped as 'approving of physical contact'. Among 50 TS there were 18 children whose parents 'approved' of physical contact and 32 children whose parents 'disapproved' of physical contact. Among NTS there were 23 children whose parents 'approved' and 27 children whose parents 'disapproved' of physical contact. There is no significant correlation between parental attitudes toward physical contact and the presence or absence of thumbsucking ($\chi^2 = 0.661$, $p > 0.5$).

An inadequate mother-child relationship is usually implied as an etiological factor, both in case studies and in child psychopathology textbooks. In this study, the 'problem children' group from the Child Psychiatry Clinic were chosen as subjects to investigate this point because these children had been thoroughly studied. Methodologically, it is extremely difficult to study and define, in detail, the parent-child relationships of a large number of non-problem children, whereas, the parents of the clinical subjects are usually in a position to be carefully evaluated as to the quality of the mother-child relationship. Since thumbsucking usually becomes habitual during the first two years of life, special effort was made to investigate the quality of the mother-child relationship of the child's first two years. Of the

312 'problem' children, 201 used pacifiers and were therefore excluded from the study. The remaining 111 children's case histories were carefully reviewed, and the quality of the mother-child interaction was categorized. If the following conditions were found to have been present in the first two years of childhood, the mother-child relationship was qualified as 'inadequate or disturbed': (1) open rejection of the child; statements that the child was unloved; child delivered to the care of several mother substitutes; (2) severe marital discord resulting in the unhappiness of the mother and resentment toward the child; (3) severe neurosis or psychosis of the mother.

The mothers without the above characteristics were classified in this study as having established at least a relatively 'adequate relationship' with their children. In the 111 'problem children' there were 11 TS and 100 NTS. Of the 11 TS, six children had 'inadequate or disturbed' mother-child relationships and five had at least an 'adequate' relationship. Of the 100 NTS, 42 children had 'inadequate or disturbed', and 58 had 'adequate' mother-child relationships ($\chi^2 = 0.202$, $p > 0.05$). There was no significant difference between the two groups. This finding does not support the hypothesis that a poor mother-child relationship can be etiologically related to habitual thumbsucking. A separate comparison of the pacifier users with nonpacifier-users in the 'problem children' group did not reveal any significant difference.

As many psychiatrists and some known textbooks have regarded thumbsucking as a psychological problem, and an indication of neuroticism in children, we compared the incidence of thumbsucking in 'problem children' and 'non-problem' children. Although our subjects cannot be considered representative samples, both groups were from similar socioeconomic and cultural backgrounds and thus, comparisons could be made. Of the 250 'non-problem' school children, 141 children used pacifiers and, were therefore excluded and analyzed separately. In the remaining 109 children, there were 16 TS and 93 NTS. Of the 312 'problem children', the 201 pacifier-users were excluded and compared separately. Of the remaining 111 children, there were 11 TS and 100 NTS. No significant difference was found in the incidence of thumbsucking in the 'problem' and 'non-problem' children ($\chi^2 = 0.744$, $p > 0.05$). Similarly, the incidence of pacifier-use was not significantly different in these two groups. It was felt that the large number of children who used pacifiers in both groups might account for the relatively low frequency of thumbsucking in urban Turkish children (14-18 percent) as compared to 25 percent in the United States¹⁰ and 30-50 percent in Scandinavia⁴.

As a last variable, a careful inquiry was made of the pre-sleep condition and ways of putting children to bed during the first two years. The forms of falling asleep were classified as: (1) being left alone in their rooms to sleep on their own, after having been fed to satisfaction; (2) being fed by breast or bottle while going to

sleep in a crib or in the mother's lap; (3) being rocked in the mother's lap or in a cradle, or being sung lullabies while falling asleep (usually after completion of feeding).

The figures in Table III indicate an extremely strong relationship between thumbsucking and the way children are put to sleep. Ninety-six percent of the thumbsuckers had been left alone to fall asleep after having been fed. Of the NTS children, there was not a single child who was left to fall asleep alone or without a sucking opportunity while going to sleep. An additional attempt was made to test this finding by studying seven families selected on the basis of the following criteria: (a) each family had both TS and NTS children; (b) the age difference between siblings was rather low, in that the average age difference was 1 ½ years, the greatest being 2½ years (only one child); (c) these families did not use pacifiers; (d) the oldest child in these families was not older than seven. All variables investigated in our research groups were also studied in these families.

