

*Assumptions for the analysis
of speech disorders and primary functions
using the CARSTENS AG501 articulograph
and an acoustic field distribution analyzer*

Katarzyna Klessa, Anita Lorenc, Łukasz Mik, Agnieszka Borowiec & Daniel Król



ADAM MICKIEWICZ
UNIVERSITY
POZNAŃ



UNIVERSITY
OF WARSAW

LA
BORA
TORIUM
MOWY



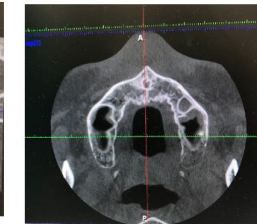
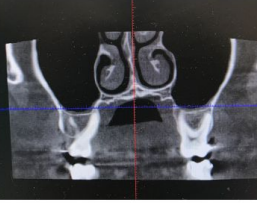
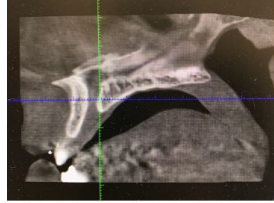
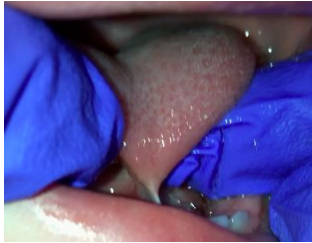
AKADEMIA NAUK
STOSOWANYCH
W TARNOWIE

Pilot studies

- Articulographic and acoustic-phonetic analyses of **normative** pronunciation of Polish **nasal** vowels and **lateral** consonants
- Articulographic and acoustic-phonetic analyses of speaking styles (e.g. elicited **IDS**, **ADS**, semi-spontaneous narration) as well as swallowing



Research process



- Introductory interview
- Neurologopedic and myofunctional diagnosis
- Orthodontic diagnosis
- Physiotherapeutic diagnosis
- Data collection using:
 - EMA: electromagnetic articulography CARSTENS AG501
 - AFDA: acoustic field distribution analyzer - audio-video recordings

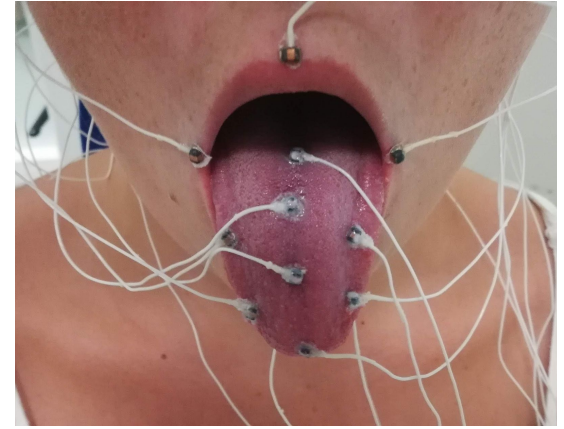
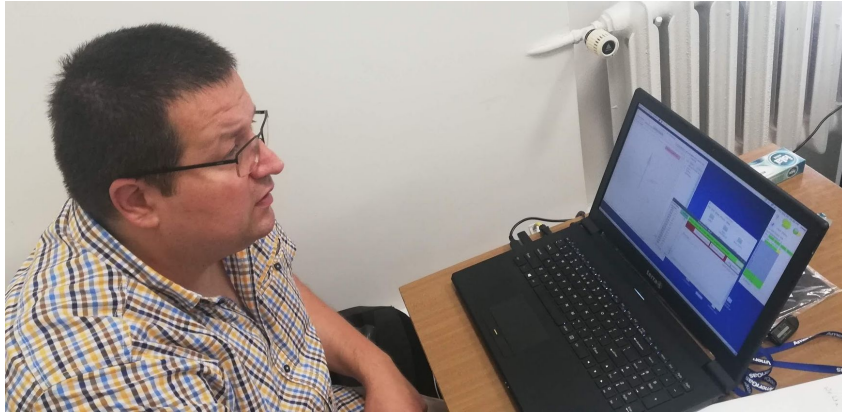
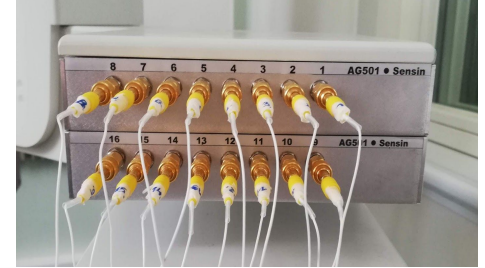
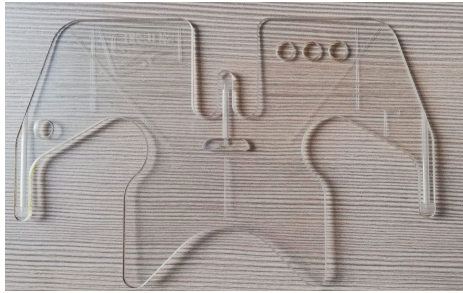
Research goals

