Mouthing behaviour of young children

An observational study

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PREFACE

In this study the time children mouth during the day is researched by means of observations. The counselling committee who gave the assignment for this research consisted of representatives of the plasticizer industry, toy industry, RIVM (National Institute of Public Health and the Environment), Consumentenbond (Consumers Association) and the Inspectie Gezondheids Bescherming (General Inspectorate for Health protection). The research is carried out in the Netherlands at the Sub-department of Household and Consumer Studies at the Wageningen Agricultural University.

First of all we would like to thank the members of the counseling committee, Mr. P.C. Bragt and Mrs. S. Stefanovic (IGB), Mr. L. van Dijk and Mr. H.F. van Wijk (plasticizer industry), Mrs. D.C.C. Kok and Mr. R. Luijk (Consumentenbond), Mr. M. Twist and Mrs. J. Bakker (toy industry) and Mr. M.P. van Veen (RIVM). Special thanks go to Mrs. J. Bakker, for correcting the report on English at such a short notice.

Also, we would like to thank Mrs. K. Alfano (Fisher Price) for her time and guidance in the preliminary phase of the research and Mrs. B. Mentzel (Groot Klimmendaal) and Mrs. V. Lauwers (day care centre Pipeloi) for the time they took to share their experiences with us. Mrs. C.A.A. Butijn (Department of Household and Consumer Studies) was a great help preparing the group discussion and leading this.

Last but not least we would like to thank the parents, who agreed to join in the group discussions and the parents who observed their children, for their time and enthusiasm. Observing was a heavy task, but it was carried out very carefully.

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Samenvatting

Deze studie is gedaan in het kader van een groter onderzoek waarin nagegaan wordt in hoeverre zacht PVC-speelgoed met phtalaten gezondheidsrisico's zouden kunnen veroorzaken. In deze studie wordt aandacht besteed aan de tijd dat kinderen sabbelen per dag.

Doel van het onderzoek
Het doel van het onderzoek is: het kwantificeren van de tijd dat kinderen in de leeftijd van 3 tot 36 maanden sabbelen en het krijgen van een indruk van de variatie tussen kinderen.
Onder sabbelen wordt verstaan: alle activiteiten waarbij objecten de mond raken of in de mond gestopt worden met uitzondering van eten en drinken. Deze term omvat zowel likken als zuigen, bijten en kauwen.

Er wordt door kinderen op verschillende manieren gesabbeld. De ontwikkeling van het sabbelgedrag begint met reflexmatig zuigen. Na een tijdje gaan kinderen over op het sabbelgedrag om dingen te ontdekken. Dit gebeurt niet alleen door te zuigen, maar ook door te likken.
Als kinderen ouder worden, zuigen ze omdat ze moe zijn of troost nodig hebben. Het is niet mogelijk een bepaalde periode van de dag aan te wijzen waarop kinderen meer sabbelen dan op andere periodes van de dag. Dit komt onder andere omdat het dagritme van de kinderen verschilt en sommige kinderen sabbelen om te ontdekken als ze levendig zijn terwijl anderen dat gedrag vertonen als ze moe worden. De verschillen in sabbelgedrag tussen de kinderen zijn erg groot. Er worden zelfs grote verschillen gevonden binnen een gezin.

Onderzoeksopzet
Om de sabbeltijden te bepalen zijn kinderen geobserveerd. De observaties moesten gedaan worden door een bekende van het kind in een normale omgeving omdat dan het gedrag van het kind het minst beïnvloed wordt.

Er is gevraagd aan ouders om hun kind twee dagen lang tien keer per dag een kwartier te observeren. Dit betekent een totale observatietijd van 2,5 uur per dag. De sabbeltijd werd gemeten met behulp van een stopwatch om exacte waarnemingen te krijgen. De observaties vonden overdag plaats als het kind wakker was. Er zijn geen observaties gedaan als het kind sliep of at (met uitzondering van een kleine snack of een snoepje). Naast de observaties is door de ouders een vragenlijst ingevuld met daarin vragen over demografische kenmerken, het karakter van het kind en het speengebruik.

Er is een onderscheid gemaakt tussen verschillende soorten objecten waarop gesabbeld wordt: speen, vingers, niet-speelgoed, speelgoed bedoeld om op te sabbelen en speelgoed niet bedoeld om op te sabbelen. Het onderscheid tussen speelgoed bedoeld om op te sabbelen en speelgoed niet bedoeld om op te sabbelen is gemaakt door de onderzoekers. Dit onderscheid is gebaseerd op een lijst die geleverd is door een speelgoedfabrikant.

De kinderen zijn verdeeld in vier leeftijdscategorieën (3-6 maanden, 6-12 maanden, 12-18 maanden, 18-36 maanden). Iedere categorie is in een andere fase van ontwikkeling.

Analyse
Om sabbeltijden per dag te krijgen is de geobserveerde sabbeltijd van een dag geëxtrapoleerd. Voor deze extrapolatie is gebruik gemaakt van het dagritme (dat de ouders hebben ingevuld in de vragenlijst) om te bepalen hoe lang het kind wakker is en de mogelijkheid heeft om te sabbelen.

Omdat er tegenwoordig praktisch geen spenen geproduceerd worden die gemaakt zijn van zacht PVC met phtalaten, is deze categorie minder belangrijk voor dit onderzoek. Om deze reden zijn alle sabbeltijden de geëxtrapoleerde sabbeltijden voor de tijd dat een kind overdag wakker is, zonder een speen.

Resultaten
Onderstaande tabel geeft de totale geëxtrapoleerde sabbeltijden zonder speen.

Tabel S-1 Totale geëxtrapoleerde sabbeltijden [minuten] (zonder speen).

		standaard deviatie	minimum	gemiddelde	maximum
3-6 maanden	(n=5)	19.1	14.5	36.9	67.0
6-12 maanden	(n=14)	44.7	2.4	44.0	171.5
12-18 maanden	(n=12)	18.2	0.0	16.4	53.2
18-36 maanden	(n=11)	9.8	0.0	9.3	30.9

In alle leeftijdsgroepen, behalve de groep van 6-12 maanden, wordt relatief het meest gesabbeld op de vingers. De leeftijdsgroep van 6-12 maanden sabbelt het meest op speelgoed (niet bedoeld om op te sabbelen). In de leeftijdsgroep van 12-18 maanden wordt speelgoed bedoeld om op te sabbelen bijna niet gebruikt. In de leeftijdsgroep 18-36 maanden wordt speelgoed bedoeld om op te sabbelen helemaal niet gebruikt.

SUMMARY

This study is a part of a larger project to determine if PVC softened toys with phthalate could possibly cause health risks for children due to mouthing. Here it is focused on the time children mouth during the day, to estimate the total exposure time per day.

Aim of the research
The aim of the research is to quantify duration of mouthing in infants of 3 to 36 months and to study child-to-child variations.
The term mouthing means: all activities in which objects are touched by mouth or put into the mouth except for eating and drinking. This term includes licking as well as sucking, chewing and biting.

Children show different kinds of mouthing behaviour. The development in mouthing behaviour starts with sucking as a reflex. After some time children start to explore by putting things into the mouth. This is not necessarily sucking, but also licking.
When children get older, they suck when they are tired or need comfort. It is not possible to pinpoint a part of the day in which it can be expected that children mouth more than other parts of the day, because each child's daily routine differs between children and some children start exploring by mouth when they are lively, others when they get tired. The differences between children regarding the mouthing behaviour are very large. Even big differences are found in one family.

Design of the study
To determine the mouthing times children were observed. The observations had to be done by a person who is familiar to the child in a normal setting because this will least influence the behaviour of the child.

Parents were asked to observe their children ten times 15 minutes per day on two days. This means a total observation time of 2.5 hours a day. The mouthing time was measured by means of a stopwatch to get exact data. The observations took place when the child was awake during the day. No observations were done while the child was sleeping or eating (with exception of a little snack or sweet). In addition to the observations, a questionnaire was filled in by the parents covering demographic aspects, characteristics of the child and policy regarding the dummy.

A distinction was made between the kind of objects: dummy (= pacifier), fingers, non toys, toys meant for mouthing and toys not meant for mouthing. The division in toys meant for mouthing and toys not meant for that purpose, was made by the researchers based on a list of toys meant for mouthing provided by a toy producer.

The children are divided into four groups according to their age (3-6 months, 6-12 months, 12-18 months and 18-36 months). Every group is in a different phase of development.

Analysis
In order to get daily mouthing times, the sum of the observed mouthing times during one day was extrapolated. For this extrapolation the daily routine, filled in in the

questionnaire by the parents, is used to determine the time the child is awake and has the opportunity to put something into the mouth.

Because virtually no dummies produced today are made from phthalate softened PVC, this category is less important for this research. For this reason all presented mouthing times are the extrapolated total mouthing times for the time awake without a dummy.

Results

The table below shows the total extrapolated mouthing time in minutes (without dummy) per age group.

Table S-1: Total extrapolated mouthing time [minutes] (without dummy).

		standard deviation	minimum	mean	maximum
3-6 months	(n=5)	19.1	14.5	36.9	67.0
6-12 months	(n=14)	44.7	2.4	44.0	171.5
12-18 months	(n=12)	18.2	0.0	16.4	53.2
18-36 months	(n=11)	9.8	0.0	9.3	30.9

The product category that is most mouthed on is in all age groups the fingers, except for the age group 6-12 months. This group mouths most on toys. Toys meant for mouthing are hardly used in the age group 12-18 months and never used in the age group 18-36 months.

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1 INTRODUCTION

This study is a part of a larger project to determine if phthalate softened PVC toys could possibly cause health risks for children due to mouthing. Here it is focused on the time children mouth during the day, to estimate the total exposure time per day.

The term mouthing means: all activities in which objects are touched by mouth or put into the mouth except for eating and drinking. This term includes licking as well as sucking, chewing and biting. Appendix 1 contains a list of the definitions used in this research.

Young children have a need to suck and chew. They mouth on products that are meant for that purpose, such as dummies (= pacifiers) and teething rings, but they also mouth on products not especially intended for this purpose, such as toys and cloths. The frequency and the intensity of mouthing differ from child to child and probably depends on a number of factors. Little is known about the subject, however. Whenever toys are mouthed on, there is a chance that substances in the toy might migrate in the child's saliva and be swallowed, which in the long term could lead to adverse health effects on the child.

The aim of the research is to quantify frequency and duration of mouthing in infants of 3 to 36 months and to study child-to-child variation. Attention is also addressed to the variation of duration and frequency of mouthing in infants. A distinction is made between mouthing on toys meant for mouthing, such as teething rings, mouthing on toys not specifically made for that purpose and on other objects.

A number of research methods is used to try to answer the question how long children mouth. Orientational research has been conducted to determine the most important factors influencing mouthing behaviour and to provide a foundation for the research design for the main part of the study. The orientational study includes a literature survey. In addition to the literature survey, some expert interviews were held. This will be discussed in the next chapter. The second part of this study, the main research, involves a group discussion with mothers of children in the target group and an observational study. The design and results of the group discussion will be described in the third chapter. The research design of the observations will be described in the chapter 4, followed by the results of the observations in the fifth chapter. The report will finish with recommendations for further research.

2 ORIENTATIONAL RESEARCH

2.1 INTRODUCTION

In the orientational phase of this research, a literature survey was carried out and expert interviews were held. The literature survey provides more detailed information on the reasons for mouthing and the factors that influence this behaviour. The expert interviews detail experiences of people who work daily with children. This information is used to determine the design of the main study.

2.2 LITERATURE SURVEY

There are different ways to class mouthing behaviour of children.
Turgeon-O'Brien et al. (1996) distinguish nutritive and non-nutritive sucking. The nutritive form consists of breast-feeding and bottle-feeding which provides essential nutrients. The non-nutritive form ensures a feeling of well-being, warmth, and a sense of security. Non-nutritive sucking is probably the earliest sucking habit adopted by infants in response to frustration and to satisfy their urge and need for contact.
Children who neither receive unrestricted breast-feeding nor have access to a dummy may satisfy their need with alternative habits such as finger sucking or sucking on other objects (a blanket or toy) (see figure 2-1).

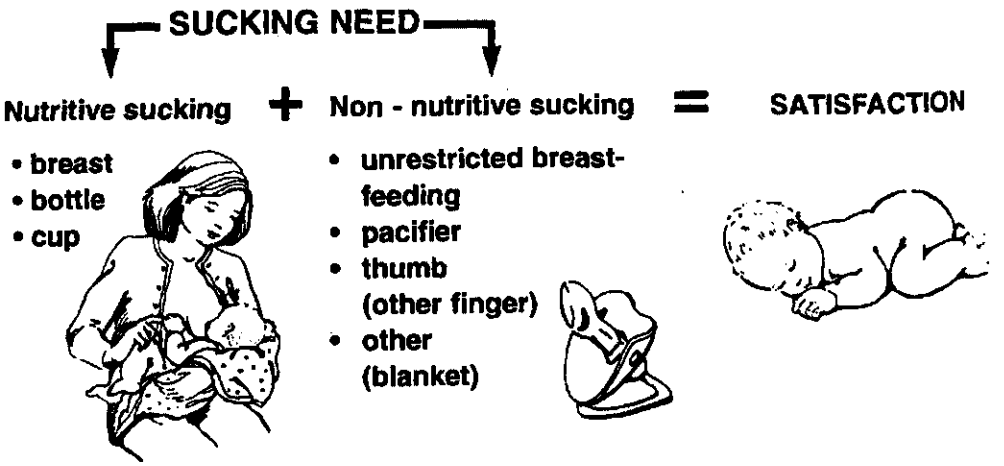

Figure 2-1 Satisfaction of sucking need by nutritive and non-nutritive sucking (Source: Turgeon-O'Brien et al., 1996).

Larsson and Dahlin (1985) distinguish 3 forms of the sucking behaviour (next to nutritive sucking): dummy sucking, finger sucking and non-nutritive sucking (see figure 2-2).

