



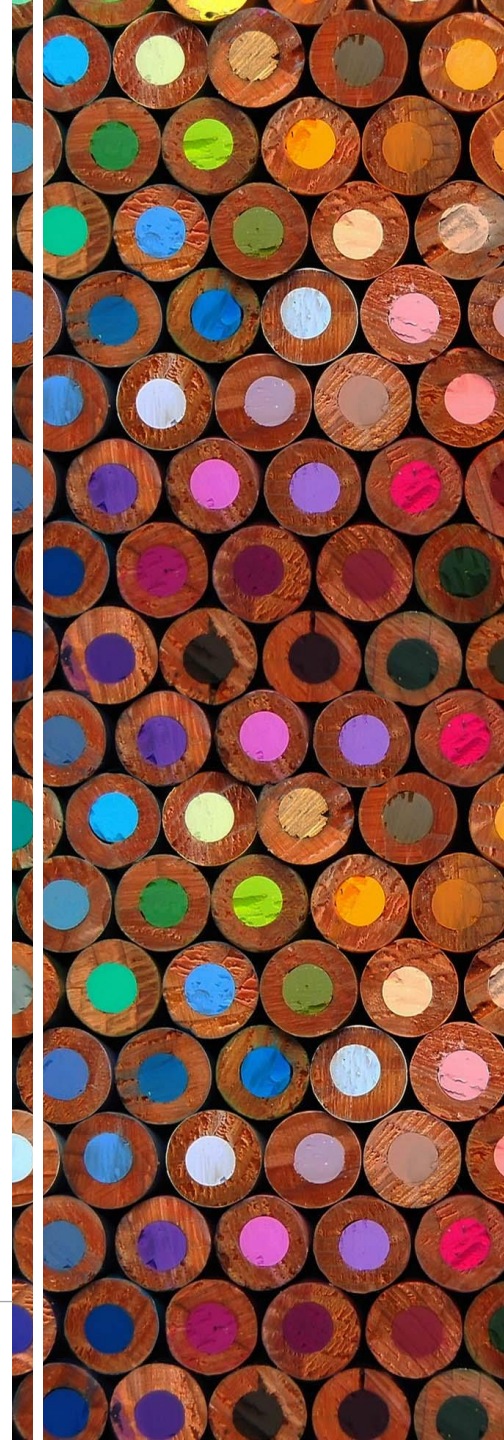
Integration of auditory, labial and manual signs in Cued Speech perception by deaf adults : an adaptation of the McGurk paradigm

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clemence.bayard@gipsa-lab.grenoble-inp.fr

FFAVSP2015

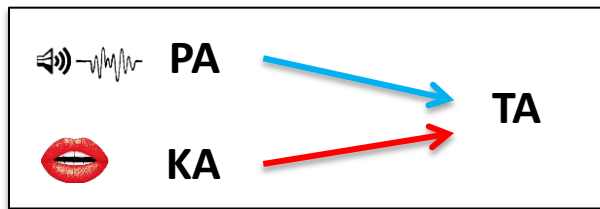
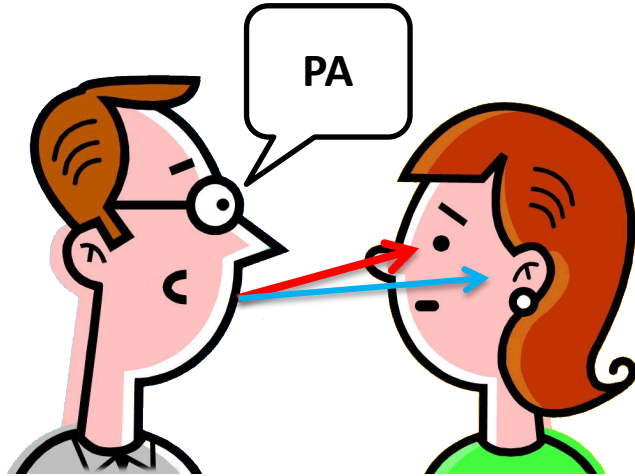
13th September 2015

