



**HAL**  
open science

## Influence of food consistency on the mandibular temporal patterns during chewing and babbling

Leslie Lemarchand, Sophie Kern, Andrea Macleod, Mélanie Canault

► **To cite this version:**

Leslie Lemarchand, Sophie Kern, Andrea Macleod, Mélanie Canault. Influence of food consistency on the mandibular temporal patterns during chewing and babbling. International Child Phonology Conference, Jun 2019, Montréal (Québec), Canada. International Child Phonology Conference. hal-04625506

**HAL Id: hal-04625506**

**<https://hal.science/hal-04625506>**

Submitted on 26 Jun 2024

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

# Influence of food consistency on the mandibular temporal patterns during chewing and babbling

Leslie Lemarchand<sup>1 & 2</sup>, Sophie Kern<sup>1</sup>, Andrea MacLeod<sup>2</sup> & Mélanie Canault<sup>1</sup>

<sup>1</sup>Laboratoire Dynamique du Langage, CNRS UMR 5596, Université Lyon 2, Lyon, France

<sup>2</sup>Ecole d'Orthophonie et d'Audiologie, Université de Montréal, Montréal, Canada

[leslie.lemarchand@univ-lyon2.fr](mailto:leslie.lemarchand@univ-lyon2.fr), [sophie.kern@univ-lyon2.fr](mailto:sophie.kern@univ-lyon2.fr), [andrea.macleod@umontreal.ca](mailto:andrea.macleod@umontreal.ca), [melanie.canault@univ-lyon1.fr](mailto:melanie.canault@univ-lyon1.fr)



Faculté de médecine



## THEORETICAL BACKGROUND

### Relationships between feeding and speech

- **Anatomical findings:** shared anatomical effectors (MacNeilage, 1998; Hiiemae, 2002).
- **Clinical findings:** high prevalence of feeding and swallowing difficulties in infants with language impairments (Malas et al., 2015, 2017).
- **Genetic findings:** the role of FOXP2 on feeding and speech development (Zimmerman & Maron, 2017).
- **Phylogenetic findings:** changes in diet impacted human language sounds inventory (Blasi et al., 2019).
- **Ontogenetic findings:** parallel development of speech and feeding (Thibault, 2007).

### Food consistency exposure

- Food consistency (i.e. hard food, soft food) influences the development of jaw muscles' function in rats (Liu et al., 1998) and the development of jaws' size in young children (Larsson, 1998).
- Mice fed with solid consistencies are able to adapt their chewing movement according to the nature of the consistency administered unlike those that are fed only with soft textures (Fujishita et al., 2015).
- Food consistency influences the temporal characteristics of chewing in adults (Anderson et al., 2002) and in typically developing children (Gisel, 1988; Wilson et al., 2012).

### Babbling (6-12 months) and complementary feeding

- **Emergence of lowering and raising jaw gestures (MacNeilage, 1998):**
  - First syllables
  - First chewing gestures
- **10 months a period of change for oro-motor development ?**
  - 80% of french children consume semi solids (Lemarchand, 2019).
  - $\searrow$  syllabic duration (Canault et al., 2018; Canault et al., under review).
  - $\searrow$  chewing cycle duration (Lemarchand et al. 2017, 2018; Lemarchand, 2019).

## RESEARCH QUESTIONS

- Is there a link between speech and feeding development ?
- Does the exposure to different consistency types impact oro-motor development?
- Are syllable duration and chewing cycle duration correlated to feeding practices at 10 months ?

## CONCLUSIONS

- The syllables duration and the chewing cycles duration seem to be correlated to the frequency of semi-solids and solids exposure.
- >> A regular exposure to semi-solid and solid textures could contribute to the improvement of masticatory skills (Green et al., 2017), as well as that of articulatory skills.
- The development of articulatory skills is part of a complex and integrated system (Iverson, 2010). This study tends to show a link between speech and chewing development.
- Including more participants and testing other developmental stages would be helpful for the validation of these preliminary results.

## METHODS

### Population

- 14 French-speaking children (7 females and 7 males).
- 10 months old.
- Typical development: born at term, no neurological, physical or oro-motor impairments and no clinical history of eating disorders.

### Material and procedure

- Audio and video recordings.
- Parental questionnaire on child feeding behaviors (Lemarchand, 2019).