articulatory analyses

EMA: Carstens AG 501

- describe the stabilizing mechanism of the tongue **rest position** relative to the **norm** and to different manners of compensation taking account of the tongue parts (anterior, posterior, middle and lateral edges) relative to passive articulators
- examination of the **oral phase of swallowing** and **tongue articulation** in subjects with a **normative** and **disordered tongue rest position**
- acquiring knowledge about the relationship between **primary functions and tongue articulation**

Data collection procedures - CARSTENS AG501



Archives of the project: *Infant-directed and adult-directed speech: preliminary investigation with Carstens AG501 Articulograph (Mowa kierowana do dzieci i dorosłych: badanie wstępne z użyciem artykulografu Carstens AG501)*. Miniatura-2 Project funded by the National Science Centre in Poland (ID: 2018/02/X/HS2/03593).

Research goals

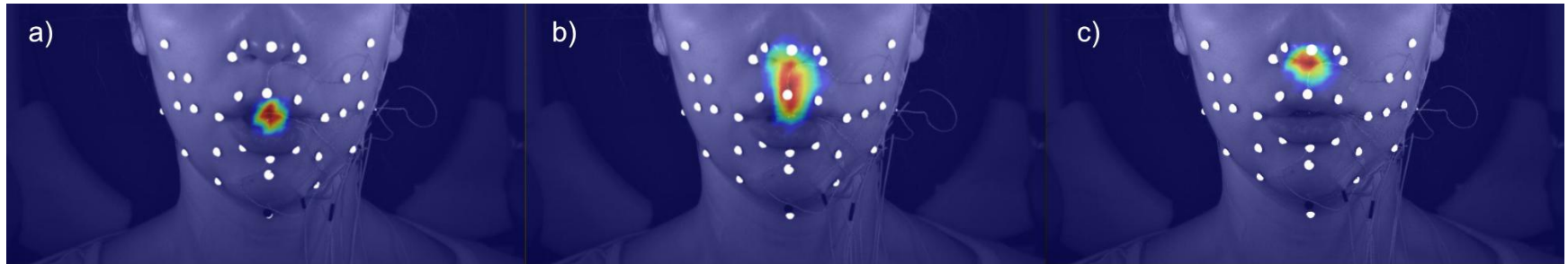
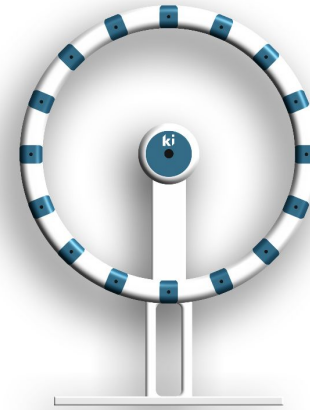
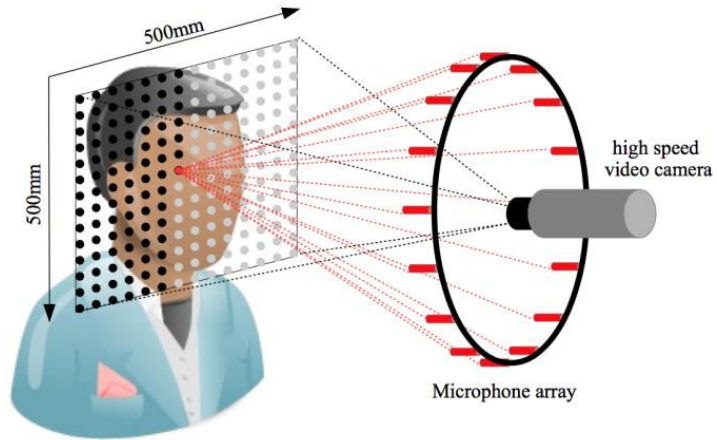
acoustic-phonetic analyses