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SPEECH PERCEPTION

- For normally hearing (NH) people



*The famous
McGurk effect*

(McGurk & Mac Donald, 1976)

➔ *« Fusion » response
audio-visual integration*

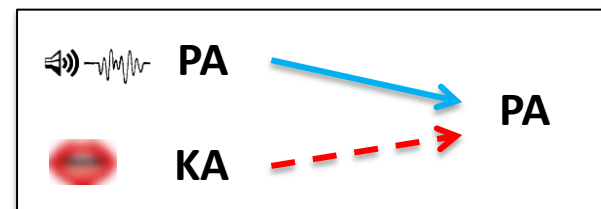
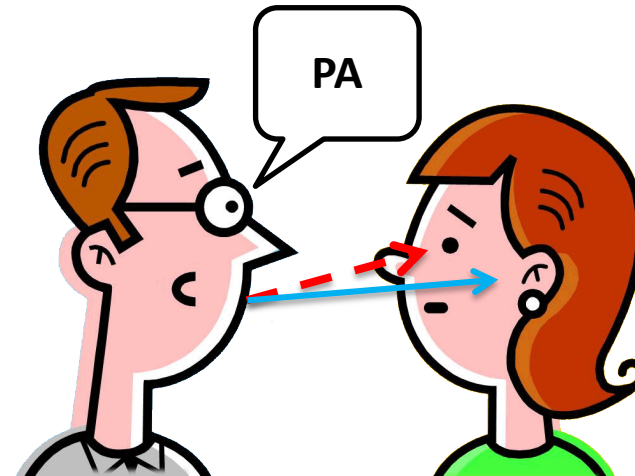
SPEECH PERCEPTION

- For deaf people

Audio-visual integration is an adaptative process



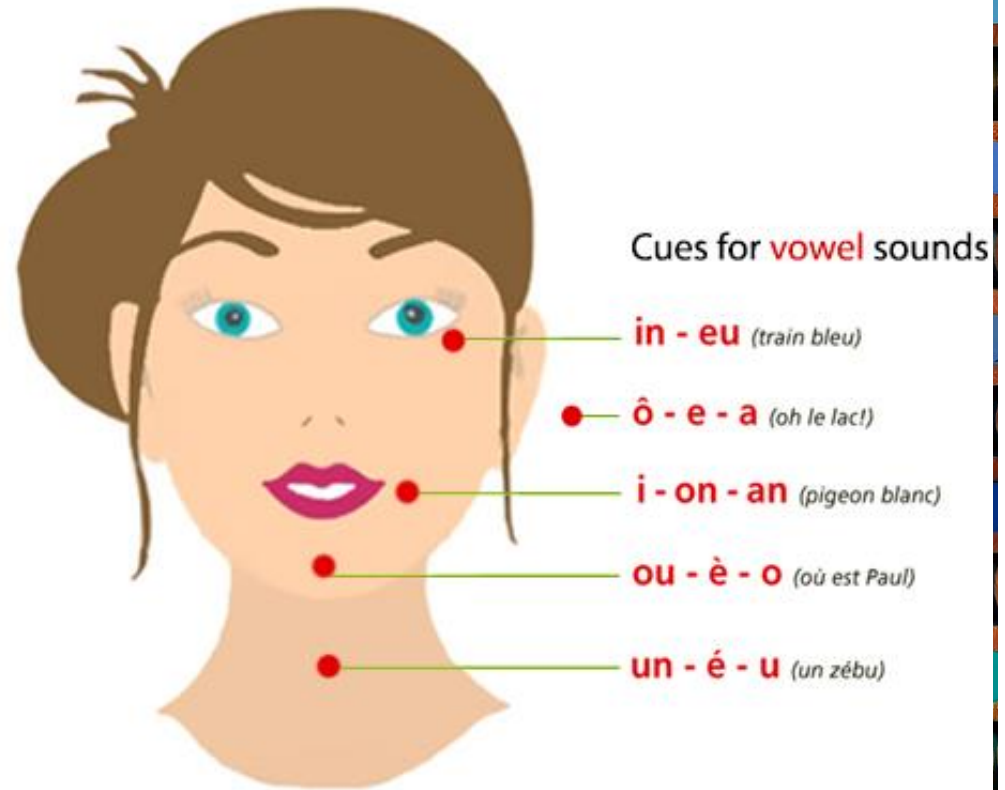
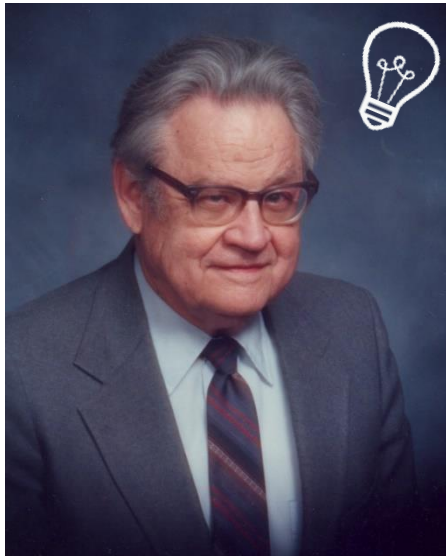
- *Auditory abilities*
- *Quality of the information*