### Corpus

930 CV syllables and 1927 chewing cycles (semi-solid (e.g. green peas, banana, cheddar) and crackers textures).

### Analysis

- **Syllable duration** (Praat software)
- **Chewing cycle duration** (i.e. one down-and-up movement of the mandible (Gisel, 1988) (Datavyu software)
- **Complementary feeding score between (0 and 21 points):** based on the type (ie, mixed (1pt), semi-solid (2pts), solid (4pts)) and exposure frequency (ie, sometimes (1pt), often (2pts), very often (3pts)) of introduced consistencies.

## RESULTS

The **chewing cycle duration** ( $M = 1092,4$  ms;  $SD = 243,7$ ) tends to be **shorter** when the **complementary feeding score** is **higher**.

The **syllabic duration** ( $M = 364,8$  ms;  $SD = 57,6$ ) tends to be shorter when the **complementary feeding score** is **higher**.

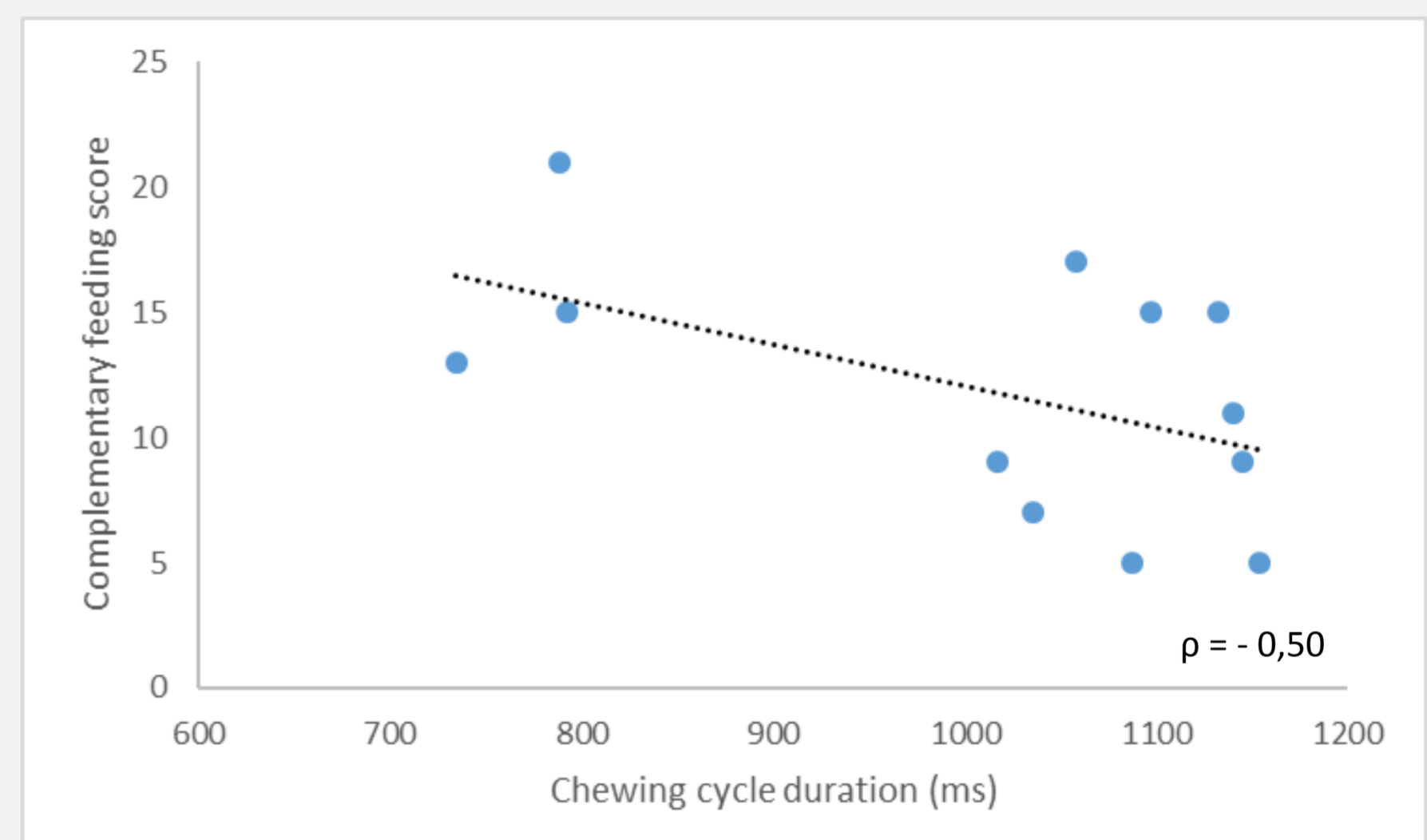


Fig.1. Chewing cycle duration (ms) according to complementary feeding score

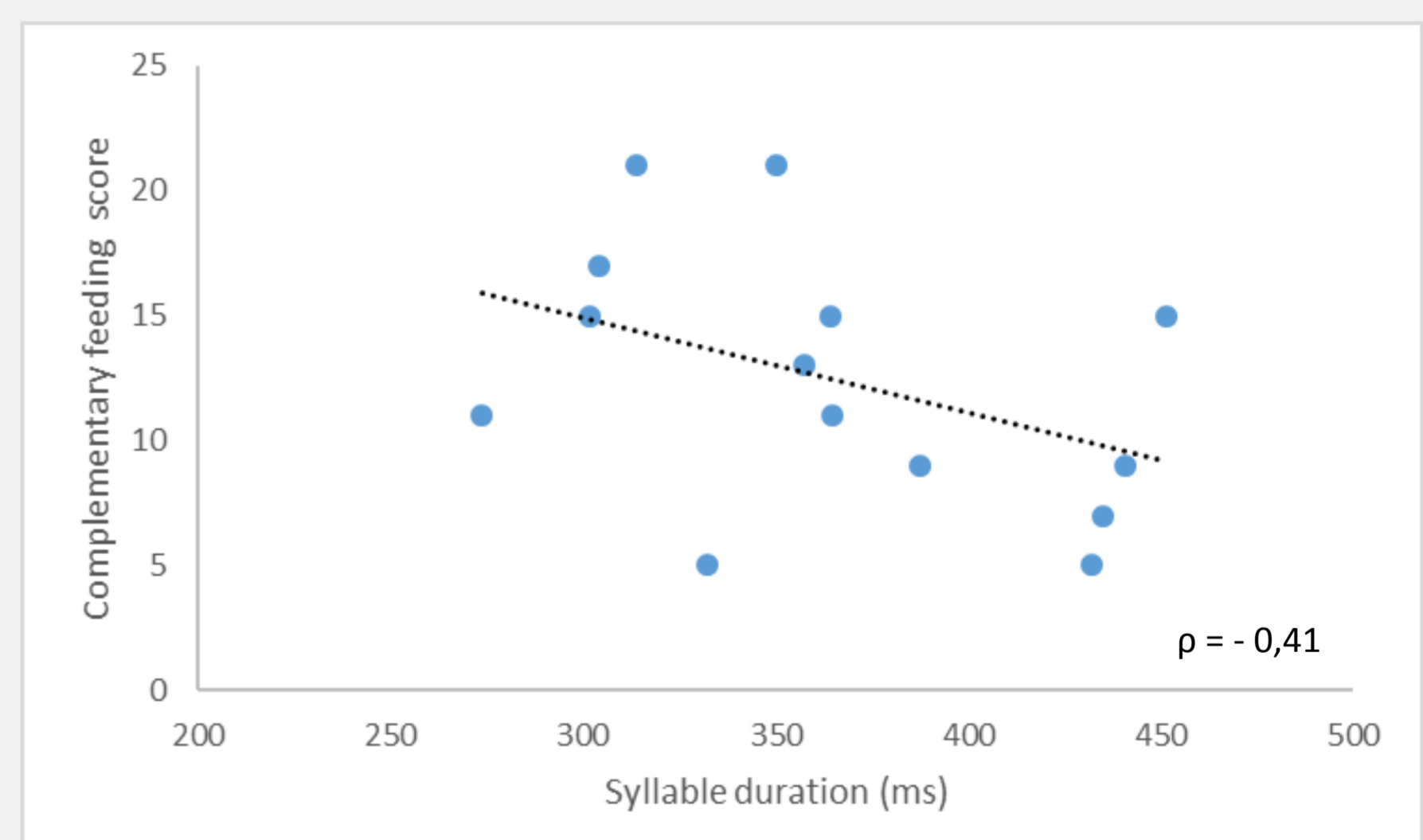


Fig.2. Syllable duration (ms) according to complementary feeding score

## BIBLIOGRAPHIE

- Anderson, K., Throckmorton, G. S., Buschang, P. H., & Hayasaki, H. (2002). The effects of bolus hardness on masticatory kinematics. *Journal of Oral Rehabilitation*, 29(7), 689-696.
- Blasi, D. E., Moran, S., Moisik, S. R., Widmer, P., Dediu, D., & Bickel, B. (2019). Human sound systems are shaped by post-Neolithic changes in bite configuration. *Science*, 363(6432), eaav3218.
- Canault, M., Yamaguchi, N., Pallierau, N., Krznowski, J., Roy, J.P., Dos Santos, C. & Kern, S. (2018). Evolution des habiletés articulatoires au stade du babillage : le timing des syllabes CV. Proceedings of XXXIe Journées d'Etudes sur la Parole, Aix-en-Provence, 4-8 juin 2018, 433-441.
