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Current Results of a Study on Teeth and Jaw Development

Pacifiers: the Right Shape is Crucial

Pacifiers are popular with children and parents. Speech therapists, midwives, obstetric nurses, pediatricians and dentists as well as orthodontists are more discriminating, however: Their use can be helpful, depending on the situation, but extensive use may lead to various malocclusions as well as to speech disorders. To counteract permanent tooth misalignments, the right shape of a pacifier is crucial. This is the bottom line of a study at the University of Minho, Portugal, and of an interdisciplinary discussion among experts.

The need to suck is innate; fetal sucking is already observable in the womb at the end of the first quarter of pregnancy. During breastfeeding the nutritive sucking changes into the non-nutritive, whereby the need for the latter is individually very different, according to Dipl. Med. Suzanne Knauer-Schiefer, Wolfsburg. Non-nutritive sucking by breastfeeding or with a pacifier serves self-regulation or calming; it helps with falling asleep and supports digestion. It promotes oral development, which can be seen especially well in neonatology, says Knauer-Schiefer. It also has an influence on breathing, eating and speech development.

Advice in practice

A pacifier can have advantages and disadvantages (Table 1). "Basically, my advice is to use the pacifier only

if needed," says Knauer-Schiefer. For preterm babies or sick infants a pacifier can be helpful; the SIDS (sudden infant death syndrome)

Arguments for pacifiers	Arguments against pacifiers
<ul style="list-style-type: none"> - help in calming, also during illness - reduction of pain perception - reduction of the risk of sudden infant death - fewer secondary habits such as nail-biting and sucking on pencils - parents' needs 	<ul style="list-style-type: none"> - presumed influence on breastfeeding relationship - when used for too long: misalignment of the teeth - when used for too long: delayed speech development - middle ear infections (otitis media)

Table 1: Arguments for and against the use of pacifiers (modified from [1–5] and from a speech by S. Knauer-Schiefer)



© Suzanne Knauer-Schiefer

Dipl. Med. Suzanne Knauer-Schiefer, pediatrician and neonatologist, Wolfsburg

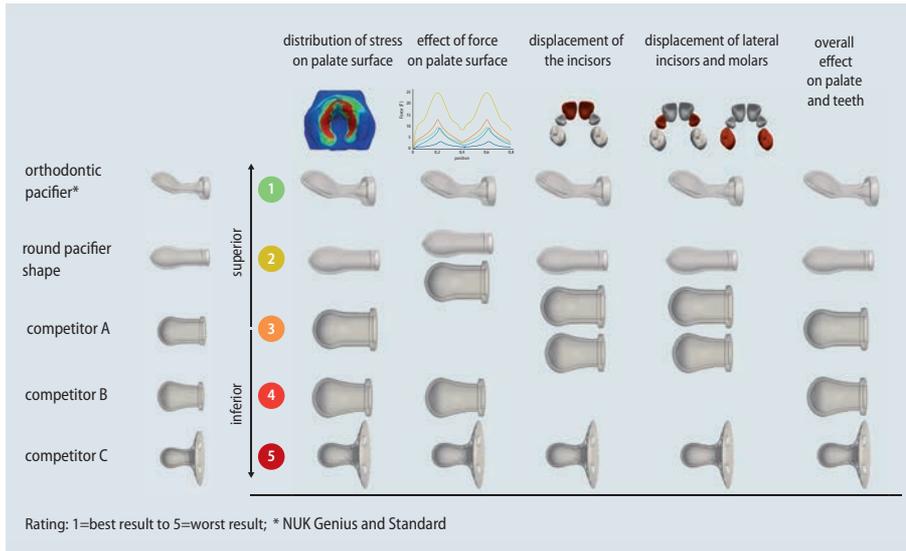


Fig. 1: Results of the computer simulation to analyze the effect of various pacifiers on the infantile palate (modified from [6])

the palate (mucous membrane; cortical, cancellous and alveolar bones; periodontal ligament), the tongue, and the developing teeth in infants aged 6 months were taken into account. In addition, the dynamic of the sucking cycle was examined, which, according to Norton, is essential to obtain accurate results. The orthodontic pacifier NUK Genius, the NUK Standard Pacifier, and four pacifiers with other designs were examined. Comparison parameters were the distribution of the stress on the surface of the palate, the force exerted on the palatal surface, and the differing tooth displacement.