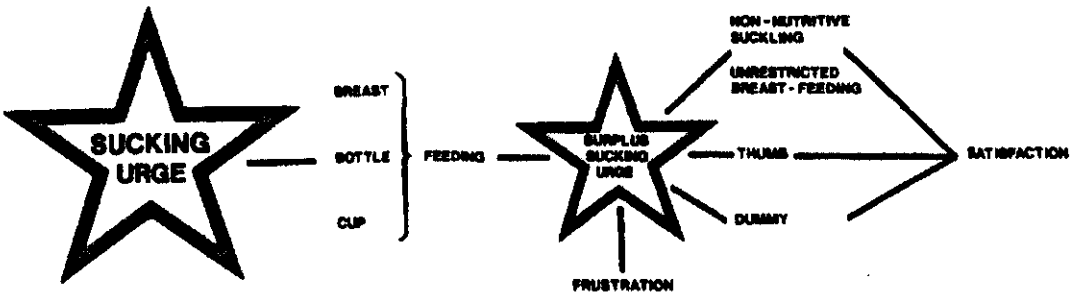

Figure 2-2 The etiology of the different sucking habits (Source: Larsson and Dahlin, 1985).

They explain that an infant has a sucking instinct that varies in degree among children but is usually powerful. After the child has taken first cereal or mother's milk, a surplus sucking urge often remains. The extent of this surplus depends on the extent of the original urge and on how much of it has been spent on the intake of nourishment. The surplus sucking urge may be either frustrated or re-channelled. For the child, the most attractive method (and probably the most natural) is unrestricted, sometimes non-nutritive sucking. If this is not possible, the child must choose between dummy and finger sucking to obtain satisfaction. If the surplus sucking urge is not so strong, it can probably be diverted and the child can find satisfaction through physical closeness and cuddling (Larsson and Dahlin, 1985).

White (1975) describes the mouthing development of children, and distinguishes sucking and exploring behaviour. Exploring is licking or placing into mouth for the purposes of discovery. For a baby of 0-6 weeks the sucking behaviour is just a reflex. If someone touches the lips of a child with a finger it will immediately turn the head, try to put it into the mouth and suck on it. After 3.5 months the behaviour of the child will change. If someone touches the lips then, this will not be followed by an automatic reaction any more, but the reaction will come after a short time and is sometimes followed by a search for the thing that caused the sensation. From the age of 6 weeks the child also uses the mouth to investigate its environment (together with looking and touching). It likes to put small objects into the mouth. First the child will start with its own fists, followed by its fingers and finally everything it can take. While investigating, the child puts things into the mouth for only a few seconds. This behaviour goes on until about 24 months (White, 1975).

In addition, another reason for mouthing is that the gums of the child are soft and sensitive just before the teeth come through. This causes an uncomfortable feeling and to reduce this the child will mouth on something. For most children the teeth start to come through at the age of 8 months (White, 1975).

Larsson et al. (1993) investigated the association between breast-feeding and the development of the sucking habit of Swedish, Norwegian and Norwegian Sami (Lapp) children. They only found a correlation between breast-feeding and the development of the sucking habit for the Norwegian Sami children that were living in a community which seems to be somewhat less influenced by the modern, Western way of nursing babies.

There is nothing found in the literature about how children mouth, what period of the day they mouth and the production of saliva in relation to mouthing. The group discussions gave more insight into some of these topics.

2.3 EXPERT INTERVIEWS

Interviews were held with a speech therapist and a nurse from a day care centre. In addition information from the manager of child research at the Fisher Price Play Laboratory was obtained. The information obtained in the interviews is based on education and daily experience of the experts, except for the information from the manager of child research. Her information was mainly based on research done by this manager.

The speech therapist was specialised in the development of the mouth. This speech therapist, Beatrijs Mentzel, works at a rehabilitation centre. She is specialised in treating very young children. Although she only works with handicapped children, she was able to give useful information about healthy children because the development of the mouth of handicapped children is not different from normal children, only slower.

The nurse in the day care centre (Pipeloi in Wageningen), Vera Lauwers, works daily with children and has experience with a lot of different children.

The manager of child research at the Fisher Price Play Laboratory (East Aurora, New York), Kathleen Alfano, has conducted a mouthing study herself and has experience with observing children. The Fisher Price Play Laboratory is an integral part of Fisher Price child research and observance. In this laboratory children are observed, play patterns are studied and observation techniques are developed. Also research is done in the home environment. The information relevant to this study was obtained from Fisher Price via a memo, e-mails and a telephone conference.

The results of these interviews can be grouped under four themes:
1. Reasons for mouthing
2. Effect of teeth on mouthing behaviour
3. Mouthing behaviour as a habit/ effect of dummy policy
4. Observation techniques

2.3.1 Reasons for mouthing

The need for mouthing/sucking is in the first place caused by a reflex. This reflex provides the children with food (Alfano, Mentzel and Lauwers). Young children also explore their world through mouthing (Alfano and Mentzel). This is because the mouth is more sensitive than the hands at this age, so objects can be better determined by mouth (Mentzel). Exploring behaviour is characterised by putting just about everything into the

mouth for a few seconds (Alfano). Children also use the mouth as a third hand, when they need both hands for something else (Lauwers). Young children who use dummies usually suck on them to become calm and to comfort themselves. This is usually the case when the children get tired (Alfano) or need security in situations of tension (Mentzel). In the day care centre that is visited the dummy is only given before sleeping or when children are very upset or ill (Lauwers).

Mentzel expects that the force used for sucking is bigger than the force used for exploring. The influence of breast-feeding on mouthing behaviour is not clear. There is much more force needed to get the milk, but whether this stimulates (the sucking reflex is much more developed) or discourages (the children are tired) mouthing is not clear (Mentzel).
How long children mouth during the day depends on age and physical development (teething) and what they are mouthing on. Children in general do not have a preference for one kind of material or size (Alfano). The items that children put into their mouths are made from a variety of materials and have a variety of sizes. Not all the children put things into the mouth (Alfano). Lauwers has also noted that mouthing behaviour differs from child to child.

2.3.2 Effect of teeth on mouthing behaviour

During the phase in which children grow teeth, the attention is moved to the mouth, because the mouth is more sensitive in this phase and therefore aches. Children want to bite on something, like fingers and toys (Alfano, Mentzel and Lauwers). According to Mentzel, these toys are preferably hard toys like teething rings to ease the pain. Lauwers stated that it does not matter whether these things are soft or hard, but cuddly toys are not considered for this.

2.3.3 Mouthing behaviour as a habit/effect of dummy-policy

When children get older, mouthing behaviour is not directly a reflex or a need to explore any more, but determined by a habit. It can be expected that the mouthing need for older children partly depends on the 'culture' in the family or in other words, the policy of the parents regarding the dummy. When parents often use a dummy to get the children calm, this will stimulate the mouthing behaviour (Mentzel). On the other hand, when children walk around all day with a dummy or a feeding bottle, it can be expected that they will not put a toy or something else into the mouth from habit, because the mouth is already filled. But they will do this sooner when they lose the dummy or feeding bottle just for the sensation of putting something in the mouth. Lauwers however does not expect that this policy will influence the total mouthing time because children who do not get a dummy will use something else instead to mouth on.

The day care centre in Wageningen has the policy not to give the dummy during the day, except when the children go to bed. Pieces of cloth are allowed. The children accept this policy (Lauwers).

2.3.4 Observation techniques

Researching the behaviour of children under the age of three years is difficult, because in order to have findings that reflect reality, the research must be conducted in a normal setting where children have the opportunity to behave naturally. Observations in familiar surroundings and with people that are familiar to the children is important. Observations conducted by the researchers will give the certainty of useful observations with correct

values, but the presence of the strange researcher will influence the behaviour of the children (Alfano). When children are observed in a day care centre, the presence of a strange researcher will have less impact on the behaviour of children but it is not sure if this surrounding can be marked as familiar and normal.

The use of a video camera to observe the mouthing behaviour of children is debatable. Parents are very diligent in their observations. However, distraction of one type or another may occasionally divert their attention, whereas the videotape will continue to record. On the other hand, a problem with video observations is that children move around often and sometimes very quickly. Catching their behaviour on videotape can be complicated and tricky. A second problem is that their behaviour will be influenced because of the strange situation. Using the videocamera in this study is advised against because it is very important to observe normal behaviour (Alfano).

3 GROUP DISCUSSION

3.1 INTRODUCTION

In order to get more detailed information about mouthing behaviour of children, a focus group discussion was held with parents of children aged between 3 months and 3 years. The information from the literature survey and the expert interviews were the foundation for the group discussions.

3.2 DESIGN

Two sessions of an hour were planned, one in the morning and one in the evening. The discussion was divided into three parts, on the basis of the three different ways of mouthing. The three different ways are: reflex mouthing, discovery mouthing and habit mouthing. Every part was introduced by a statement to which the parents could react. The statements were followed by questions to explore the subject in depth until (according to the participants) all the ideas and information about this phase had been discussed. The discussion tried to focus primarily on other objects than the dummy. The discussion was led by a moderator. In addition to the moderator an observer attended the discussion to make notes. The discussion was also recorded on tape and typed out.

The three statements were:
- Children are born with a reflex to suck
- Young children explore with their mouth
- Mouthing is a habit

The main goal was to get answers on the questions:
- are these phases detected by the parents?
- what are reasons for mouthing?
- is there a difference detected between mouthing to explore and mouthing/sucking as a reflex?
- is there a period of the day during which children are mouthing a lot?
- does getting teeth influence the mouthing behaviour?
- does mouthing become a habit and can parents influence that?
- do strange surroundings have influence on the mouthing behaviour?

Both sessions started with an informal reception by the moderator and the observer. A short introduction followed and the reasons for the research were explained. The participants were asked to introduce themselves by telling their name and family composition (including the age of the children).

3.3 PARTICIPANTS

The participants were all mothers recruited at the market or outside a day care centre. In total eight parents agreed to participate. Due to different circumstances, finally five parents were able to attend. Two parents participated in the morning session and three parents participated in the evening session. The parents in the morning session both had one child. Two parents in the evening session had two children, the other had one child. The moderator herself also had a child. In total the behaviour of eight children was discussed.

Two mothers had a son of 8 months old, one had two daughters - one of 18 months and 3.5 years, one had two daughters of 4 months and almost 3 years old and one had a daughter of 20 months old. The child of the moderator was a boy of 30 months. Three mothers had given or were still breast-feeding.

3.4 RESULTS

During the discussions it became very clear that there are large differences between children, even between children in the same family. There seems to be a pattern in mouthing behaviour, but there was always an exception in the group. A difference is detected in mouthing behaviour: sucking and licking. Parents discovered that sucking is associated with becoming calm or intimacy and licking is associated with exploring.

Parents do detect different kinds of mouthing. They can imagine that the mouthing behaviour is influenced by the age and development of the children and have seen this development themselves, although not always consciously.

There are several reasons for mouthing. The reasons for mouthing differ with age and development of the child and the energy level of the moment. The parents observed that during the first months the children mostly suck and do that for a long period of the day. Children start licking when they get older and want to explore. Then the children suck less and do not need the dummy during the day, but all the children from the parents in the focus group still use a dummy when they are tired/go to bed, when they are ill, need security or are bored. Two children never wanted to use a dummy, but used their thumbs as a substitute. Parents noticed that very important factors to mouth on objects are colour (yellow), the unfamiliarity of objects or toys (the newer the better) and the shape of the object (when something sticks out it seems to be more attractive to mouth on). The parents could not indicate a period of the day in which children mouth a lot.

Not much difference in mouthing behaviour is seen between children whose teeth came through very easily and children who had difficulties growing teeth. Children with more difficulties with teeth coming through, slobbered more but the parents were not sure if the teeth were the reason for slobbering. There was more attention for the mouth in the period that the teeth came through. Children started rasping with their teeth, but biting to ease the pain is not clearly observed. According to the parents hardly any children were interested in using a teething ring to ease the pain. In spite of this, most parents in the group discussion detected biting marks on toys or broken toys because of biting. Parents noticed that after the teeth came through, biting became an other way to explore an object. Tension and frustration often result in biting.

All parents believe that mouthing, mostly sucking, is a reflex, but becomes a habit. It is possible to teach children to stop the sucking habit after some time. The best example for this is that children often start complaining when they are not allowed to keep the dummy in the morning when they get up, or when they see the dummy during the day but are not allowed to get it. When they are distracted, they forget the dummy and do not need it anymore. Children also accept that they are sometimes not allowed to use the dummy because they know that they may use it at a settled time. Most parents start to cut back the use of the dummy during the day when children get older. This often ends with 'losing' the dummy or ritual throwing the dummy away. One child decided that she was too old for the dummy and asked her parents to stop giving it to her. The parents agreed but it was obvious that she needed the dummy at night to sleep. Soon after this, the child started sucking on the thumb during the day. In spite of the motivation of the child, she still seemed to have a need for sucking. There was some discussion whether the sucking activity makes children calm instinctively, or that the parents taught the children to associate sucking with being calm. This question has not been answered.

Parents do not feel the need to influence the mouthing behaviour in order to explore things, except licking on dirty or dangerous objects. They see it as a part of the game and do not think it is unhealthy or bad for the child. The parents did not observe different mouthing behaviour in a strange surrounding, for example when they visit someone. They can imagine that it makes a difference when the parents leave.

3.5 RESEARCH QUESTIONS

Children show different kinds of mouthing behaviour. According to Larsson and Dahlin (1985), Turgeon-O'Brien et al. (1996) and White (1975), the development in mouthing behaviour starts with sucking as a reflex. This is confirmed by Alfano, Mentzel, Lauwers and the parents in the group discussion. After some time children start to explore by putting things into the mouth. This is not necessarily sucking, but also licking. When children get older, they suck when they are tired or need comfort. It can be expected that teeth coming through causes a revival of the mouthing behaviour, but this is not noticed by the parents. It is not possible to pinpoint a part of the day in which it can be expected that children mouth more than other parts of the day, because each child's daily routine differs between children and some children start exploring by mouth when they are lively, others when they get tired. Sucking is always associated by the parents with tired children. The differences between children regarding the mouthing behaviour are very large. Some children never put anything into their mouth or never want a dummy, others use the dummy for a long period of the day or mouth on everything they can grasp. Even big differences are found in one family so the culture of the family seems less important than the character of the child. It is not clear what the effect of a dummy is on the exploring behaviour by mouth.
According to Lauwers, Mentzel and the parents, sucking behaviour becomes a habit that can be influenced by the parents. Parents start to cut back the use of a dummy during the day. According to the parents exploring by mouth is not necessarily a habit, but part of the game or part of the development. The parents in the group discussion do not want to interfere in that at this age.