Acoustic Field Distribution Analyzer

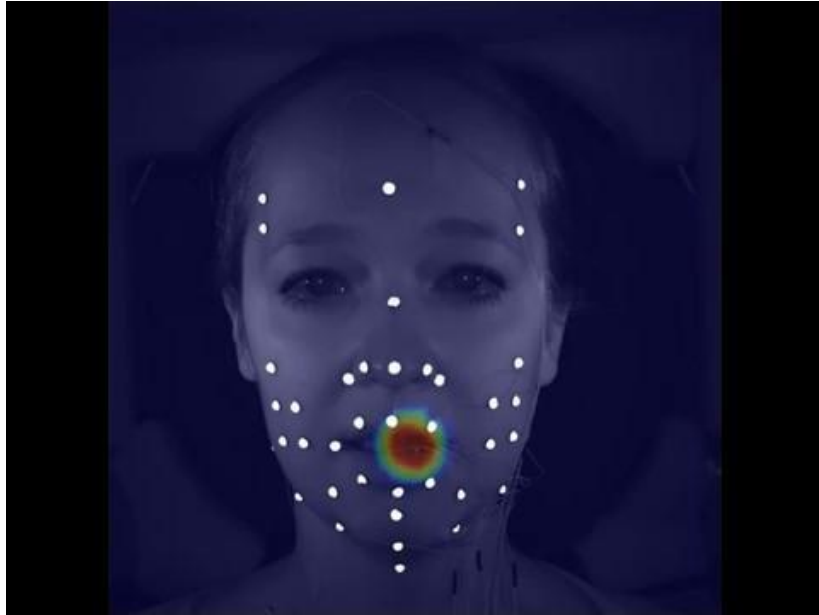
AFDA

- description of the **tongue articulation in the horizontal dimension** using the Acoustic Field Distribution Analyzer
- Inspecting functional and articulatory connections in relations to the **symmetry / asymmetry of articulatory gestures**
- description of **oral, nasal and nasalised** articulations in the horizontal dimension using the Acoustic Field Distribution Analyzer