TABLE III: Distribution of Thumbsuckers (TS) and Non-Thumbsuckers (NTS) in Relation to Forms of Falling Asleep

	TS		NTS	
	n	%	n	%
Children left alone to fall asleep after being fed	48	96	0	0
Children provided with sucking experience, breast or bottle, to fall asleep	1	2	22	44
Children, after being fed, are rocked or sung lullabies to induce sleep	1	2	28	56
Total	50		50	

Two families had three children each, one TS and two NTS. Five families had two children each, one TS and one NTS. Thus, in these seven families there were seven TS and nine NTS. The only consistent finding was in the area of falling asleep, in that all TS were put to bed alone with no sucking opportunity other than their thumbs, and that all the NTS children had an opportunity to suck the breast or bottle while falling asleep. Two of these families are worth reporting: Family I had three children — a 5 year old boy, 2½ year old girl, and a 1½ year old boy. The two older children had been breast fed for four months and bottle fed for 30 months. The youngest child was not yet weaned at the time of investigation. They were all schedule-fed until satisfaction. It was found that the two older siblings had at least adequate physical contact and an adequate relationship with their parents, but the youngest child was considerably deprived. The mother had had long-term depression after this youngest child's birth, and the father had been away most of the day and

many nights as an intern in a hospital. There was no consistent mother substitute for the baby, who spent much time lying in bed with a bottle given to him before sleeping periods. This child, and the oldest one, who were regularly put to sleep in the mother's lap while sucking the breast or bottle, were not thumbsuckers. The thumbsucker in the family was the second child. It was after her birth that her parents, who were educated, were exposed to the recommendation of putting the child to sleep alone after having been fed.

Family VI had three children — 6 and 5 year-old girls and a 4 year old boy. The first two children were breast fed for nine months and the youngest for seven months. None had bottle feeding. They were all demand fed until satisfaction. Physical contact with babies was not highly approved in the family. There was no striking disturbance in the mother-child relationship with the two older children, but one could not easily say this with the youngest child, who was abruptly weaned at seven months, at a time when the mother had to leave for Europe to accompany the father because of the latter's severe illness. The child lost the breast feeding and the mother at the same time. The separation lasted about six months. During this period, the children were taken care of by the grandmother. In this family, the oldest child was regularly put to sleep alone in her crib after being fed, but the younger two children regularly slept in the mother's lap while sucking her breast. During the period of separation from the mother, the youngest child was regularly put to sleep by the grandmother, who rocked the baby in her lap and sang lullabies. The thumbsucker was the oldest child, and the other two children, one of which had a dramatic abrupt separation from the breast and the mother, were not thumbsuckers.

These case reports of families also strongly support our finding of the importance of the form of falling asleep as an etiological factor in thumbsucking.

Discussion and Conclusion

Our findings have to be considered provisional because of the question of reliability of data obtained through anamnestic methods. Nevertheless, material from different sources seem to lead to certain common findings, and therefore we feel justified in formulating the following etiological hypothesis of habitual thumbsucking. This hypothesis needs further evaluation through longitudinal studies which we plan to undertake. One of our findings was that there was significantly less thumbsuckers among breast-fed children, but that insufficient duration of breast feeding could not be a cause of thumbsucking since the habit was acquired while breast feeding was still continued. Another finding was that there were more schedule-fed children among TS than among NTS, but the difference between the numbers of TS and NTS was not significant in the total schedule-fed children. Therefore, it was felt that the connection could be an

indirect one. Another positive finding was that there were more thumbsuckers among children of educated mothers. Finally, it was found that thumbsucking and falling asleep alone, without a sucking opportunity or other rhythmic stimuli, were highly correlated. We propose the following explanation for these findings: educated mothers are likely to be more influenced by modern child-rearing techniques which include scheduled feeding and putting the child to sleep alone, have a better opportunity and more reason (as many work) to utilize the products of the modern baby-food industry, and tend to practice less breast feeding and more bottle and scheduled feeding than uneducated mothers. These mothers also tend to let their infants go to sleep alone after feeding. The more tradition-bound, uneducated mothers, breast and demand feed their babies until satisfaction, and generally put them to sleep either while feeding or by rocking and lullabies. We have already explained how breast and demand feeding, although found to be correlated with the absence of thumbsucking, could not be etiologically pertinent. Thus, the highly significant variable found in our study, i.e. the form in which the child is allowed or induced to fall asleep, seems to stand out as the etiological factor in thumbsucking. This needs further explanation.