On the basis of the literature study, the expert interviews and the group discussions the main study is set up. The research questions of this main part of the study are:

- Are there any differences in total mouthing time between the first and the second observation day?
- Are there any differences in total mouthing time between boys and girls?
- What is the total mouthing time registered per age group?
- What is the total mouthing time per day (extrapolated) per age group?
- What is the total mouthing time on each product category per age group?
- What is the mouthing time on combined product categories?
- What are the percentages of licking and sucking/biting per age group?

4 OBSERVATION STUDY

4.1 DESIGN

To determine the mouthing times, children are observed by their parents.
The observations had to be done by a person the child is familiar with, because this will least influence the behaviour of the child. While there is not a time of the day that children seem to mouth more often, children had to be observed during the whole day. Behaviour of a child can be influenced by a number of factors such as illness, pain or visitors. Because the pattern of mouthing behaviour might differ on different days, the observations had to take place on more than one day.

Parents were asked to observe their children ten times 15 minutes per day on two days. The observation periods had to be divided over the day as follows:

- between waking up and 11 a.m. 3 times one quarter of an hour;
- between 11 a.m. and 3 p.m. 3 times one quarter of an hour;
- between 3 p.m. and going to bed 4 times one quarter of an hour.

This means a total observation time of 2.5 hours a day. Parents were allowed to observe two times 15 minutes successively. They were asked not to observe longer than 30 minutes successively because due to fatigue the observations might become less reliable. The mouthing time was measured by means of a stopwatch to get exact data. The observations took place in a normal setting when the child was awake during the day. No observations were done while the child was sleeping or eating (with exception of a little snack or sweet). In addition to the observations, a questionnaire was filled in by the parents covering demographic aspects, characteristics of the child and policy regarding the dummy.

If the parents were disturbed during the observation time by for example the phone or someone at the door, they had to go on until the total observation time was 15 minutes. When the parents missed an observation period for instance because the child was sleeping, they had to write this down in the diary. It was made very clear that the parents had to behave as normal as possible during an observation period. For instance, if a child normally gets a dummy when it cries, the parents had to give this also during the observation period.

A distinction was made between licking and sucking/biting, as the force exerted in both activities seems to differ. For this research, licking is when the object touches the lips or tongue outside the mouth but is not put inside the mouth. Sucking/biting is when the object is put into the mouth.

Also a distinction was made between the kinds of objects: dummy, fingers, non toys, toys meant for mouthing and toys not meant for mouthing. The parents only had to write down the type of toy the child was mouthing on. Appendix 2 contains a list of toys written down by the parents in the diaries. The distinction between toys meant for mouthing and toys not meant for that purpose, was made afterwards by the researchers on the basis of information from a producer of toys. The group of toys meant for mouthing contains all kinds of teething rings and some rattles.

Pilot study
Before the research started, a pilot was held with two parents. The parents were sent the complete set to evaluate the contents. As a result of this evaluation, some parts of the questionnaire and (video)instruction were adapted.

4.2 RESPONDENTS

The following activities were undertaken to recruit respondents:
- hanging posters and leaflets at day care centres, supermarkets, children's clothes shops and child health care centres;
- putting letters in mailboxes in a neighbourhood with a lot of young families;
- asking people personally at the market and at the day care centres to participate;
- putting an advertisement on the bulletin board of the university computer network;
- putting articles in free local news papers;
- asking respondents to search in their neighbourhood for other respondents.

In total 60 parents agreed to participate in the research with together 67 children in the target group. Forty-three parents with together 45 children sent back the filled in diaries. One of them was received after the deadline, so it was not possible to process these data. Two diary sets could not be used, because they were not filled in correctly. From one set only one diary was filled in correctly, the other one was not used in the analyses. Seven parents withdrew their participation because of the summer holidays or a lack of time and from seven other parents the diaries were not received although they had promised to send it back before the deadline. In the end the diary sets of 42 children were used (together 83 diaries) in the analyses.

4.2.1 Selection criteria
The educational level of the parents might be of influence to the policy regarding mouthing on toys. Also the fact that children attend a day care centre some days a week may influence mouthing behaviour. There is no information about the effect of these factors so it would require a separate study to base selection criteria on this. With the recruitment of respondents, the only used criterion was the age of the children (between 3 months and 36 months). An attempt was made to get a spread of age, but no one was refused because of this criterion.

4.2.2 Age groups
The children were divided into four groups according to their age. Every group is in a different phase of development.
- The children in the age group of 3-6 months start to look around and notice their environment.
- The children in the age group of 6-12 months are able to sit, they also have control over the muscles of their hands so they can grip objects by themselves.
- The children in the age group of 12-18 months are able to crawl. Some of them can walk so they can move around freely.
- The children in the age group of 18-36 months are able to play alone.

The period in which the parents did the observations was July 18th until August 9th, 1998. The reference date for the age of the children was set on August 1, 1998.

4.3 INSTRUCTION PACK

The respondents received by mail a parcel that contained:

- a written instruction (Appendix 3);
- an instruction on videocassette;
- a general questionnaire (Appendix 4);
- a diary set (one for every observation day) (Appendix 5);
- a filled in page of the diary (as an example);
- a stopwatch;
- a pen;
- a stamped addressed return envelope.

Written instruction
In this instruction the research was explained. In addition to this instruction was given regarding the use of the stopwatch, and how to fill in the diaries. The instruction also contained information on how to behave in special situations.

Video instruction
The video instruction contained the information from the written instruction illustrated with video pictures. It showed the working of the stopwatch and how to fill in a diary page. This video instruction also contained pictures of a child licking and a sucking/biting child as an example to illustrate the used definitions.

Questionnaire
The questionnaire contained questions about the age of the child, whether the child was breast-fed or bottle-fed, what kind of food the child gets now (to determine in what developmental phase the child is at the moment) and the policy regarding the dummy. Also questions were asked to give a global picture of the demographic composition of the group. In addition to this the daily routine of the child on the observation days was asked in order to extrapolate the mouthing times to a value for the total time of the day the child is awake.

Diary
The diary contained several columns in which the parents could successively fill in: the cumulative mouthing time (per period), whether the child was licking or sucking/ biting, what kind of object the child was mouthing on. When the child started to lick and continued to suck/ bite on the same object and there was no time to register the times in between, the total time for licking and sucking/biting was registered and both columns were marked. For the analysis this time is divided by two. This is also done when a child mouths on two different objects successively. Parents were asked to stop observing as soon as the fifteen minutes were over, even if the child went on mouthing. So the observed time is never longer than fifteen minutes per period. One page for every observation period was included in the diary, and five extra pages in reserve. On each page was space to write down remarks. For both days separate diaries were included.

A filled in page of the diary
This page was included to show how the diary had to be filled in.

Stopwatch
To obtain exact mouthing times and to deter parents from guessing the mouthing time, a stopwatch was included. To prevent errors, the parents were asked not to reset the stopwatch to zero during the observation period, so only one button had to be used. After each observation period the stopwatch had to be reset to zero.

4.4 ANALYSIS

4.4.1 Extrapolation
In order to get daily mouthing times, the sum of the observed mouthing times during one day was extrapolated. For this extrapolation the daily routine, filled in in the questionnaire by the parents, is used to determine the time the child is awake and has the opportunity to put something into the mouth. This is the time a child is not sleeping or eating and is referred to as 'the time awake'. The extrapolation is made per child per day, so the values of the observations per child per day are multiplied with the time awake that day according to the questionnaire. The extrapolation is corrected for the missed observation periods. The used calculation is:

$$\frac{\textit{the time awake (that day)}}{\textit{observation time (that day)}} \times \textit{total observed mouthing time (that day)} = \textit{extrapolated mouthing time per child per day}$$

This calculation results in the extrapolated value per child per day. The mean value of both days per child are taken. This is the extrapolated value per child.

4.4.2 Reliability
In order to get an indication of the reliability of the way observations were done, three methods were used:
1. Shadow observations: some children are observed simultaneously by the parents and one of the researchers.
2. Inter-observer reliability: two researchers simultaneously observed a video recording of a child.
3. Intra-observer reliability: video-recordings of a child were observed by the researchers repeatedly.

4.4.3 Time and motion study
In order to get an estimation of the behavioural pattern of a child and the total time during the day a child might be involved in investigating the world by mouthing, four children of the sample are observed a whole day by means of time and motion observations. (Haller-Wedel, 1969; Mundel, 1970). At random intervals, 12 times per hour, the activity the child was involved in was registered. This was done by the researchers themselves. The observation started when the child woke up in the morning and lasted until it went to bed in the evening.
The activities were categorised into eight groups. It was counted how many moments a certain activity was registered. For every category it was calculated what percentage of time that certain activity was done. The used calculation is:

number of moments the activity is registered X *100% = percentage of time the activity is done*
total registered moments

In addition to this, during the whole day, the total mouthing time was clocked. This was done to assess the reliability of the extrapolated values.

5 RESULTS

5.1 QUESTIONNAIRE

5.1.1 Distribution of age

In this study 42 children were observed. The distribution of boys and girls over the age groups is presented in table 5-1.

Table 5-1 Number of boys and girls per age group.

	boys	girls	total
3-6 months	2	3	5
6-12 months	7	7	14
12-18 months	6	6	12
18-36 months	6	5	11
total	21	21	42

5.1.2 Nutrition

The sample consisted of 30 (73%) breast-fed children of which 6 (15%) were still being breast-fed during the research. The other 11 (27%) children were bottle fed from the beginning. From the children who were breast-fed in the past (24 children), 7 (29%) had received this for 6 months or less. Information on 1 case was missing.

At the time the research was done, 4 children (10%) were only fed fluid food (breast or bottle feeding), 20 (50%) got industrially prepared food/mixed food or a combination of industrially prepared or mixed food and fluid food. No special food was given to 16 (40%) children: they eat the same food as the other members of their family. Information on two cases was missing. The kind of food that is eaten per age group is presented in table 5-2.

Table 5-2 Kind of food over the age groups.

	fluid food	industrial/mixed food or combination	no special food
3-6 months	4 (80%)	1 (20%)	0
6-12 months	0	13 (93%)	1 (7%)
12-18 months	0	5 (46%)	6 (54%)
18-36 months	0	1 (10%)	9 (90%)
total	4 (10%)	20 (50%)	16 (40%)

5.1.3 Teeth

Seven (17%) children in the sample did not have teeth yet. The first teeth were coming through with 13 (31%) children, 9 (21%) children already had teeth but no molars. The remaining 13 (31%) children had teeth as well as molars.
Biting marks on toys were made by 15 (36%) children. Breaking toys because of biting was observed by parents of 3 children (7% of the children). Because teeth coming through is often associated with toys meant for mouthing the following tables are made. Table 5-3 shows the distribution of these figures over the age groups and the use of toys

meant for mouthing and table 5-4 shows the number of children who made biting marks and used a toy meant for mouthing in relation to teeth coming through.

Table 5-3 Distribution of teeth coming through over the age groups, biting marks and use of toys meant for mouthing.

	no teeth	teeth coming through	already teeth*	biting marks	used toys meant for mouthing
3-6 months	4	1	0	0	3
6-12 months	3	11	0	3	10
12-18 months	0	1	11	7	2
18-36 months	0	0	11	5	0
total	7	13	22	15	15

*With some children the molars were coming through.

Table 5-4 Biting marks and use of toys meant for mouthing in relation to teeth coming through.

	no teeth	teeth coming through	already teeth*
number of children in this phase	7	13	22
biting marks	0	3	12
used toys meant for mouthing	5	8	2

* With some children molars were coming through.

5.1.4 Use of the dummy

In the sample 71% (n=30 children) sometimes use a dummy and 29% (n=12) never use a dummy. The distribution of the use of a dummy over the age groups is presented in table 5-5.

Table 5-5 Use of a dummy over the age groups.

	never a dummy	(sometimes) a dummy
3-6 months	1 (20%)	4 (80%)
6-12 months	3 (21%)	11 (79%)
12-18 months	3 (25%)	9 (75%)
18-36 months	5 (46%)	6 (54%)
total	12 (29%)	30 (71%)

From the children who use a dummy 13% (n=4) have unrestricted use of it and 70% (n=21) use it when they go to bed. From the 21 children who get a dummy when they go to bed 3 children (10% of the children who use a dummy) only get a dummy when they go to bed, not in other situations, and 18 children get a dummy when they go to bed and in (special) other cases for example when the child is ill, bored, tired or when it cries. The remaining 5 children only use a dummy in special situations.

5.1.5 Observation days

The parents were asked to fill in if the observation day was a normal day (without unusual events). Because the impact of an event differs between families, the parents were asked to define a (not) normal day themselves. The first observation day was a normal day (without unusual events) for 37 children (88%); for 5 (12%) children it was not a normal day. The second observation day was for 34 (81%) children a normal day and for 6 (13%) not. For two cases this information was missing (5%). In 3 cases (7%) both the first and the second day were not normal. Reasons given for a day not being a normal one were for example because they visited someone, someone came to visit them or new furniture was brought.

The parents were asked to fill in if the child was acting as normal on the observation day. Parents were asked to define this themselves as well. According to the parents the child acted as normal on the first observation day in 28 (67%) cases. Not acting as normal on the first day were 14 (33%) children. On the second observation day 32 (76%) children acted as normal. Not acting as normal were 8 (19%) children. Two cases were missing (5%). In 2 cases (5%) the child did not act as normal on both observation days. Reasons given included, for example, because the child slept longer than normal, the child was listless, the child suffered from teeth coming through or the child felt ill.

5.1.6 Age and level of education of the parents

The mean age of the mothers in the sample is 33 years. The youngest mother is 27 years old, the oldest 45 years old. The mean age of the fathers in the sample is 35 years. The youngest father is 29 years old, the oldest father is 48 years old.