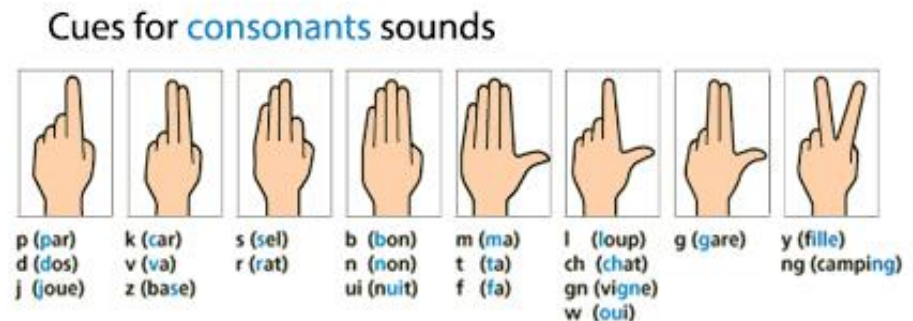
⇒ ***Audio responses increase and visual responses decrease***

(Desai, Suckney & Zeng, 2000, Leybaert & Hout, 2001, Hout, 2001, Hout & Leybaert, 2002, Hout & Leybaert, 2003, Hout & Leybaert, 2004, Hout & Leybaert, 2005, Hout & Leybaert, 2006, Hout & Leybaert, 2007, Hout & Leybaert, 2008, Hout & Leybaert, 2009, Hout & Leybaert, 2010, Hout & Leybaert, 2011, Hout & Leybaert, 2012, Hout & Leybaert, 2013, Hout & Leybaert, 2014, Hout & Leybaert, 2015, Hout & Leybaert, 2016, Hout & Leybaert, 2017, Hout & Leybaert, 2018, Hout & Leybaert, 2019, Hout & Leybaert, 2020, Hout & Leybaert, 2021, Hout & Leybaert, 2022, Hout & Leybaert, 2023, Hout & Leybaert, 2024, Hout & Leybaert, 2025)