The results showed that the Genius and the Standard pacifiers exerted a lower maximal pressure and a significantly lower force than the other four pacifiers studied did. In addition, the pressure was more evenly distributed and all tooth displacements were smaller. Overall, the risk for displacement of the teeth and deformation of the palate was lowest with the Standard or the Genius Pacifier, according to the present computer-simulated method of calculation (Fig. 1).



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prophylaxis among children who are not breast-fed is proven [3–5]. In the case of excessive demands on parents and of activities that cannot be postponed, a pacifier is acceptable. But a child should never be “plugged”; the pacifier should be used as if it were a medication [5]. Knauer-Schiefer recommended a soft material, a flat and narrow shape, the right size, and “silicone rather than latex.”

Study on the effect of various pacifier shapes

Prof. Dr. Ana Norton, Porto, Portugal, and Prof. Dr. J. Miguel Nóbrega, Guimarães, Portugal, presented current results of their own research into the effects of various pacifier shapes on tooth position and the development of the upper jaw [6]. To this end, the scientists from Portugal developed and evaluated a complex computer model of the palate of a 6-month-old child. This model allowed them to make exact predictions about the effect of various pacifier shapes on orofacial structures.

The studies performed to date [7, 8] cannot conclusively clarify the effects of pacifiers on teeth and up-

per jaw development. Limitations are, among others, the simplified uniform palate structure and the adoption of static conditions to represent the dynamic sucking cycle. In the current experimental study [6] the simulation very accurately imitated the oral sucking cycle and a detailed palate model. To this end, the various structures of



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WORKSHOP

Springer Medizin Expert Round Table

“Pacifiers – current findings from science and implications for practice“, online, May 2, 2022

Participants:

- Mathilde Furtenbach, speech therapist, Innsbruck, Austria
- Dr. Isabell von Gymnich, pediatric dentist, Regensburg, Germany
- Dr. Matthias Kiefl, orthodontist, Straubing, Germany
- Dipl. Med. Suzanne Knauer-Schiefer, pediatrician and neonatologist, Wolfsburg, Germany

Ingrid Lohmann, midwife and breastfeeding counsellor, BSc., Bad Gandersheim, Germany

Dr. Christof Metzler, pediatrician, Langenargen, Germany

Prof. Dr. João Miguel Nóbrega, Department of Polymer Engineering, University of Minho, Campus de Azurém, Guimarães, Portugal

Prof. Dr. Ana Norton, Dental Medicine School, University of Porto, Portugal

Moderation:

Dr. Erik Heintz, Springer Medizin Verlag GmbH, Munich, Germany



The consensus of the expert round table was that in the simulations, orthodontic pacifiers delivered better

results than the other models examined did. Consequently, depending on the frequency, intensity and

wearing time, they reduce the risk of development of malpositioned teeth compared with other pacifiers.

Pacifiers and Current Study Results from an Expert Point of View

What Factors Influence Infant Development?

There are many questions related to the topic of pacifiers: Is there a connection between pacifiers and breastfeeding? What role does the pacifier play in the development of the jaw and the teeth as well as of speech? Does the use have an influence on infant development? How often and for how long should a pacifier be used? What are the risks of the various forms of pacifiers (orthodontic, symmetrical, rounded)? How are the results of the new simulation study of different pacifier shapes assessed? Experts from various disciplines answer these questions from their own perspectives.

A midwife's perspective

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Ingrid Lohmann, midwife and breastfeeding counsellor, BSc., Bad Gandersheim, Germany

"It is gratifying that the current study looked for the optimal pacifier shape, because a pacifier can provide help and relief. What is important is that its use be limited to the appropriate situations, so that the close physical bonding that many an infant needs is not reduced and the distance is not increased because the child can be put down more quickly. Midwives fear that infants will forget how to breastfeed or will not learn to do it correctly if a pacifier is used too early. But this does not have to be the case, because children can learn two ways of sucking. Bottle-fed infants learn sucking on the bottle and the non-nutritive sucking on the pacifier at the same time. They also have more need of a pacifier than breast-

fed infants do. In addition, pacifiers can regulate excessive breastfeeding. Orthodontists and speech therapists worry about careless use and the complications that result from it. So there are many reasons to control their use properly."

A pediatric dentist's perspective

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Dr. Isabell von Gymnich, pediatric dentist, Regensburg, Germany

"Pacifiers are definitely good up to the first year of life, but a thin pacifier neck is prerequisite. After the first year of life a measured 'withdrawal' is advisable, because children may otherwise get used to swallowing through this opening. This can then result later in disorders in swallowing and speaking, requiring speech therapy and orthodontic treatment. The current study impressively shows the extent of the deformations and misalignments

caused by pacifiers that are wrong and used for too long. It should be used as a supporting argument for the recommendation of a suitable pacifier."