- Canault, M., Yamaguchi, N., Pallierau, N., Krznowski, J., Roy, J.P., Dos Santos, C. & Kern, S. (under review). Syllable duration changes during babbling: a longitudinal study of French child productions. *Journal of Child Language*.
- Fujishita, A., Koga, Y., Utsuni, D., Nakamura, A., Yoshimi, T., & Yoshida, N. (2015). Effects of feeding a soft diet and subsequent rehabilitation on the development of the masticatory function. *Journal of oral rehabilitation*, 42(4), 266-274.
- Gisel, E. G. (1988). Chewing cycles in 2-to 8-year-old normal children: a developmental profile. *American Journal of Occupational Therapy*, 42(1), 40-46.
- Green, J. B., Simone, M., Le Reverend, B., Wilson, E. M., Richburg, B., Alder, M., ... & Jorett, C. (2017). Advancement in Texture in Early Complementary Feeding and the Relevance to Developmental Outcomes. In R. E. Black, M. Makrides, & K. K. Ong (Eds.), *Nestlé Nutrition Institute Workshop Series* (Vol. 87, p. 29-38).
- Hiiemae, K. M., Palmer, J. B., Medicis, S. W., Hegener, J., Scott Jackson, B., & Lieberman, D. E. (2002). Hyoid and tongue surface movements in speaking and eating. *Archives of Oral Biology*, 47(1), 11-27.
- Iverson, J. M. (2010). Developing language in a developing body: the relationship between motor development and language development. *Journal of Child Language*, 37(02), 229-261.
- Larsson, E. (1998). Orthodontic aspects on feeding of young children: a comparison between Swedish and Norwegian-Sami children. *Swedish Dental Journal*, 23(3), 117-121.
- Lemarchand, L., MacLeod, A., Canault, M., & Kern, S. (2017). Speech and feeding development : A longitudinal study on Quebecois French-Speaking children between 8 and 14 months. 14th International Congress for the Study of Child Language, Lyon, 17-21 juillet 2017