The highest completed education is for 1 (2 %) mother and 2 fathers (5%) compulsory school, for 13 (31%) mothers and 8 (19%) fathers intermediate vocational school and for 26 (62%) mothers and 30 (71%) fathers higher vocational school or university. The sample contained a relatively large number of higher educated parents. Information of two couples was missing.

5.2 RELIABILITY OF THE OBSERVATIONS

5.2.1 Shadow observations

Thirteen shadow observations were done with three different parents. Each shadow observation lasted one observation period (15 minutes). During three shadow observations the child didn't mouth and during one shadow observation the child mouthed the entire 15 minutes, these observations are not included in the analyses. The measurements of 9 shadow observations are used. The mean observed mouthing time per observation period was 479 seconds. The mean difference between the researcher and the parent was 14 seconds per observation period. This is a difference of 2.9%. In one observation period there was no difference between the time clocked by the researcher and the parent. In 5 observation periods, the researcher had a higher value than the parent. In the other 3 observation periods the parent had a higher value than the researcher. A test for paired samples was done to determine if the differences were statistically significant. The differences were not statistically significant (Wilcoxon Matched-Pairs Signed-Ranks Test: mean researcher = 486 seconds; mean parent = 472 seconds; $z = -1.3$; $p = 0.2$; two tailed).

5.2.2 Inter-observer reliability and intra-observer reliability

Inter and intra-observer reliability were assessed by observing a child recorded on videotape. The observed videotape lasted 16 minutes and 6 seconds (966 seconds). This tape was observed two times by both researchers. The mean observed total mouthing time of the observations was 240 seconds. The mean difference between the two researchers was 18 seconds per observation period (mean researcher 1 = 231, mean researcher 2 = 249). This is a difference of 7.5%.
The mean difference between the two observations of one observer was 20 seconds (mean observation 1 = 250, mean observation 2 = 230). This is a difference of 8.3%. The few number of observations does not allow the differences to be tested statistically.

Remark: The differences between the observations done by the researchers are rather high compared to the shadow observations. This difference is caused by the fact that a child on videotape had to be observed. On a video it is less clear to see when exactly the child puts something into the mouth, because the video can only record from one direction. It is not possible to follow the child. So when the child turns away or when the child takes a big toy like a teddy bear, the exact moment the toy is put into the mouth can only be guessed.

Because the differences between the observers and per observer were less than 10% and no significant differences were found between observation times of the parents and the researchers it can be assumed that the observed mouthing times in this research are comparable to the time the child actually mouthed in the observed periods.

5.2.3 Time and motion study

Four children were observed during one day. In order to get an estimation of the total time a child performs certain activities, what the child was doing was recorded at random intervals (12 per hour). The activities the children were involved in were divided into eight categories.
Table 5-6 gives the results of these observations. The values are expressed as a percentage of the total observed moments (from rising in the morning until sleeping in the evening).

Table 5-6 Percentage of time an activity is done per day (from rising in the morning until going to bed in the evening).

	age of the observed children			
	5 months	17 months	29 months*	35 months
playing	24	14	25	33
walking without toys	0	14	0	20
reading/watching pictures	0	9	0	2
sitting/watching television	30	20	32	6
personal care	0	0	6	8
eating/drinking	15	17	13	11
sleeping (during the day)	27	24	23	18
other	4	2	1	2

* the child felt ill on the observed day.

The main activities of a child during the day are playing, sitting/watching television, sleeping and eating/drinking. In general these activities are done during 68-96 % of the

time. The first four activities (playing, walking without toys, reading, sitting/watching television) are more or less comparable activities regarding the opportunity to mouth. These four activities taken together, show comparable amounts of time for the children of different ages. However, the sleeping and eating/drinking times seem to become less the older the child gets.

5.2.4 Total mouthing time during the day

Table 5-7 presents the total clocked mouthing times during the time and motion study. Next to this the value of the total mouthing time (except the dummy) is compared to the extrapolated mouthing time based on the diary sets of these children filled in by the parents. Both methods result in rather comparable times.

Table 5-7 Total mouthing time [hours/minutes] during the time and motion study compared to the extrapolated mouthing time of the observed child.

	age of the observed children			
	5 months	17 months	29 months*	35 months**
observed total mouthing time	4h 42 min.	2h 30 min.	3h 44 min.	12 min.
observed dummy	4h 12 min.	2h 27 min.	3h 40 min.	10 min.
observed other (total without dummy)	30 min.	3 min.	4 min.	2 min.
extrapolation (without dummy)	30 min.	5 min.	-	4 min.

* this child felt ill on the observation day. An extrapolated time could not be computed because no diary is filled in for this child.

** the total mouthing time is only recorded from the afternoon until the child went to bed in the evening. The extrapolated time is calculated for this period of the day (about 4.5 hours).

5.3 DIFFERENCES BETWEEN GROUPS

In order to determine whether the results of groups of subjects differ, some analyses were done. The tests used were non-parametric (Baarda and de Goede, 1991; Storm-van Essen, 1992). The data used for these tests were the total mouthing times without the dummy.

Observation days

To determine if there is a difference in observed mouthing times between the first and the second observation day, a test for paired samples was conducted. The difference in mouthing time between the days is not statistically significant (Wilcoxon Matched-Pairs Signed-Ranks test: mean rank 1st day = 21.19; mean rank 2nd day = 18.27; $z = -0.46$; $p = 0.65$, two tailed).

To determine if there is a difference in time awake between the first and second observation day, a test for paired samples was conducted. The difference is not statistically significant (Wilcoxon Matched-Pairs Signed-Ranks test: mean rank 1st day = 17.26; mean rank 2nd day = 24.88.; $z = -0.17$; $p = 0.86$, two tailed).

The time awake and the mouthing time do not differ between the days. Therefore the mean value of the two days is used in further analyses.

Observation periods
To determine if there is a difference in observed mouthing times between the periods (rising until 11.00 a.m., 11.00 a.m. until 3 p.m. and 3 p.m. until sleeping) over the day, a One-Way Anova was conducted. The differences between the periods are not statistically significant (Kruskal-Wallis One-Way Anova: mean rank 1st period = 66.04; mean rank 2nd period = 62.92; mean rank 3rd period = 61.55; Chi-square = 0.33; df = 2; p = 0.85) so in general children did not mouth more or less during a special period of the day.

Boys and girls
To determine if there is a difference in observed mouthing times between boys and girls, a test for independent samples was conducted. The difference is not statistically significant (Mann-Whitney U: mean rank for boys = 20.95; mean rank for girls = 22.05; U = 209; p = 0.77, two tailed).

Age groups
To determine if there is a difference in observed mouthing times between the age groups, an analysis of variance was conducted. The differences between the age groups are statistically significant (Kruskal-Wallis One-Way Anova mean rank 3-6 months = 31.00; mean rank 6-12 months = 28.00; mean rank 12-18 months = 17.67; mean rank 18-36 months = 13.09; Chi-square = 13.27; p = 0.004, two tailed). So the age of the child is of influence to the mouthing times. For this reason the mouthing behaviour is presented for different age groups.

Dummy
To determine if there is a difference in total mouthing times (without dummy) between children that use a dummy and children that never use a dummy a Mann-Whitney U test was conducted per age group.

- age group 3-6 months the difference is not statistically significant (Mann-Whitney U: mean rank dummy = 3.00; mean rank no dummy = 3.00; U = 2.0; p = 1.00, two tailed);
- age group 6-12 months the difference is not statistically significant (Mann-Whitney U: mean rank dummy = 4.67; mean rank no dummy = 8.27; U = 8.0; p = 0.23, two tailed);
- age group 12-18 months the difference is statistically significant (Mann-Whitney U: mean rank dummy = 2.33; mean rank no dummy = 7.89; U = 1.0; p = 0.02, two tailed);
- age group 18-36 months the difference is statistically significant (Mann-Whitney U: mean rank dummy=8.40, mean rank no dummy = 4.00; U = 3.0; p = 0.03, two tailed).

In the age groups 12-18 months and 18-36 months the difference in total mouthing time (without dummy) between children that use a dummy and children that never use a dummy is statistically significant. In the age group 12-18 months the mean total mouthing time of children that use a dummy is higher than that of children who do not use a dummy. In the age group 18-36 months this relation is the other way around: the children that use a dummy have a lower mean total mouthing time than children who do not use a dummy.

5.4 EXTRAPOLATED MOUTHING TIMES

To calculate the extrapolated mouthing times, the time awake per child per day is used. To get an indication of the used values, table 5-8 shows the time awake per age group.

Table 5-8 Time awake per age group per day [hours/minutes].

	minimum	mean	maximum
3-6 months	5h 43 min.	7h 47 min.	9h 13 min.
6-12 months	5h 58 min.	8h 5 min.	10h 30 min.
12-18 months	7h 0 min.	8h 33 min.	9h 43 min.
18-36 months	6h 23 min.	8h 42 min.	11h 5 min.

The distribution of the total time awake is presented in Appendix 6.

5.4.1 Dummy

A large part of the total mouthing time during the day is used for mouthing on a dummy. Table 5-9 presents the extrapolated mouthing times of the dummy per age group and the percentage the dummy is used in the total mouthing time (on all categories of objects).

Table 5-9 Extrapolated mouthing times on the dummy [minutes] per age group and the percentage the dummy is on average used in the (mean) total mouthing time.

	minimum dummy	mean dummy	maximum dummy	mean dummy as % of mean total mouthing time	mean total mouthing time (all categories)
3-6 months	0.0	94.9	214.1	72%	131.8
6-12 months	0.0	27.3	112.6	38%	71.3
12-18 months	0.0	17.3	94.8	51%	33.6
18-36 months	0.0	20.8	155.0	69%	30.1

Because virtually no dummies produced today are made from phthalate softened PVC, this category is not important with regard to the intake of phthalates. For this reason, in the following part **all presented total mouthing times are the extrapolated total mouthing times for the time awake per day without a dummy.**

5.4.2 Total mouthing times

The total extrapolated mouthing times per age group are presented in table 5-10.

Table 5-10 Total extrapolated mouthing time [minutes] per time awake per day (all categories without dummy).

	standard deviation	minimum	mean	maximum
3-6 months	19.1	14.5	36.9	67.0
6-12 months	44.7	2.4	44.0	171.5
12-18 months	18.2	0.0	16.4	53.2
18-36 months	9.8	0.0	9.3	30.9

Below figure 5-1 shows the total extrapolated mouthing times per age group (without dummy). In the 'box' the median value is given as the black line, the box represents the

range between the 25th and 75th percentile. The lines indicate the minimum and maximum value, unless extremes (*) or outliers (o) are identified. 'Extreme' is a value larger than three times the box height from the upper or lower horizontal lines of the box. An outlier is defined as a value larger than 1.5 times the box height from the upper or lower horizontal lines of the box.

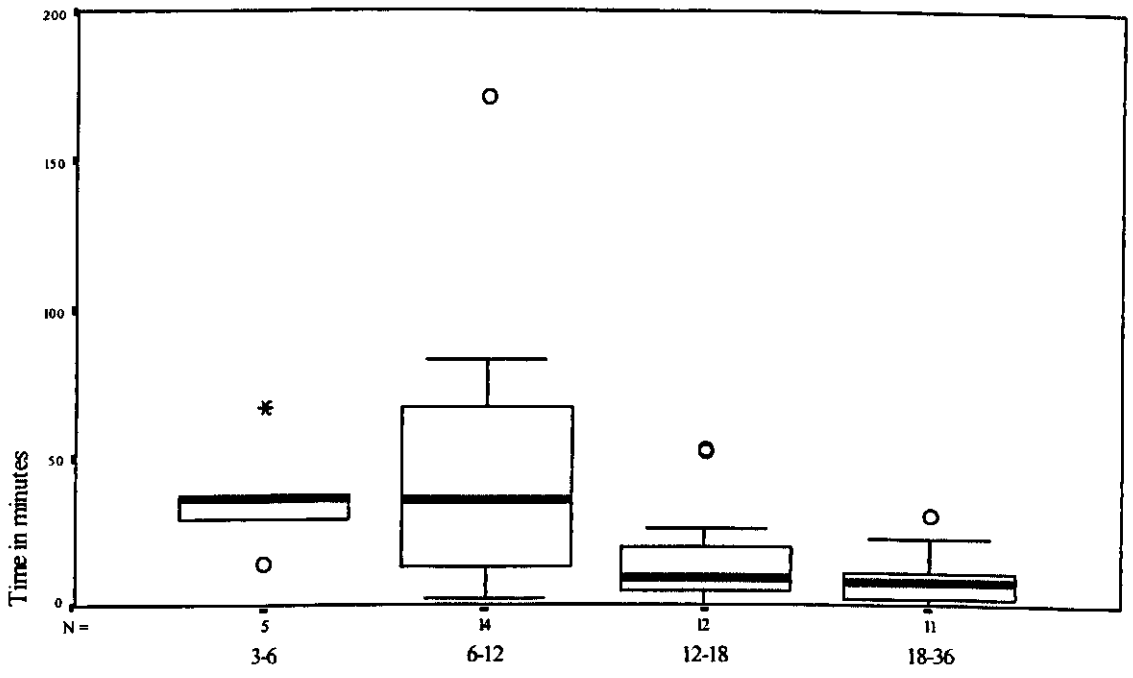

Figure 5-1 Total extrapolated mouthing time [minutes] during the time awake per day per age group (all categories except dummy).

The range in the age group 6-12 months is the highest.

Figure 5-2 below shows the total extrapolated mouthing time during the time awake per day.