CUED SPEECH, A CORNETT'S IDEA



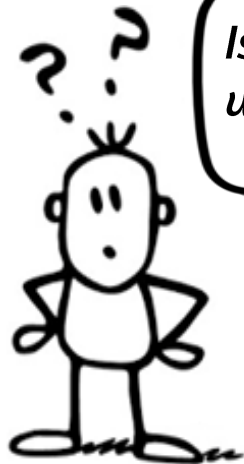
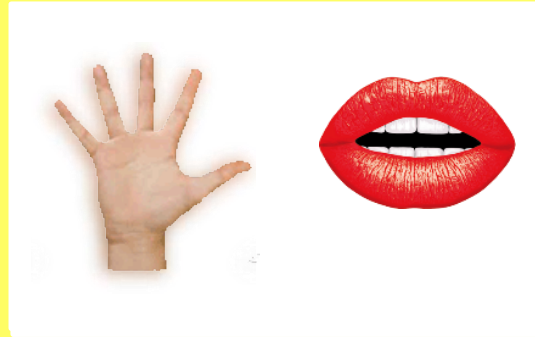
- Cued Speech is designed to reduce ambiguity related to lipreading
- Each syllable is uttered with a complementary gesture called a manual cue. Each manual cue can code several phonemes, but these phonemes differ in their labial image.
- The combination of visual information allows deaf individuals to perceive all syllables optimally.



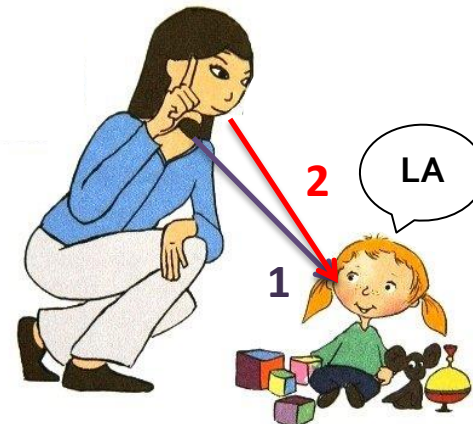
CS PRODUCTION & PERCEPTION



These results reverse the classic way of considering the CS



Is the hand advance used in perception ?



(Attina et al. , 2002, 2004,2005)
(Troille, 2009 ; Sacher et al., 2008 ; Abouata, 2007 ; Gillet, 2006)

CS PERCEPTION – WITHOUT SOUND

ULB

UNIVERSITÉ LIBRE DE BRUXELLES

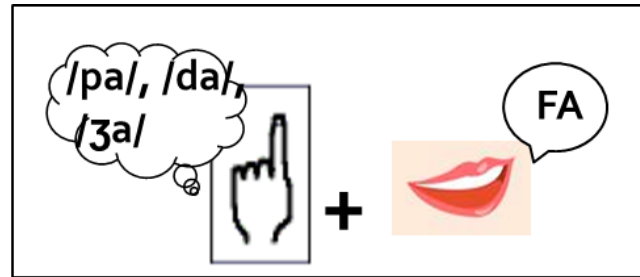


The respective weight of each info?



Deaf CS-users

NH CS-users

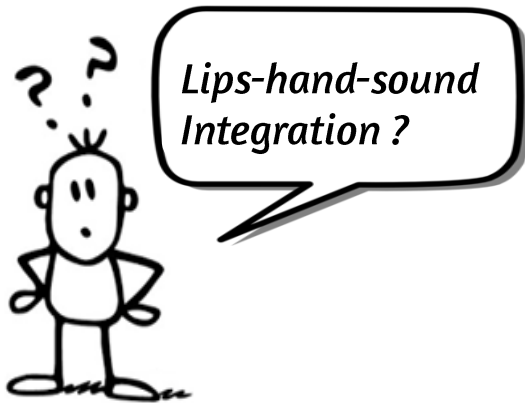


Lips-hand integration

- ➔ Hand responses despite the incongruency (Deaf > Normally-Hearing)
- ➔ Manual responses increase with an ambiguous labial information. Labial response increase with an ambiguous manual information.
- ➔ Combination suggesting a « McGurk effect »

(Alegria & Lechat, 2005; Leybaert, Bayard, Huyse & Colin, 2013)