- Lemarchand, L., MacLeod, A., Canault, M., & Kern, S. (2018). Développement de la parole et de la mastication : Evolution de la durée des cycles oscillatoires mandibulaires observés entre 8 et 14 mois chez 4 enfants québécois. Proceedings of XXXIe Journées d'Etudes sur la Parole, Aix-en-Provence, 4-8 juin 2018, 142-150.
- Lemarchand, L. (2019). Babillage et diversification alimentaire: Pratiques et influences sur le contrôle oro-moteur. Thèse de Doctorat, Université Lyon 2 & Université de Montréal.
- Liu, Z. J., Ikeda, K., Harada, S., Kasahara, Y., & Ito, G. (1998). Functional Properties of Jaw and Tongue Muscles in Rats Fed a Liquid Diet after Being Weaned. *Journal of Dental Research*, 77(2), 366-376.
- MacNeilage, P. F. (1998). The frame/content theory of evolution of speech production. *Behavioral and brain sciences*, 21(04), 499-511.
- Malas, K., Trudeau, N., Chagnon, M., & McFarland, D. H. (2015). Feeding/swallowing difficulties in children later diagnosed with language impairment. *Developmental Medicine & Child Neurology*, 57(9), 872-879.
- Malas, K., Trudeau, N., Giroux, M.-C., Gauthier, L., Poulin, S., & McFarland, D. H. (2017). Prior History of Feeding-Swallowing Difficulties in Children With Language Impairment. *American Journal of Speech-Language Pathology*, 26(1), 138.
- Thibault, C. (2007). *Orthophonie et orofaire: la sphère oro-faciale de l'enfant. Troubles thérapeutiques*. Paris, Masson.
- Wilson, E. M., Green, J. B., & Weismer, G. (2012). A Kinematic Description of the Temporal Characteristics of Jaw Motion for Early Chewing: Preliminary Findings. *Journal of Speech Language and Hearing Research*, 55(2), 626-639.
- Zimmerman, E., & Maron, J. L. (2016). FOXP2 gene deletion and infant feeding difficulties: a case report. *Molecular Case Studies*, 2(1), a000547