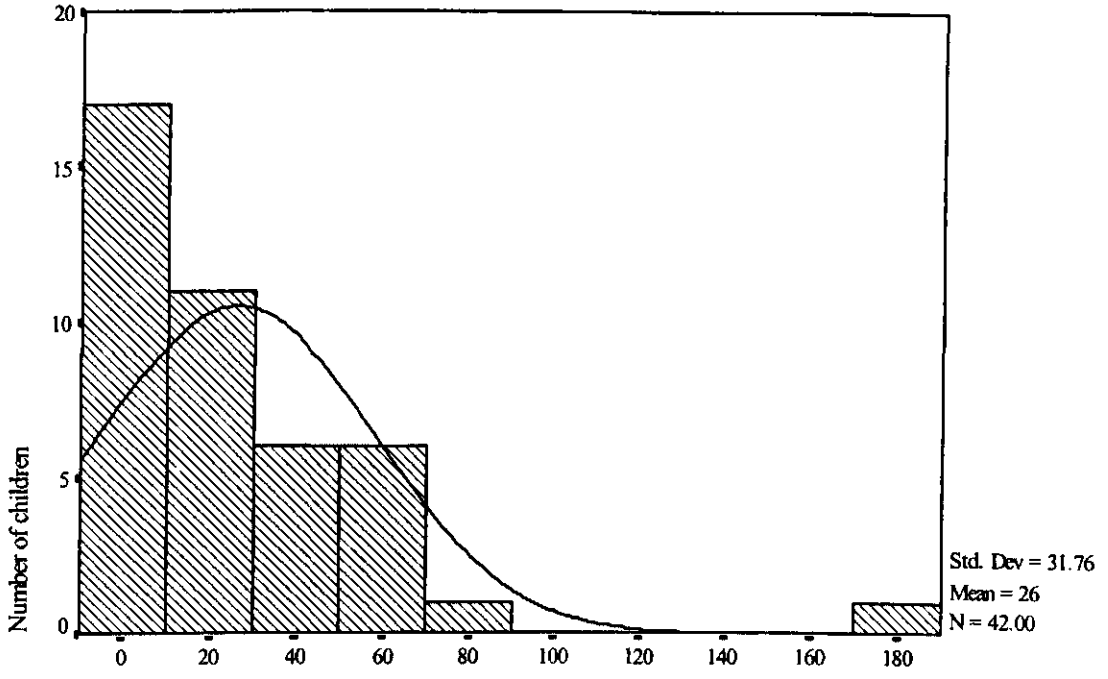

Figure 5-2 Distribution of the extrapolated total mouthing time [minutes] (excluding dummy) during the time awake per day.

5.4.3 Kind of mouthing behaviour

In this research a distinction is made between licking and sucking/biting. Table 5-11 gives the percentages of the total mouthing time per age group that children lick or suck/ bite.

Table 5-11 Percentages of licking and sucking/ biting of the total mouthing time during the time awake.

	licking	sucking/ biting
3-6 months	42%	58%
6-12 months	34%	66%
12-18 months	17%	83%
18-36 months	23%	77%
total	32%	68%

On average two-thirds of the time, children suck/bite on products. The remaining one-third of the time they lick on products. In the age group of 12-18 months, the children suck/bite the most. The percentage of licking is largest in the youngest age group (3 to 6 months).

5.4.4 Mouthing time per product category

Figure 5-3 to figure 5-10 show the distribution of the total mouthing times (without dummy) over the product categories per age group relative to the total mouthing time (without dummy) and the distribution of activities over 24 hours per age group.

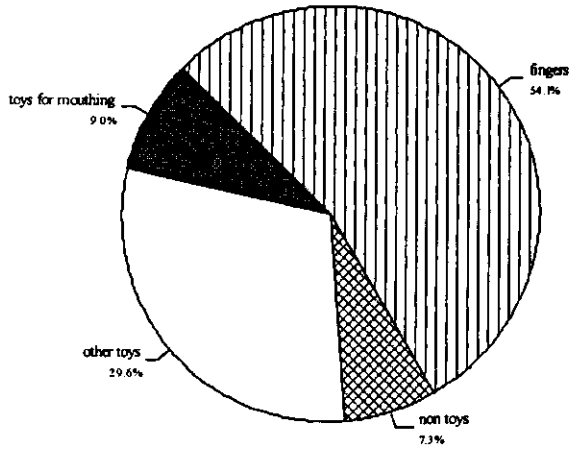

Figure 5-3 Mean mouthing time per product category relative to the total mouthing time for the age group 3-6 months. This circle represents 36.9 minutes.

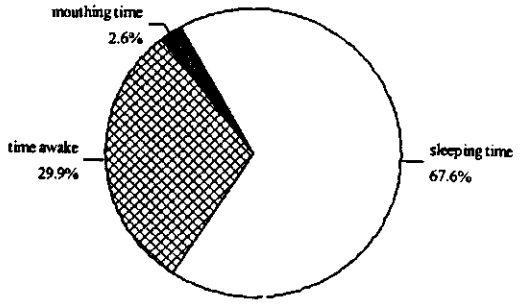

Figure 5-4 Activities over 24 hours for the age group 3-6 months (mouthing time is the total mouthing time per day without dummy).

More than half of the time, children in the age group 3-6 months mouth on their fingers.

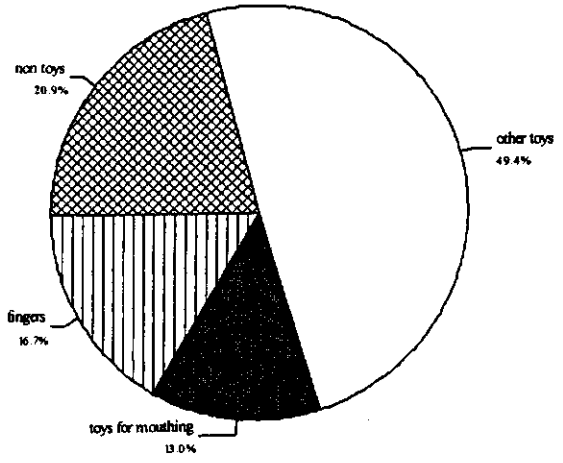

Figure 5-5 Mean mouthing time per product category relative to the total mouthing time for the age group 6-12 months. This circle represents 44.0 minutes.

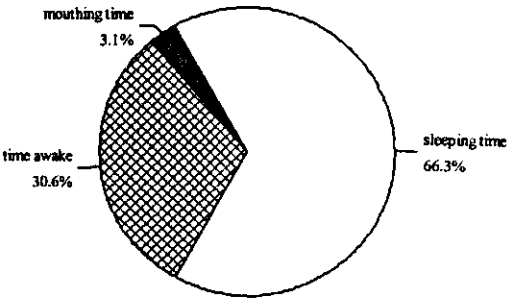

Figure 5-6 Activities over 24 hours for the age group 6-12 months (mouthing time is the total mouthing time per day without dummy).

Almost half of the time, children in the age group 6-12 months mouth on other toys. The share of the fingers is decreased in comparison to the age group 3-6 months.

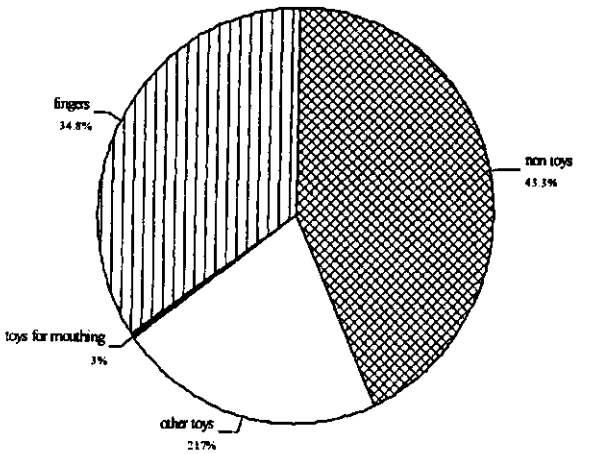

Figure 5-7 Mean mouthing time per product category relative to the total mouthing time for the age group 12-18 months. This circle represents 16.4 minutes.

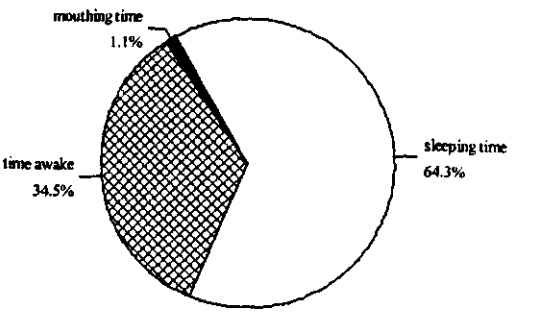

Figure 5-8 Activities over 24 hours for the age group 12-18 months (mouthing time is the total mouthing time per day without dummy).

In the age group 12-18 months the children mouth most of the time on non toys and fingers. The share of the toys meant for mouthing is reduced to less than 1% of the total mouthing time.

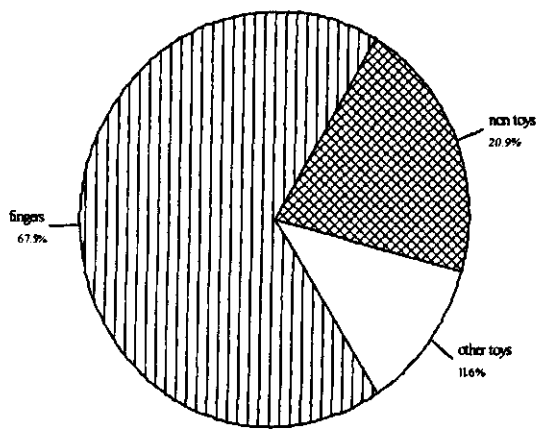

Figure 5-9 Mean mouthing time per product category relative to the total mouthing time for the age group 18-36 months. This circle represents 9.3 minutes.

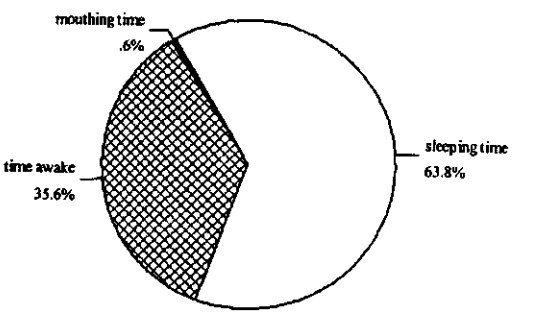

Figure 5-10 Activities over 24 hours for the age group 18-36 months (mouthing time is the total mouthing time per day without dummy).

Almost 70% of the time, children in the age group 18-36 months mouth on their fingers. In this group none of the children mouthed on toys meant for mouthing.

Figure 5-11 presents the mean total extrapolated mouthing times per product category per age group during the time awake per day.

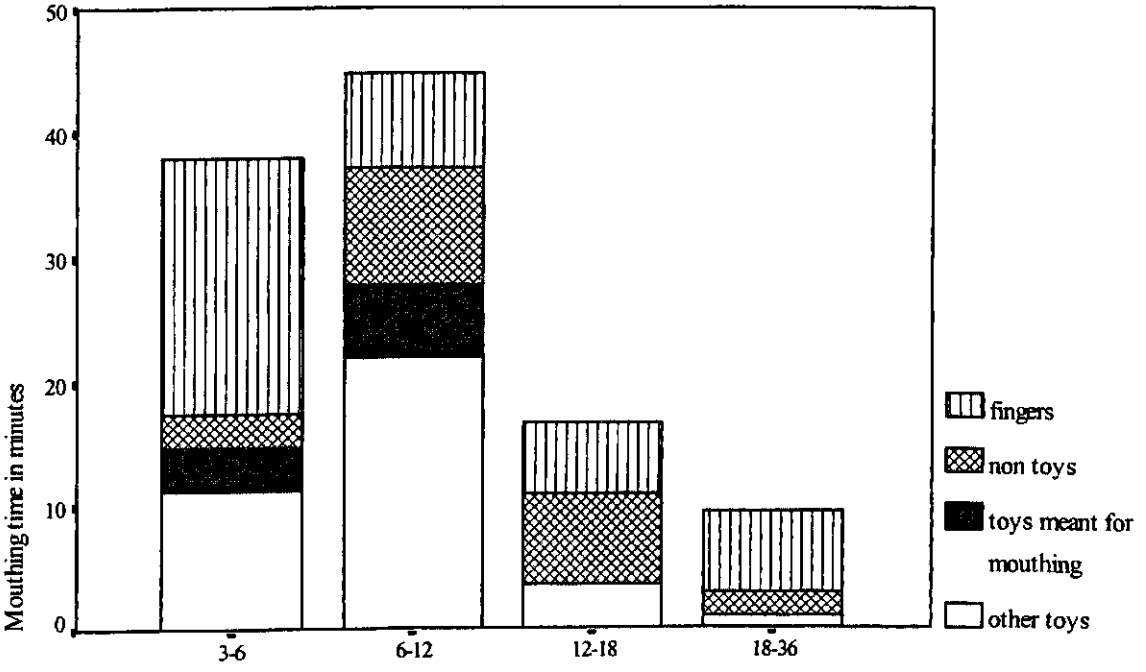

Figure 5-11 Mean total extrapolated mouthing time [minutes] per product category per age group during the time awake per day.

The total mouthing time is the highest in the age group 6-12 months. Compared to the mouthing times in the two youngest age groups, the two oldest age groups show a strong decrease in mouthing time.

The descriptive statistics of the total mouthing time per product category during the time awake per day per age group are presented in table 5-12 to table 5-15.

3-6 months

Table 5-12 Total mouthing time per product category during the time awake per day for the age group 3-6 months [minutes].

	standard deviation	minimum	mean	maximum
non toys	2.8	0.0	2.8	6.9
toys for mouthing	5.1	0.0	3.4	12.2
other toys	10.0	0.6	11.3	26.8
fingers	18.8	1.6	20.5	50.7
total	19.1	14.5	36.9	67.0

6-12 months

Table 5-13 Total mouthing time per product category during the time awake per day for the age group 6-12 months [minutes].

	standard deviation	minimum	mean	maximum
non toys	8.4	0.2	9.4	25.7
toys for mouthing	11.4	0.0	5.8	39.7
other toys	28.5	0.4	22.1	101.5
fingers	11.6	0.0	7.5	41.6
total	44.7	2.4	44.0	171.5

12-18 months

Table 5-14 Total mouthing time per product category during the time awake per day for the age group 12-18 months [minutes].

	standard deviation	minimum	mean	maximum
non toys	14.2	0.0	7.2	50.3
toys for mouthing	0.1	0.0	0.0	0.4
other toys	3.5	0.0	3.6	10.4
fingers	14.9	0.0	5.8	52.7
total	18.2	0.0	16.4	53.2

18-36 months

Table 5-15 Total mouthing time per product category during the time awake for the age group 18-36 months [minutes].

	standard deviation	minimum	mean	maximum
non toys	3.4	0.0	2.0	11.6
toys for mouthing	0.0	0.0	0.0	0.0
other toys	1.2	0.0	1.1	3.8
fingers	9.1	0.0	6.3	25.7
total	9.8	0.0	9.3	30.9

The minimum is the lowest value found for this category. The total minimum value is the lowest value found for the total mouthing time. This total time is not the sum of the lowest values per category. Every minimum might come from another child. The same is true for the maximum values.