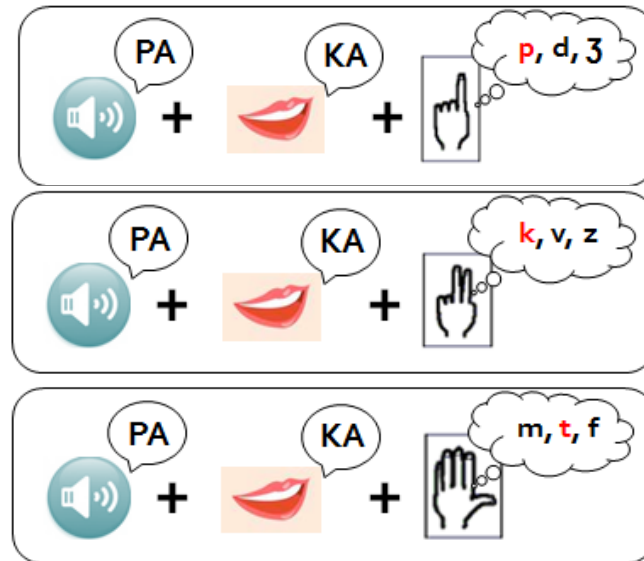
CS PERCEPTION – WITH SOUND



- How does CS impact the AV integration?
- What is the contribution of each information?
- Effect of Auditory status?

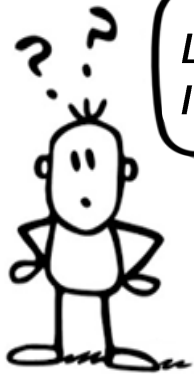
Identification task with CV syllables consisting of one of the /p, k, t/ phonemes articulated with /a/.

3 CS incongruent cond.



(Bayard, Colin & Leybaert, 2014)

CS PERCEPTION – WITH SOUND

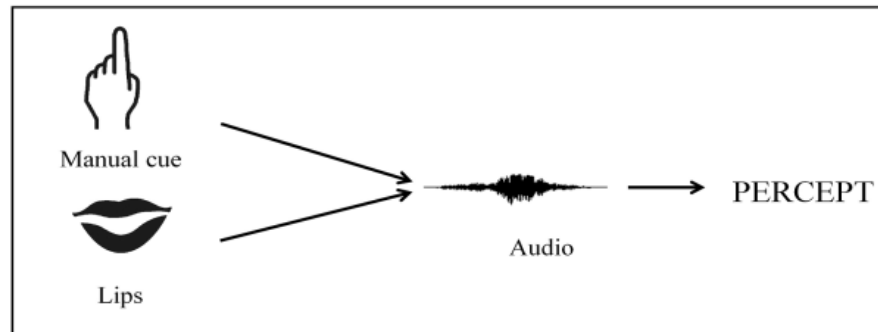
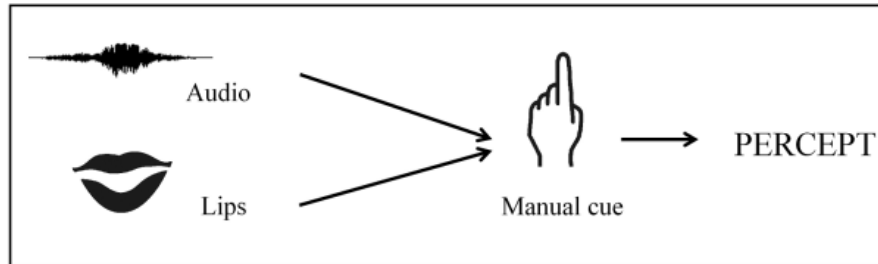


*Lips-hand-sound
Integration ?*

- In McGurk condition without manual cue, deaf and NH had the same response pattern.
- The addition of a manual cue impacts AV integration : less fusion response in favor of another kind of response depending on auditory status.