A pediatrician's perspective

© Dr. Christof Metzler



Dr. Christof Metzler, pediatrician, Langenargen, Germany

"Is a pacifier better than thumb sucking? I get this question again and again, mainly from parents of restless children. Three aspects play a role in practice: first, the mother-father-child bonding, which should not be disturbed. When parents try to do without a pacifier and the child cries even more, a pacifier can help to calm the child. It's important to get across to the parents that they can offer the children something to calm them without having a guilty conscience or the fear of doing damage. The second

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aspect is to satisfy a sucking need with a pacifier and not with something else. The third goal is to avoid complications and long-term damage to the teeth and jaw by using the right pacifier. The results of the current study are a significant supporting argument in favor of the pacifier, especially for critical parents. Indeed, their number has increased greatly in the past several years. They try desperately to avoid a pacifier. If, in addition to stating my opinion as a doctor, I can show them that it is scientifically proven that a pacifier – at least if it's the right kind – has no negative influence, then that's a convincing argument. However, we should work towards using or switching to orthodontic pacifiers in order to avoid jaw and tooth misalignments, because that is also shown in the study."

A speech therapist's perspective



Mathilde Furtenbach, speech therapist, Innsbruck, Austria

"I have treated children with myofunctional disorders for many years. All of these children also had teeth and jaw misalignments and were referred to me by orthodontists. Practically all of them had a history of using a pacifier or sucking their thumb. No matter whether they had misalignments or speech disorders, growth of the oral cavity was hampered in all of them. Therefore, a pacifier should fulfill certain criteria: size, shape, and material composition are decisive. The pacifier is a foreign body in the child's mouth. Therefore, it should be so designed that it interferes as little as possible with the physiological tongue function and with oral development. The pacifier shaft should be as flat as possible,

Summary

The right shape – orthodontic with a thin neck –, the softness of the material, the limitation regarding daily use, and the end of the pacifier period are important factors for normal jaw development. Responsible use of a pacifier is important – for instance, a child with a pacifier in its mouth should not speak. In general, however, pacifiers should not be "demonized"; they can be useful and they have their place – e.g. for parents to take breaks, to help fall asleep, to accompany medical applications such as inoculations or injections, or during plane trips. According to the results of a current study from Portugal [6], NUK pacifiers are superior to the other models studied and can help to avoid teeth misalignments.

and the baglet should occupy as little space as possible and be soft. The pacifier should be as light as possible and doesn't need to grow with the child. A pacifier is an aid for parents that should be used sparingly and for only a limited amount of time. However, the duration of sucking has the greatest negative influence on the development of oral functions and jaw growth. It should be used reasonably and responsibly. Similar to a medication, the pacifier requires an indication and a specified duration; the child must be weaned from it, and side-effects are to be expected. The earlier the habit is broken, the better!"

An orthodontist's perspective



Dr. Matthias Kiefl, orthodontist, Straubing, Germany

"For optimal jaw development, it is important to promote somatic swallowing between the first and second year of life. Ideally, therefore, a pacifier should not be used longer than to the end of the first year of life. No later than beginning with the second year of life, use of the pacifier should be slowly reduced, and it should be employed for only a very limited period of time. Otherwise, the phase of visceral swallow-

ing is prolonged and the risk of a persistent bite opening increases. Further factors important for optimal jaw development are proper nasal breathing, tongue resting position and strong tongue muscles. As far as possible, no unphysiological force should be exerted on the dental arches. Lip tension and lip closure should function well. In general, therefore, I recommend a pacifier neck as thin as possible, no so-called torpedo pacifier (thick and round). If the pacifier is very thick, the lip closure can be restricted and thus the lip closure function can be permanently negatively influenced. The exertion of physiological force on the dental arches without exogenous influence is important for optimal jaw development. The smaller the bite opening, the less opportunity the tongue has to secondarily embed itself interdentially when swallowing or speaking. My plea is that a pacifier with a thin neck be used only in specific cases and temporarily.

The current study substantiates well the principle 'form follows function'. The result is clear and shows the thinner the pacifier neck, the better, and the less influence it has on the alveolar process. I find it very good that, thanks to this study, we have a model for simulating the effect of various pacifier shapes on the surrounding structures. It's very exciting to have a model with which different pacifier shapes can be tested in the future."

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