5.4.5 Conclusions

The results of this study show that no differences are present between the two observed days. Within the days no differences are found between the different periods of the day. The total mouthing times for boys and girls are neither different from each other.

There are, however, differences in total mouthing time between the age groups. Children younger than one year of age mouth more than the older children. The children in the age between 6 and 12 months mouth most.

The objects mouthed on are also different in the different age groups. The youngest children mouth mostly on their fingers, whereas the children between 6 and 12 months mouth most of the time on toys (not meant for mouthing).
The older age groups mostly mouth on non-toys and on their fingers.

Toys meant for mouthing are used in different proportions. They are mostly used by children in the age between 6 and 12 months. Children older than 12 months hardly ever use these toys to mouth on.

On average two thirds of the time children suck/bite on products. The remaining one third of the time they lick on products. In the age group 12-18 months the children suck/bite the most. The youngest age group licks relatively most.

6 DISCUSSION

Orientational research
Expert interviews had been planned for the initial phase of the research. However, it proved to be impossible to get in touch with both a development psychologist with special knowledge about young children and a human movement scientist, as had been planned. The idea of consulting a paediatrician was advised against, as they are not expected to be specialised in the development of the mouth of young children. Instead, a speech therapist specialised in treating very young children was consulted. In spite of a quite extensive search, very little literature was found on this topic. When one takes into account the lack of literature in this field, it is not surprising that there were difficulties tracking down specialists to consult about mouthing behaviour of young children.

Recruitment of respondents
Recruiting respondents proved difficult as the observations were planned during the summer holidays when a lot of people usually leave home for some weeks. For this reason a number of motivated people were unable to carry out the observations. The tight time schedule for the total research implied it was not possible to plan the observation period in a time when more people are at home. Also problems were caused by the fact that parents wanted to be outside with their children during sunny weather where it was almost impossible to conduct the observations. If the research had been planned in another time of the year it might have been easier to find more motivated people and receive a higher response.

Sample
Some parents may have been deterred from taking part in a study into children's mouthing behaviour as they felt their children do not mouth (enough) or do not mouth on toys at all. Some parents who were approached personally did react in this way but were persuaded to take part in the study when it was explained that this research was trying to draw up an overall picture of mouthing behaviour. These were mainly parents with older children. If the research had been presented as a study into the behaviour of young children, perhaps there would have been more reactions from parents whose children mouth very little.

Level of education
The sample contains a relatively large number of higher educated parents and hardly any parents with a lower level of education. One reason for this is the fact that higher educated people tend to cooperate more easily in research, especially in a research which is fairly complex, as this one was. While recruiting people, the lower educated people seemed to have more difficulties understanding the aims of and the reasons for the research and what was expected from them. Most of them decided not to cooperate. Another reason is the methods used to recruit respondents. Wageningen and the surrounding areas contain a relatively high percentage of higher educated persons, because of the presence of the university. Recruiting by getting respondents to ask around in their neighbourhood also reinforced this effect because the circle of friends mostly consists of people with a comparable level of education.
The level of education of the parents may influence the policy regarding mouthing on toys. However, group discussions with parents seemed to refute this as the mouthing behaviour of two children in one family differed greatly. Also, the level of education of the parents

did not seem to have an influence on the mouthing behaviour of their children. Next to this almost all the diaries were filled in correctly and all parents appeared to have understood what was expected from them. Great attention seems to have been paid to filling in the diaries, no matter what the level of parent's education was.

Group discussion
Two group discussions were planned with eight to ten parents, to get information about the differences between the children. However, due to the limited time, only eight parents were found that were willing to participate in the group discussions. In spite of a phone call to remind them of the appointment, only five parents (with a total of eight children) finally attended. The ages of the children ranged from 4 months to 3.5 years. During the discussion it became clear that the children were very different in behaviour. A third discussion meeting would add to the total number of parents interviewed but this would probably not have provided much more new data to the information already obtained.

Research technique of the group discussion
In a group discussion people normally speak about themselves, their experiences or feelings. The group discussion in this research dealt with the participants' children. The parents had not yet observed their children so did not have a clear picture of the mouthing behaviour of their child. This made it more difficult to give an answer to detailed questions. A good example of this is that a parent was absolutely sure that her child never mouthed on the fingers while the person who was taking care of the child at that moment (one of the researchers) afterwards said the child had mouthed on its fingers for a long time. The information obtained in the group discussion gives a picture of differences between children, but the results on details have to be handled with care.

Observing in the day care centre
Observing children in a day care centre to get more data did not appear to be an option. The first reason is that it is not sure if children at a day care centre behave as they would do at home. Both parents and nurses at the day care centre were not sure whether children's behaviour at these two places is similar. The second reason is that children also reacted to the presence of researchers at the day care centre. It took a substantial amount of time before the children ignored the researchers and continued playing. A solution would have been to place video cameras in the room in which the children were playing. However, this was not done due to privacy reasons: it would have been time-consuming and difficult to get written consent from all parents to observe their children and without an agreement video observations were not allowed. Another problem with video observations is that children move around often and sometimes very quickly. Catching their behaviour on videotape can be complicated and tricky.

Total observation time
Most of the respondents underestimated the energy it costs to observe 2.5 hours during the day over two days. During the recruitment, most respondents were very positive about the time they were being asked to observe, but afterwards a lot of them remarked that it was very hard to carry out. For this reason, most people who had two children in the target group and at first intended to observe them both, decided to observe only one child. It can be expected that observing for less time (for example two observations in the morning, two in the afternoon, two in the evening) would also have resulted in an acceptable estimation to total mouthing time and would have been easier for parents to fulfil. While there is no significant difference in mouthing times and daily routines over the two days, another

solution to relieve the parents would have been to spread the number of observations over more than two days.

Distribution of observation periods over the day
The distribution of the observation periods over the day was the same for all age groups. Also the total observation time per day was the same. Most parents were unable to observe all the periods. Many of the older children slept most of the time during the afternoon observation period (between 11.00 hours and 15.00 hours). It would have been better to make various observation periods for the different age groups during the day. This however would require extensive preliminary research to discover the day schedule for each age group.

Stopwatches
The stopwatches sent to the respondents did not appear to be of very good quality. The longer they were used, the worse the buttons reacted. This obviously influenced the exactness of the time registration. Fourteen respondents complained about this problem. Nine of them only made a remark about it in the diary and found a solution themselves like using a stopwatch they already had or using a digital clock or timer on the CD-player. The other five respondents called and were immediately send a new stopwatch.

Children's reaction
The research design provides a way to observe children with minimised impact on their behaviour. Despite this design a lot of respondents noticed that their children did react to the observations as someone was watching them constantly. Children also wanted to draw when they saw one of the parents with a paper and pencil. Also the fact that parents followed their children when they walked away during the observation period caused some to hide and treat it as a game. This may have influenced mouthing behaviour.

Comforting during the observation time
In a few cases children started to cry during the observation time. Normally, parents comfort the child or give it a dummy and they continued to do so during the observation period. However, when comforting the child, it was not always possible to record the mouthing time, especially when the dummy was used to comfort. Some parents made a remark about this, but it was not clear how often this influenced the mouthing time, especially the sucking time on the dummy. While this research focuses on toys and not the dummy, the influence of this effect seems to be unimportant.

Response time
In this study the parents were given two weeks (including three weekends) to observe the children. It was not necessary to carry out the observations on two successive days. Possibly due to the energy it costs to observe and the holidays (it is not easy to find a normal, quiet day), it took much longer than two weeks before the diaries were returned. If similar research is conducted again, more time should be planned for data collection.

Toys meant for mouthing
In this research a distinction is made between toys meant for mouthing and toys not meant for mouthing. Toys meant for mouthing are described by producers as toys meant to ease the pain when children get teeth. However, the children can not and parents who participated in this research did not make this distinction. The parents we contacted for the group discussion, time and motion study and shadow observations allowed their children to

mouth on anything, as long as it was not dirty or dangerous (for example sharp or small enough to be swallowed). The parents are not specifically asked what their policy regarding mouthing is when children seem to have pain due to teeth coming through, but we observed ourselves (in the day care centre and at home) that children have access to a lot of toys and choose themselves the toys they play with and mouth on. The results of this study show that when children mouth on toys, it is most of the time a toy not meant for mouthing. One reason might be that the children can choose their toy out of a lot of toys and toys meant for mouthing are just a small part of the toys available (no information is obtained about the different kinds of toys that were available). Therefore the chance that children choose a toy not meant for mouthing might be large. A second reason may be that, according to the parents we spoke with in this study, their children did not mouth or bite just because they wanted to ease the pain, but in most cases did this because this is a way of exploring objects.
For these reasons this research is also focused on the total mouthing time, including all toys, non toys and fingers.

Mouthing times in other research
An estimated mouthing time between 6 and 12 hours is used in studies to determine the exposure of children to products. The mouthing times per day measured in this study are much lower. One reason for this is that in this study mouthing times do not include dummies, because virtually no dummies produced today are made from phthalate softened PVC. Also, this study did not assess children while they are sleeping as children usually mouth in a passive way on a dummy or their fingers during sleep. Objects with another shape than the dummy (which is nipple-shaped) will most likely fall out of the mouth when the child is asleep.

Representativity of the sample 1
To give a more reliable estimation of the total mouthing times for a population, the composition of the sample is important. The composition of the sample has to be comparable to the composition of the population the estimation has to count for on the factors that might influence the subject that is studied. A way to get this kind of sample, is to draw an aselect sample out of the population for which the estimation should be made. A way to determine if the selected sample is representative for the population, is to compare the distribution of relevant factors in the sample and in the population the sample is drawn from. When these distributions are comparable, it can be said that the sample is representative for the population it represents. The chance that the sample has the same composition as the population is then very large. The results may than be regarded as being the results for the total population.
Next groups can be made on the basis of factors that might influence the subject that is studied and check if statistically significant differences are found between the groups. These differences are then supposed to be present in the population too. The larger the number of respondents in the groups, the more reliable the estimations are.
In this research the sample was not large enough to check possible factors and get reliable estimates for the total population. Drawing a larger sample out of the population was not possible on such short notice, but would be recommended for a further study.

This implies that no exact values can be given for mouthing times in the total Dutch population of children in the age between 3 months and 3 years. However, it is defensible to treat the data presented here as reliable estimates, given the variation found in this sample.

Reliable estimations for the total population require knowledge about the factors influencing the mouthing behaviour of children and how these factors are distributed in the population. A larger and more in-depth study is required to assess these factors into more detail.

Representativity of the sample

In order to be able to assess the representativity of the sample for the population it is drawn from, the composition of the sample is important. The composition of the sample has to be comparable to the composition of the population the estimation has to count for on the factors that might influence the subject that is studied. However, the factors that influence mouthing behaviour are not known, let alone the distribution of these factors in the population. Therefore it is not possible to assess the representativity of the sample of this study for the total Dutch population.

This implies that no exact values can be given for mouthing times in the total Dutch population of children in the age between 3 months and 3 years. However, it is defensible to treat the data presented here as reliable estimates, given the variation found in this sample.

Recommendations for further research

More reliable estimations for the total population require knowledge about the factors influencing the mouthing behaviour of children and how these factors are distributed in the population. A larger and more in-depth study is recommended to assess these factors into more detail.

A way to get this information, is to draw a large aselect sample out of the population for which the estimation should be made. Next groups can be made on the basis of factors that might possibly influence mouthing behaviour and it can be checked if statistically significant differences are found between the groups. These differences are then supposed to be present in the population too. The larger the number of respondents in the groups, the more reliable the estimations are.

In this research the sample was not large enough to check possible factors and get more reliable estimates for the total Dutch population. Drawing a larger sample out of the population was not possible on such short notice, but is recommended for a further study.

REFERENCES

Baarda, D.B. and M.P.M. de Goede. 1991. *Basisboek SPSS/PC+, praktische handleiding voor het verwerken en analyseren van (onderzoeks)gegevens*. Leiden-Antwerpen, Stenfert Kroese.

Haller-Wedel, E. 1969. *Das multimomentverfahren in Theorie und Praxis: ein statistisches Verfahren zur Untersuchung von Vorgängen in Industrie, Wirtschaft und verwaltung*. Second edition. München, Carl Hanser-Verlag.

Larsson, E.F. and K.G. Dahlin, 1985. The prevalence and the etiology of the initial dummy- and finger-sucking habit. *American Journal of Orthodontics*, 87; 5, 432-435.

Larsson, E.F. et al. 1993. Rearing of Swedish, Norwegian, and Norwegian Sami children. *Scandinavian Journal of Dental Research,* 101; 6, 382-385.

Mundel, M.E. 1970. *Motion and time study, Principles and practices*. Fourth edition. New Jersey, Prentice Hall Inc.

Storm-van Essen, L. 1992. *Leerboek gegevensverwerking met SPSS/PC+ en Data Entry*. Schoonhoven, Academic Service.

Turgeon-O'Brien, H. et al. 1996. Nutritive and nonnutritive sucking habits: A review. *Journal of Dentistry for Children*, 63; 5, 321-326.

White, B.L. 1975. *Over de verstandelijke en emotionele ontwikkeling van het kind in de belangrijkste periode van zijn leven; praktische gids voor de opvoeding in de drie jaren waarin de toekomst van het kind al voor een groot deel wordt bepaald*. Baarn, Ambo bv.