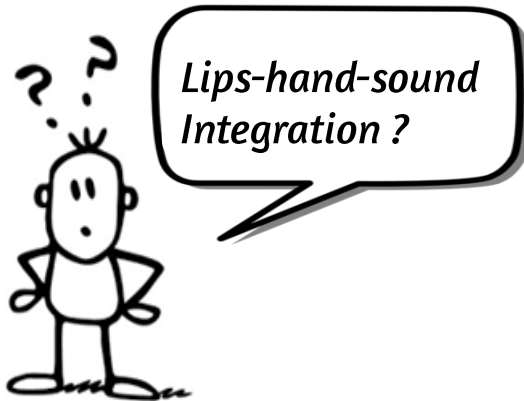


- NH rely more on auditory information
- Deaf rely more on visual information (lips and hand).



(Bayard, Colin & Leybaert, 2014)

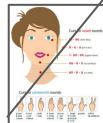
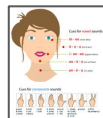
NEW STUDY - METHOD



- How does CS impact the AV integration?
- What is the contribution of each information?
- **Effect of auditory abilities ?**



Participants

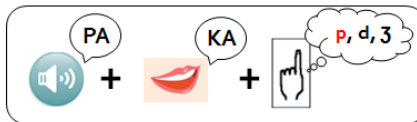
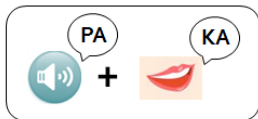


36 CS  (mean age 20 years ; 33 with CI)

35 control  (mean age 19 years ; 30 with CI)

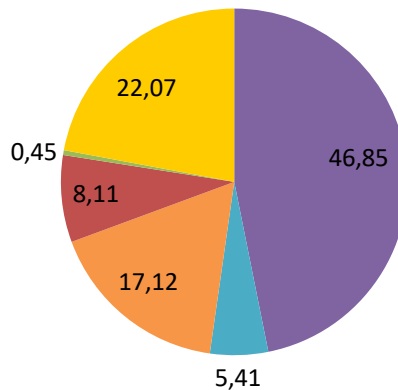
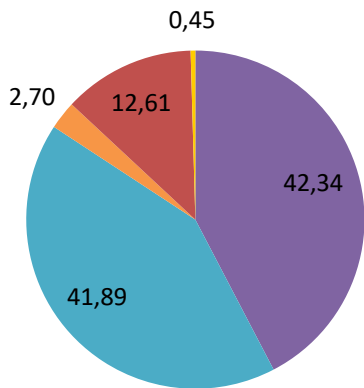
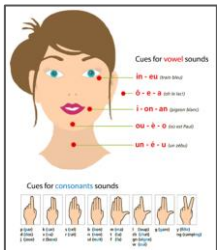
CS-USERS VS CONTROL

RESULTS – CS « AUDIO »

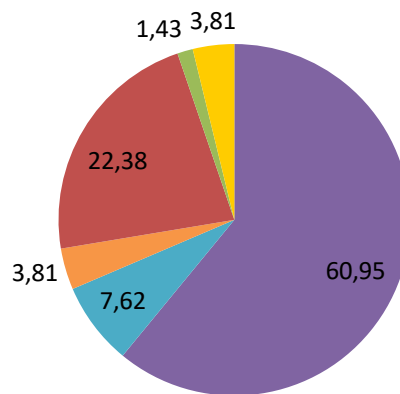
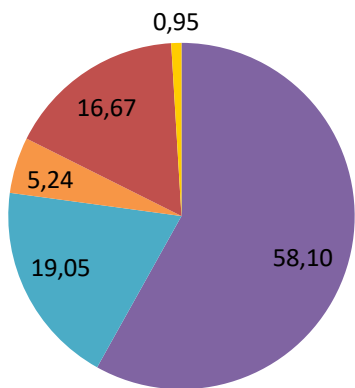
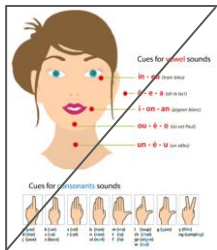