Data collection procedures - acoustic camera AFDA

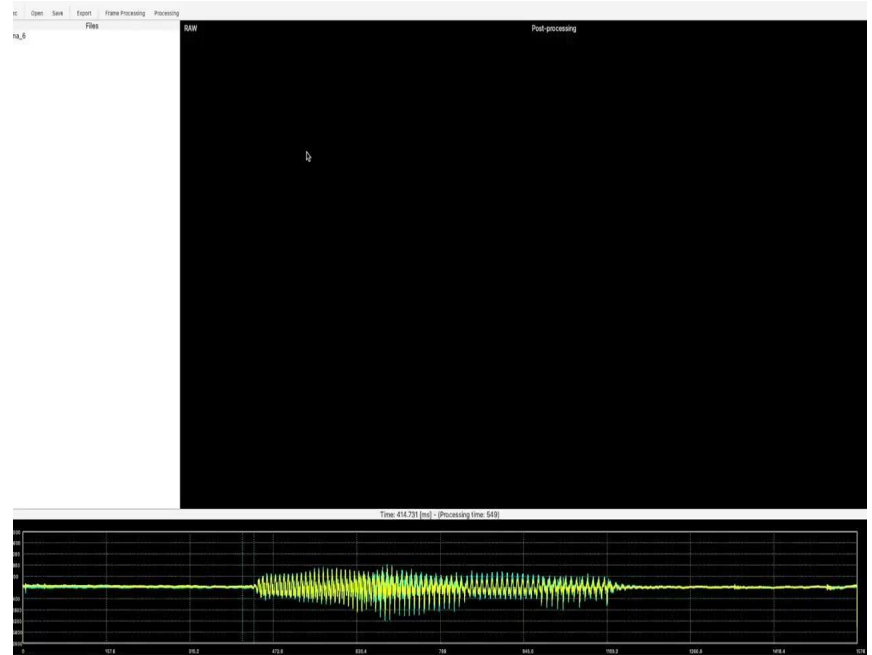


Data collection procedures - acoustic camera AFDA



<https://drive.google.com/file/d/1YOA9VC9PY37-UCZsRzozBGJe4G505pUC/view>

Ver. 1 an example visualization for: : /t l e n/



<https://drive.google.com/file/d/1SyZuU0Qf-c3QNTYnsxL79Rp1laRHaiWMM/view>

Ver. 2 - in progress

Participants

30 participants with disorders of the resting position of the tongue, oral phase of swallowing and articulation (6 persons: EMA, AFDA and full diagnostics, 24 persons: AFDA and logopedic diagnostics)

2 participants representing the articulation and biological standard, interested in participating in a research study (2 persons: EMA, AFDA and full diagnostics)

Example recording scenario

Part 1: tongue resting position and swallowing

Part 2: semi-spontaneous narration

Part 3: elicited utterances (phrases / isolated words)

- ❖ *1* participants get used to the sensors being attached to speech organs, watch movie, water administered in small quantities (also while watching a movie)*
- ❖ *2* participants talk about the previously displayed movie*
- ❖ *3* participants produce short phrases, syllables or (pseudo-)words one by one on the screen*

Ethical issues - in progress (1)

We submitted the following types of **participation information documentation** for approval of the Ethical Committee at the University of Warsaw:

- Information **about the study** for the participants (neurologopedic myofunctional diagnosis)
- information **about the EMA examination** for the participants (examination with the use of the electromagnetic articulograph)
- information on **personal data processing**, including sensitive personal data

Ethical issues - in progress (2)

We submitted the following types of **consent forms** for approval of the Ethical Committee at the University of Warsaw:

- consent of the participant of the study to participate in a scientific study including **neurologopedic myofunctional diagnosis**
- consent of the participant to participate in a research study using **electromagnetic articulation (EMA)**
- consent of the participant to participate in additional studies in the field of **orthodontics and physiotherapy**
- consent of the participant to the processing of personal data, **including sensitive data**

Thank You!

Contact us at:

¹klessa@amu.edu.pl, ²anita.lorenc@uw.edu.pl, ³magmikmen@wp.pl,

aborowiec1@o2.pl, dankrol@gmail.com



ADAM MICKIEWICZ
UNIVERSITY
POZNAŃ



UNIVERSITY
OF WARSAW

LA
BORA
TORIUM
MOWY



AKADEMIA NAUK
STOSOWANYCH
W TARNOWIE

Acknowledgements

Research supported by the grants:

- The current project: *Examination of disordered speech and primary functions using articulograph CARSTENS AG501 and Acoustic Field Distribution Analyzer (Badanie mowy zaburzonej i funkcji prymarnych za pomocą artykulografu CARSTENS AG501 i analizatora rozkładu pola akustycznego)*. Projekt OPUS funded by the National Science Centre in Poland (registr. no. 2021/43/B/HS2/00162)
- The pilot study: *Infant-directed and adult-directed speech: preliminary investigation with Carstens AG501 Articulograph (Mowa kierowana do dzieci i dorosłych: badanie wstępne z użyciem artykulografu Carstens AG501)*. Project Miniatura-2 funded by the National Science Centre in Poland (ID: 2018/02/X/HS2/03593).



NARODOWE CENTRUM NAUKI