Expert interviews

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Appendix 1

Definitions used in this research

Mouthing:	All activities in which objects are touched by the mouth or put into the mouth except for eating and drinking. This term includes licking as well as sucking and biting.
Exploring:	Licking or placing into the mouth for the purpose of discovery.
Licking:	The object is not put into the mouth but touches the lips on the outside or is licked on.
Sucking / biting:	The object is put into the mouth and sucked on or bitten.
Dummy:	Pacifier, but not the rubber teat from a feeding bottle
Fingers:	Fingers, or another body part or a body part of someone else.
Non toys:	Objects which are not intended for children to play with, including a piece of cloth, cutlery, a piece of paper, a book for adults.
Toys not meant for mouthing:	Objects which are made for children to play with and which children have easy access to. This includes cloth books or plastic books.
Toys meant for mouthing:	All kinds of teething rings, some rattles (this list with toys meant for mouthing was provided by a toy producer).
Time awake:	Time during the day that children are awake and not eating

Appendix 2

List of toys noted down

The list contains all toys the parents wrote down in the diary, on which the children mouthed during one or more of the observation periods.

3-6 months

(wooden) biting ring
ball
big beads
block
cuddle toy
doll
plastic book
rag doll
rag rattle
rattle
ring
rubber duck

6-12 months

activity centre
ball
bath book
beach ball
beaker
bear
bell
big blow-up ball
biting ring
book
box beads
bucket
cardboard book
cuddle toy
doll
duck
foot rattle
hammer
microphone
mobile
music box
musical clown
plastic boat
plastic building blocks
plastic building blocks for babies
plastic crocodile
plastic keys
plastic mirror
plastic plate
plastic tea set
plastic tortoise
rag ball
rag bear
rag book
rag cube
rag hare
rag rattle
rattle
rattle socks
ring
rubber duck
squeaky animal
telephone
wooden block

12-18 months

activity centre
ball
balloon
beach bucket
biting ring
building blocks
car
child's tea set
dish
doll
Ernie
frisbee
hammer
microphone
pen top
plastic building blocks
plastic building blocks for babies
plastic doll
plastic fish
plastic fruit
plastic hammer
plastic screwdriver
plastic train
plastic trumpet
plastic wateringcan
puzzle pieces
pyramid
rag doll
rubber duck
sea horse
spade
spade and sand
squeaky animal
super beads
tortoise
whistle
wooden block
wooden doll
wooden puzzle

18-36 months

(bottle) top
ball
balloon
bear
block
book
cuddle toy
doll
doll's bottle
harmonica
plastic ball
plastic bone
plastic doll
plastic wateringcan
rag bag
rag doll
sand mould
spade
tea set
towelling gnome
water pistol
wooden train

Appendix 3

Instructie voor het observeren van uw kind

We willen graag dat u uw kind gedurende twee dagen op een paar momenten van de dag observeert als het wakker is. De observatie hoeft niet door uzelf gedaan te worden, maar kan ook gedaan worden door een ander waar het kind goed mee vertrouwd is. Het is belangrijk dat de observatie in de thuissituatie plaatsvindt omdat het kind anders misschien ander gedrag vertoont dan normaal. Neem rustig de tijd voor het observeren en probeer momenten te zoeken dat u zo min mogelijk wordt afgeleid. Hieronder staat aangegeven hoe u de observatieperioden moet verdelen over de dag.

Observatieperioden

tussen wakker worden en 11 uur:	3 keer een kwartier
tussen 11 en 15 uur:	3 keer een kwartier
tussen 15 uur en naar bed gaan:	4 keer een kwartier

U mag zelf bepalen op welk tijdstip u in deze perioden observeert. Het is de bedoeling dat de observatie gedaan wordt als het kind speelt, dus niet tijdens het eten of slapen. Het kan zijn dat u uw kind in een van deze perioden niet de aangegeven tijd kunt observeren omdat het kind niet lang genoeg wakker is. Op deze dag vervalt dan deze observatieperiode. Als dit het geval is, vult u op het blad in het dagboekje in, dat uw kind nog slaapt.

Er mogen een aantal dagen zitten tussen de eerste observatiedag en de tweede observatiedag. U mag er ook voor kiezen twee dagen na elkaar te observeren.

Videoband

Allereerst excuses voor de slechte beeldkwaliteit van deze video. We hadden geen professionele hulp om dit te verbeteren.

Deze videoband bevat de instructie en duurt ongeveer 8 minuten. Op de videoband staan beelden van kinderen die aan het likken/lebberen en zuigen/bijten zijn om het verschil hiertussen duidelijk te maken. De informatie op de videoband komt overeen met de informatie in deze schriftelijke instructie. U kunt het allemaal dus rustig teruglezen. Als u geen videorecorder heeft, probeert u de band dan bij iemand anders te bekijken. De beelden zullen veel verduidelijken.

Stopwatch

De stopwatch is bedoeld om de tijd dat uw kind op een voorwerp sabbelt op te nemen. De stopwatch staat zo ingesteld dat hij klaar is voor gebruik.

- Door de rechterknop in te drukken gaat de stopwatch lopen.
- Drukt u de rechterknop nogmaals is, dan stopt de tijd en kunt u deze weergegeven tijd registreren in het dagboekje.
- Drukt u de knop voor de derde maal in, dan loopt de stopwatch weer verder.

Bij het opnemen van de tijd hoeft u de stopwatch dus niet tussendoor op 0 te zetten. Ook niet als het kind een ander voorwerp in de mond stopt. U hoeft alleen maar de totale tijd die

op de stopwatch staat weergegeven op te schrijven, wij berekenen later zelf de tijd per voorwerp.
Aan het eind van de observatieperiode kunt u de stopwatch weer op 0 zetten door op de linkerknop te drukken.

Als u de stopwatch tussendoor toch per ongeluk op nul heeft gezet, zet u een opmerking bij deze regel in het dagboekje en gaat weer door met observeren terwijl u de stopwatch vanaf 0 laat lopen.

Misschien kunt u voor de observatie even een beetje oefenen met de stopwatch, zodat u begrijpt hoe het werkt.

Dagboekje

Hieronder wordt aangegeven hoe u het dagboekje moet invullen.

Datum
Hier vult u de datum in van de dag dat u observeert.

Geobserveerd van ..... tot.....
Hier vult u in hoe laat het is als u begint met observeren en als u weer stopt. We hebben hier als tijd 15 minuten gezet, omdat het erg vermoeiend kan zijn langer dan een kwartier te observeren. Dit is vooral zo met kinderen die veel verschillende dingen in hun mond stoppen. Als u wilt, kunt u na het kwartier gelijk doorgaan met het volgend kwartier. Wij raden u aan niet langer dan een half uur achter elkaar te observeren, omdat dan de gegevens door vermoeidheid minder betrouwbaar worden. Het is de bedoeling dat u na ieder kwartier een nieuwe bladzijde gebruikt, ook als u twee keer een kwartier observeert. Dat maakt het voor ons makkelijker de gegevens te verwerken.

Geobserveerd door
Hier vult u in wie het kind dit kwartier observeert. Dat kunt u zelf zijn, uw partner of een ander waar het kind goed vertrouwd mee is, bijvoorbeeld een oppas.

Totale tijd (op stopwatch)
De tijd dat uw kind sabbelt, kunt u opnemen met de stopwatch. U kunt steeds de totale tijd opschrijven die op uw stopwatch staat. U zet de stopwatch dus af op het moment dat uw kind stopt met sabbelen, schrijft de tijd die weergegeven staat op in het dagboekje en zet de stopwatch weer aan als uw kind weer opnieuw begint met sabbelen (zonder de stopwatch op nul te zetten). Dus ook bij een nieuw voorwerp zet u de stopwatch niet op nul.

Manier van sabbelen
Wij maken in dit onderzoek onderscheid tussen likken/lebberen en zuigen/bijten.

Likken/lebberen:
Het kind stopt het voorwerp niet in de mond, maar likt er aan of haalt het langs de mond. Zodra het speelgoed in aanraking komt met de lippen of de tong buiten de mond, moet u deze tijd registreren. U zet dan een kruisje in de kolom likken/lebberen. De tijd dat het kind daadwerkelijk aan iets likt (dus dat het voorwerp in aanraking komt met de tong of de lippen) is zo kort dat het erg moeilijk is daar de precieze tijd van op te nemen. U moet beginnen met het meten van de tijd als het voorwerp zich in de directe omgeving van de

mond bevindt en stoppen met het opnemen van de tijd als het voorwerp bij de mond wordt weggehaald.

Zuigen/bijten:
Het kind stopt het voorwerp in de mond. Misschien kauwt of zuigt het kind erop. Zodra het voorwerp in de mond komt, moet u de tijd registreren. U zet dan een kruisje in de kolom zuigen/bijten.

Waarop wordt gesabbeld

Speen:
Als uw kind tijdens de observatietijd sabbelt op een speen (dit kan dus zowel likken/lebberen zijn als zuigen/bijten) zet u een kruisje in de kolom speen.

Vingers:
Als uw kind tijdens de observatietijd sabbelt op de vingers, de hand, de arm, de voeten of de vinger van iemand anders, zet u een kruisje in de kolom vingers.

Niet-speelgoed:
Als uw kind sabbelt op iets dat geen speelgoed is (bijvoorbeeld doekjes, bestek, papier) zet u een kruisje in de kolom niet-speelgoed.

Speelgoed:
Als uw kind sabbelt op speelgoed (hierbij horen ook de stoffen boekjes en badboekjes) zet u een kruisje in de kolom speelgoed. Wij willen dan graag weten wat voor soort speelgoed het is. Dat kunt u doen in de laatste kolom. De omschrijving bal, beer, bijtring bijvoorbeeld is voldoende.

Opmerkingen:
Onder aan de pagina van het dagboekje kunt u opmerkingen opschrijven. Dit kunnen vreemde gebeurtenissen zijn tijdens de observatieperiode of andere dingen waarvan u denkt dat het van belang kan zijn. Mocht u niet genoeg ruimte hebben dan kunt u op de achterkant verder schrijven.

Algemene opmerkingen bij de observaties

Het is belangrijk dat u tijdens de observatieperiode zo normaal mogelijk reageert. Kinderen zijn erg gevoelig voor afwijkend gedrag en zullen dan zelf ook een ander gedrag gaan vertonen. Als u normaal het kind verbiedt iets in de mond te stoppen of een broertje of zusje pakt een speeltje af en u grijpt normaal gesproken in, dan doet u dat tijdens de observatie ook.

We willen graag gegevens hebben van een heel kwartier. Mocht u tijdens het observeren gestoord worden (bijv. iemand aan de deur of telefoon) gaat u dan zo snel mogelijk weer verder met de observatie en ga door tot de totale observatietijd weer een kwartier is. Noteer dit bij opmerkingen onderaan de pagina van het dagboekje.

Als de 15 minuten om zijn en uw kind sabbelt nog rustig door, hoeft u niet door te gaan met observeren tot het kind stopt met sabbelen op dat voorwerp. U noteert gewoon de tijd die op uw stopwatch staat als de 15 minuten om zijn.

Het kan gebeuren dat uw kind begint met likken/lebberen en dan overgaat op zuigen/bijten en u geen tijd heeft om de tijd tussendoor op te schrijven. U kunt dan de tijd van het likken/lebberen en sabbelen/bijten samen opschrijven en zet dan een kruisje in zowel de kolom likken/lebberen als de kolom zuigen/bijten.

Kinderen kunnen niet altijd zelf de speen pakken. Deze wordt vaak door de ouders aangeboden omdat het kind erom vraagt of omdat het kind onrustig is of huilt. Ook bij het aanbieden van de speen tijdens de observatieperiode geldt weer: reageer zoals u dat normaal gesproken ook doet. Als u uw kind normaal gesproken in een bepaalde situatie de speen zou geven of afnemen, doet u dat nu ook en gaat u door met observeren.

Vragenlijst

Er is een vragenlijst bijgevoegd met daarop een aantal algemene vragen. De antwoorden op deze vragen zijn voor ons van belang. Wilt u deze invullen en met de dagboekjes terugsturen?

Antwoordenveloppe

Er is een antwoordenveloppe bijgevoegd. Hierin kunt u de dagboekjes en de vragenlijst terugsturen. Een postzegel is niet nodig.

We willen de ingevulde dagboekjes en vragenlijst graag zo snel mogelijk terug en zouden het fijn vinden als u de dagboekjes en vragenlijst direct na de tweede observatiedag op de post doet, maar uiterlijk 3 augustus. Mocht dit problemen opleveren in verband met vakantie of iets dergelijks, neemt u dan even contact met ons op. De pen, stopwatch en videoband hoeft u niet terug te sturen.
Als u vragen of opmerkingen heeft, kunt u ons natuurlijk bellen.
Ons telefoonnummer :

0317-482579 (overdag)
0317-422306 (Marlieke 's avonds en in het weekend)

Heel veel succes met de observaties!!
Marlieke Groot en Maaike Lekkerkerk

Instruction for the observation of your child

We would like you to observe your child on two days when he or she is awake during the day. The observation does not necessarily need to be done by yourself, but can be done by your partner or someone else who is familiar to your child. It is important that the observation is done at home, because your child might behave differently in other situations. Take the time to observe and try to find moments in which you will have as few distractions as possible. Below you will find that way in which the observation periods should be divided over the day.

Observational periods	
between waking up and 11 a.m.	3 times one quarter of an hour
between 11 a.m. and 3 p.m.	3 times one quarter of an hour
between 3 p.m. and going to bed	4 times one quarter of an hour

You may decide yourself when in each period you observe your child. The observations should be done when your child is playing, not eating or sleeping. It may be possible that you are unable to observe in all quarters in a defined period because your child is sleeping. If this happens, this observational period can be cancelled but please mark on the page in the diary that your child is asleep.

The first and second observation days do not need to follow immediately; they can but you may also choose to leave a gap of a few days between the two if you wish.

Video tape

We want to apologise for the poor quality of the videotape; it was made without professional help.

This videotape contains instructions on how to observe and lasts for about 8 minutes. The tape shows shots of children who are licking or sucking/biting to make clear the difference between these two types of behaviour. The information is the same as that which is written in this paper. If you do not have a video recorder, please try to watch this tape at someone else's home. The pictures do clarify the instructions.

Stopwatch

The stopwatch should be used to record the time your child mouths on an object. The stopwatch is ready for use.