- Fusion
- Other
- Lips
- Other-lips
- Sound
- Other-hand

CS group



Control



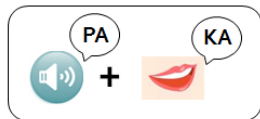
Without CS

- Fusion : CS < Ctrol

With CS

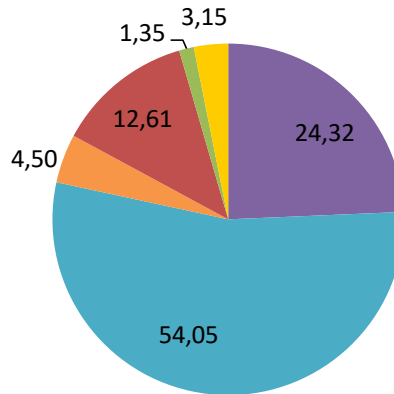
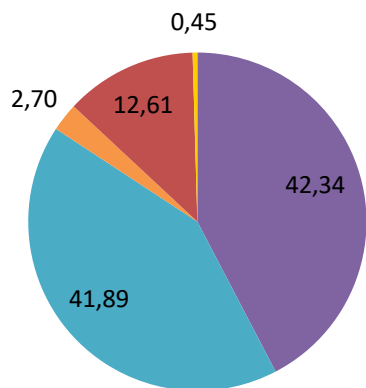
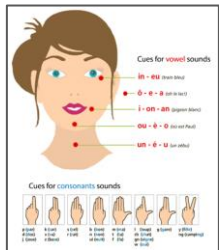
- Fusion no effect
- ↓ lips (p < .001)
- ↑ sound (p < .005)
- ↑ hand (p < .005)

RESULTS – CS « LIPS »

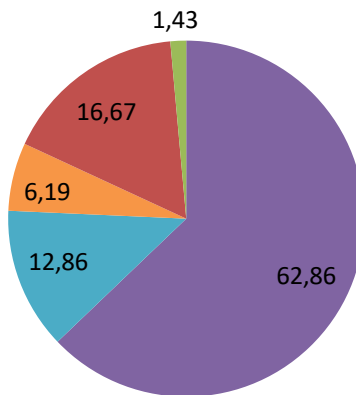
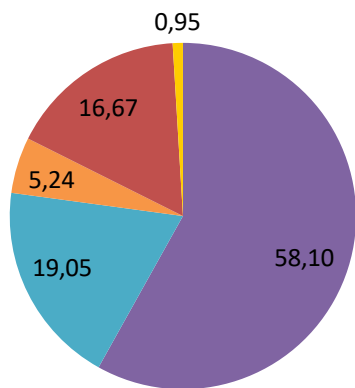
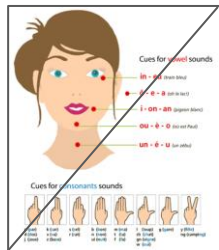


- Fusion
- Other
- Lips
- Other-lips
- Sound
- Other-hand

CS group



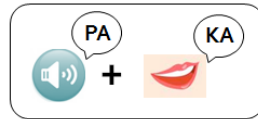
Control



With CS

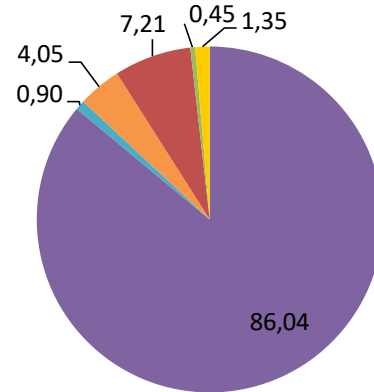
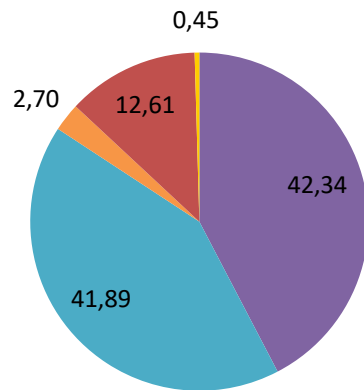
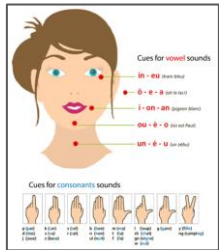
- ↓ fusion (p < .005)
- *lips no effect*
- *audio no effect*