Although during recent years, studies on the physiology and psychology of sleep have increased, our knowledge of this basic need, which consumes one-third of our lives, is rather limited. It is beyond the scope of this paper to review sleep studies. Although certain physiological aspects and varying levels of sleep in infancy have been investigated^{28,36,37}, very little is known on the drive distribution, particularly of the sucking drive, in the infant's organism during sleep or pre-sleep. Whatever physiological or biochemical mechanisms are involved, it is generally accepted that from the cerebral, physiological and behavioral standpoints sleep is a regressive activity during which there is relative dominance of the more primitive cerebral functions and inhibition of the higher ones^{36,38}. From a psychological standpoint too, sleep is considered to be a regressive phenomenon, and in psychoanalytic literature, it has been regarded as a state in which the ego regresses to more primitive levels³⁹. Peiper states that the sucking activity of the child is one of the most primitive functions, and that the sucking center is in the immediate neighborhood of other vital centers in the medulla oblongata. It is known that an infant's sucking can be aroused as a 'vacuum activity' without any external stimuli or hunger stimulus from inside. According to Peiper, this vacuum activity, frequently observed during infancy, can be seen in later childhood during 'light sleep'. Thus, sucking as a primitive reflex activity, occurs during the regressive state of sleep or light sleep. An analogous condition is observed in insulin coma, during which there is a gradual progressive dissolution of the cerebral functions. In the initial stage there is facilitation of subcortico-diencephalic activity associated with primitive involuntary movements, among

which sucking can be mentioned, together with depression of higher cerebral and cerebellar functions⁴⁰. Similarly, it is quite possible that the sucking reflex is stimulated, and the sucking drive intensified while going to sleep.

There is also the question of mouth-hand coordination in thumbsucking. Again according to Peiper, this is easily stimulated in children, and even in adults, when cerebral functions are in a regressive state. It can therefore be assumed that while falling asleep both the sucking drive and mouth-hand coordination are highly stimulated. This would explain why thumbsucking can easily start while going to sleep, and why it is particularly difficult for the child to relinquish it during the falling asleep period.

A similar explanation can be given on the basis of the psychological significance of sleep. Considering sleep as a regression of the ego to a more primitive state, the ego's relative autonomy from the id is decreased, and the organism is in increased drive tension. As sucking is one of the more primitive and important drives in infancy, its stimulus value would be expected to increase in sleep, resulting in an intensified need to seek a drive-satisfying object. Thus, a relationship between sucking and sleep on both physiological and psychological levels can be defined. While falling asleep, the intensification of the sucking drive and the stimulation of mouth-hand coordination create a favourable ground for thumbsucking. If the infant goes to sleep while sucking the breast, bottle, or pacifier, the sucking drive will be satisfied, and the stimulation of mouth-hand coordination will not be used for thumbsucking. Similarly, if the infant is rocked or if his sense organs are rhythmically stimulated (rocking, lullaby or the mother's lap) the sucking drive and mouth-hand association will be detoured, leading to a lessened perception of these internal stimulations, and to smooth sleep with less internal drive demand. It is also possible that these external stimuli may serve other purposes, such as that of assuring the infant of the mother's presence while he falls asleep, which can be perceived as gradual separation from her, or as being left alone if the child falls asleep in her absence. Children who are left alone without the breast, bottle, pacifier or other stimuli offering gratification while falling sleep, develop habitual thumbsucking which will gradually be generalized to other behavioral areas of increased drive tension (e.g. hunger, fatigue, frustration). While the onset of thumbsucking is causally related to the way of falling asleep, its relinquishment is more difficult and delayed in the pre-sleep and sleep stages than that of thumbsucking occurring elsewhere.

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