- Pushing the right button will start the stopwatch.
- Pushing it once again will stop the watch. This is the time you should register in the diary.
- Pushing the right button for the third time will start the time again.

During timing you do not need to reset the stopwatch - even if your child puts another object into his or her mouth. You only need to note down the total time, we will calculate the time per object later on.

At the end of the observational period you can reset the stopwatch by pushing the left button.

If you reset the stopwatch by accident during the observational period, please make a note on that line in the diary and continue observing, with your stopwatch running from 0 again.

It is a good idea to practise with the stopwatch before you begin observing, so you can become accustomed to its working principles.

Diary

We will now explain how the diary should be filled in.

Date
Here you write the date of the day on which you are observing

Observed from ..... to .....
Here you fill in the time you begin observing and the time you stop. We have already marked 15 minutes, because it could be very tiring to observe more than 15 minutes. This is particularly true for children who put many different objects into their mouth. However, if you want to, you may continue on to observe for another quarter of an hour. We would advise you not to observe more than half an hour at one go, as the data might become less reliable due to fatigue. For each quarter of an hour you observe please use another piece of paper in the diary; even if you observe two successive quarters of an hour. This makes it easier for us to assess the data afterwards.

Observed by
Fill in the name of person who observes the child. This may be you yourself or your partner or another person who is familiar to the child, for example a baby-sitter.

Total time (on stopwatch)
The time that your child licks or sucks on an object is recorded by means of a stopwatch. The total time on the stopwatch should be recorded. If your child stops licking or sucking, you should stop the watch and write this down in the diary. If your child starts licking or sucking again, you start the stopwatch again (without resetting it). The stopwatch does not need to be reset, even if your child starts licking/sucking on another object.

Way of mouthing
In this study we will distinguish between licking and sucking/biting.

Licking:
The child does not put the object into the mouth, but licks on it or keeps it against the mouth. If the object touches the lips or the tongue outside the mouth, you have to record this time. In this case you mark the column 'licking'. The time the child actually licks an object (i.e. the object touches the lips or tongue) will probably be very short and difficult to time accurately. In such a case you start the time when the object is directly near the mouth and stop the time when it is taken away from the direct region of the mouth.

Sucking/biting:
The child puts an object into the mouth. It may even bite or suck on it. If the object is in the mouth you take the time. Mark the column 'sucking / biting'.

On what object is mouthed?

Dummy:
If your child mouths on a dummy during the observation period (this might be either licking or sucking / biting), mark the column 'dummy'.

Fingers:
If your child mouths on fingers, a hand, arm or foot or the finger of someone else, mark the column 'finger'.

Non toys:
If your child mouths on something that is not a toy (for example a piece of cloth, cutlery, a piece of paper), mark the column 'non toy'.

Toys:
If your child mouths on a toy (including cloth books or plastic books), mark the column 'toys'. We would like to know the type of toy. This you can note down in the last column. A simple specification like ball, bear or teething ring is enough.

Remarks:
At the bottom of the page you can write down any general remarks you may have. This may be unusual events that take place during the observation period or other things that may be of importance for this study. If you do not have enough space to write everything down, use the other side of the paper.

General remarks concerning the observations

During the observations it is important to react as you would normally do. Children are very sensitive to deviating behaviour and will behave in a different way themselves too. If you usually forbid you child to put an object into the mouth, do that now too. If you interfere when a sibling takes away a toy, you should do so now as well.

We would like to have information about a full quarter of an hour. If you are disturbed during the observation period (for example someone at the door or a telephone call), please continue your observation as soon as possible and carry on until the total observation time is one quarter of an hour. Note down the disturbance at the bottom of the page.

If 15 minutes have past and your child is still mouthing, you do not need to continue observing. Note down the time on the display of your stopwatch at the moment that 15 minutes have passed.

It could occur that your child starts licking and continues sucking / biting on the same object and you do not have time to register the time in between. In such a case mark the total time for sucking and licking and mark both columns 'licking' and 'sucking / biting'.

Children are not always able to grasp a dummy themselves. Often the parents give this because the child asks for it or because it is restless or crying. Once again: react like you usually do. If you usually give or take a dummy in a certain situation, continue to do so during the observation periods.

Questionnaire

A questionnaire has been included with a number of general questions. The answers are important for us, so please fill in the questionnaire and return it together with the diaries.

Stamped addressed envelope

A stamped addressed envelope is included. This can be used to return the questionnaire and the diaries. A stamp is not necessary.

We would like to receive the diaries and questionnaire as soon as possible. Post it directly after the second observation day, with August 3 as the latest postage date. If you have difficulty in reaching this date due to holidays or other circumstances, please contact us as soon as possible. The pen, stopwatch and videotape do not need to be returned.

If you have any questions or remarks please do not hesitate to contact us.
Our telephone numbers are:

0317 - 482579 (during office hours)
0317 - 422306 (Marlieke, in the evening and during the weekend).

Good luck with the observations!
Marlieke Groot and Maaike Lekkerkerk

Appendix 4

Vragenlijst/ *Questionnaire*

Kenmerken van het kind
Characteristics of the child

Wat is de geboortedatum van uw kind?
What is your child's date of birth?
.....

Wat is het geslacht van uw kind? 0 jongen / *boy*
What is the sex of your child? 0 meisje / *girl*

Wanneer gebruikt uw kind een speen?(meerdere antwoorden mogelijk)
When does your child usually use a dummy? (more than one answer possible)

0 nooit *never*
0 bijna altijd *always*
0 tijdens het slapen *when asleep*
0 vlak voor de voeding/ het eten *just before a meal*
0 vlak na de voeding/ het eten *just after a meal*
0 als het huilt *when it cries*
0 als het moe is *when it is tired*
0 als het kind ziek is *when it is ill*
0 als het kind lastig is en op dat moment geen aandacht gegeven kan worden
when the child asks for attention that can't be given at that moment
0 anders namelijk .....
other, e.g. .....

Heeft uw kind tandjes?
Does your child already have teeth?

0 nog niet *not yet*
0 eerste tanden beginnen door te komen *first teeth are coming through*
0 wel tanden, kiezen beginnen door te komen *teeth yes, molars are coming through*
0 zowel tanden als kiezen *both teeth and molars*

Maakt uw kind wel eens bijtsporen op speelgoed?
Does your child leave bite marks on toys?

0 ja / *yes*
0 nee / *no*

Bijt uw kind wel eens iets kapot (bijv. speelgoed of speentje)?
Does your child ever destroy things (e.g. toys or dummy) by biting?

0 ja / *yes*
0 nee / *no*

Kunt u kort het karakter van uw kind beschrijven?
Can you describe the character of your child?

_____
_____
_____
_____

Voeding
Feeding

Krijgt of kreeg uw kind borstvoeding ?
Is or was your child breast fed?

0 nee / *no*
0 ja / *yes*
0 combinatie borst- en flesvoeding / *both breast and bottle*
0 niet meer / *not any longer*

hoe lang heeft uw kind borstvoeding (of een combinatie van borst- en flesvoeding) gehad? .....maanden / *month*
how long has your child been breast fed (or a combination of breast and bottle feeding?)

Wat voor voeding krijgt uw kind op het moment?
What kind of food does your child eat now?

0 alleen borst / flesvoeding
just breast / bottle feeding
0 baby-voeding uit een potje/gepureerde voeding /
industrially prepared food for baby's / mixed food
0 geen apart voedsel / mee-eten met de rest /
no special food / eats the same as the other members of the family

Dagritme
Daily routine

We willen graag weten gedurende welke perioden van de dag het kind overdag eet en wanneer het slaapt.
Wilt u hieronder het dagritme van uw kind opschrijven zoals het is op de eerste observatiedag?
We would like to know during which periods of the day your child eats and when it sleeps. Will you please fill out the routine of the first observation day below?

Bovenin de tabel vult u de tijd in waarop het kind uit bed kwam. Daaronder kunt u invullen wanneer het kind gedurende de dag heeft geslapen en gegeten. Met eten wordt bedoeld een maaltijd of de fles/borst. Tussendoortjes als koekjes, soepstengels of iets dergelijks hoeven niet opgeschreven te worden. In de eerste kolom vult u het tijdstip in waarop uw kind begint met slapen of eten. In de tweede kolom vult u het tijdstip in dat uw kind wakker wordt/ klaar is met eten. Vervolgens zet u een kruisje in de kolom slapen als uw kind deze periode geslapen heeft, en een kruisje in de kolom eten als uw kind in deze periode gegeten heeft.
At the top of the table the time at which your child gets up should be filled in. Next please note down the times of the day during which your child was asleep or was eating. Eating

means regular meals / bottles. Snacks like cookies, etcetera do not have to be noted down. In the first column the time your child starts eating / sleeping should be recorded. In the second column the time that your child has finished sleeping/eating. Next you should mark the column 'sleeping' when your child was sleeping during that period of time or the column 'eating' when your child was eating during the recorded time.

Eerste observatiedag/ *first observation day*

uit bed om/ *rising at*:_____uur / *o clock*			
van/ *from*	**tot/ *until***	**slapen/ *sleeping***	**eten/ *eating***
naar bed om/*to bed at*:_____uur / *o clock*			

Was dit een normale dag? (geen vreemde gebeurtenissen)
Was this a normal day (without unusual events)?

0 ja / *yes*
0 nee / *no*

Was uw kind in zijn/haar normale doen?
Was your child behaving normally?

0 geen bijzonderheden / *no peculiarities*
0 kind sliep langer dan normaal / *the child slept longer than it normally does*
0 kind was hangerig / *the child was listless*
0 kind had last van doorkomende tandjes / *the child suffered from teeth coming through*
0 kind was ziek / the child felt ill.

Wilt u hieronder het dagritme van uw kind opschrijven zoals het is op de tweede observatiedag?
Will you please record the routine of the second observation day below?

Tweede observatiedag / *second observation day*

uit bed om/ *rising at*:_____uur / *o clock*			
van/ *from*	**tot/ *until***	**slapen/ *sleeping***	**eten/ *eating***
naar bed om/*to bed at*:_____uur / *o clock*			

Was dit een normale dag? (geen vreemde gebeurtenissen)
Was this a normal day (without unusual events)?

0 ja / *yes*
0 nee / *no*

Was uw kind in zijn/haar normale doen?
Was your child behaving normally?

0 geen bijzonderheden / *no peculiarities*
0 kind sliep langer dan normaal / *the child slept longer than it normally does*
0 kind was hangerig / *the child was listless*
0 kind had last van doorkomende tandjes / *the child suffered from teeth coming through*
0 kind was ziek / *the child felt ill.*

Algemeen
General questions

Wat is de leeftijd van de moeder? ..... jaar / years
What age is the mother?

Wat is de leeftijd van de vader? ..... jaar/ years
What age is the father?

Wat is de hoogst voltooide opleiding van de moeder?
What is the highest educational level of the mother?

0 lagere school/LBO / *compulsory school*
0 MAVO/HAVO/MBO / *intermediate vocational school*
0 HBO/WO / *higher vocational school/ university*

Wat is de hoogst voltooide opleiding van de vader?
What is the highest educational level of the father?

0 lagere school/LBO / *compulsory school*
0 MAVO/HAVO/MBO / *intermediate vocational school*
0 HBO/WO / *higher vocational school / university*

Opmerkingen / *Additional remarks:*

Date:_____

Observed from _____ until _____ (15 minutes) Observed by: 0 mother 0 father 0 other, e.g.:_____

	way of mouthing		On what is mouthed				
Total time (at stopwatch)	licking	sucking/ biting	dummy	fingers	non toys	toys	description toys

Remarks:

Do not forget to fill in the daily routine in the questionnaire

Appendix 6

Distribution of total time awake per day

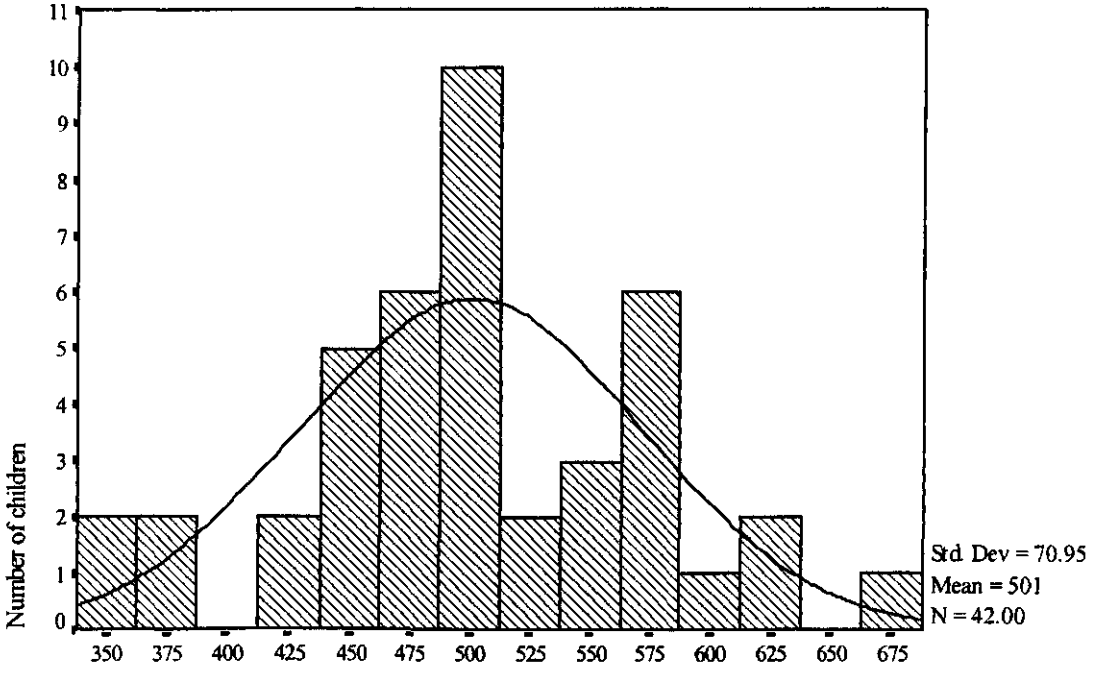

Figure A-1 Distribution of total time awake per day [minutes].