RESULTS – CS « FUSION »

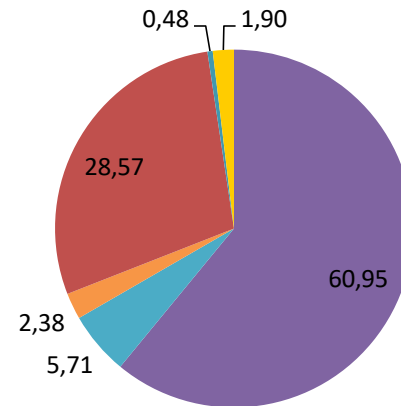
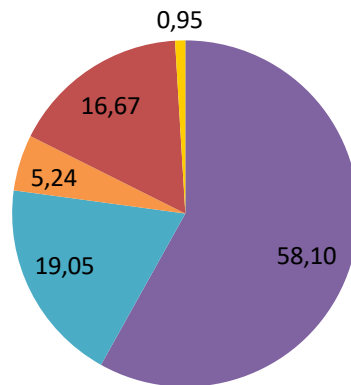
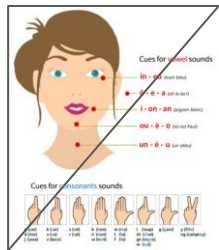


- Fusion
- Other
- Lips
- Other-lips
- Sound
- Other-hand

CS group



Control



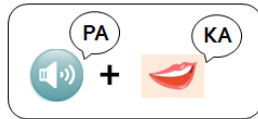
With LPC

- ↓ lips ($p < .001$)
- ↑ fusion ($p < .001$)

- Fusion : CS > Ctrol

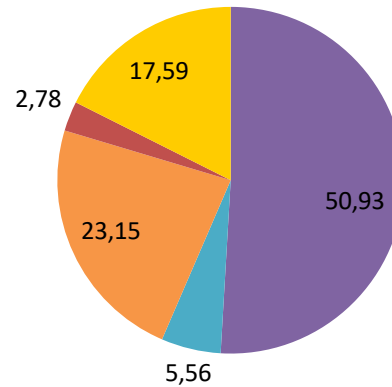
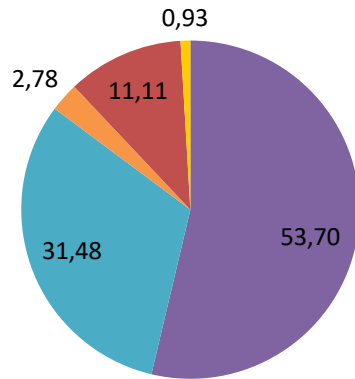
AO⁺ VS AO⁻

RESULTS – CS « AUDIO »



- Fusion
- Other
- Lips
- Other-lips
- Sound
- Other-hand

AO+



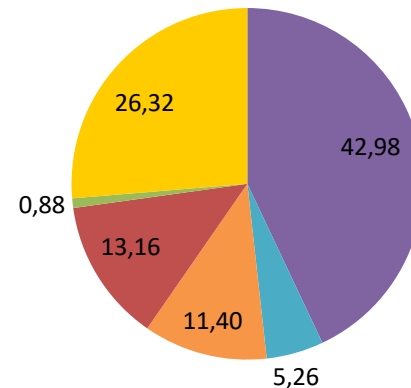
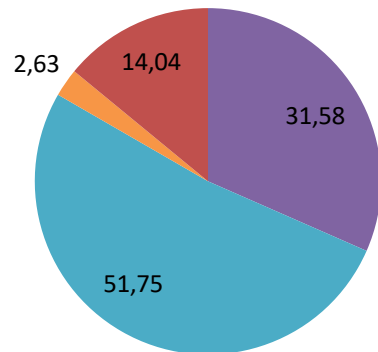
Without CS

- AO+ : fusion > lips
- AO- : lips > fusion

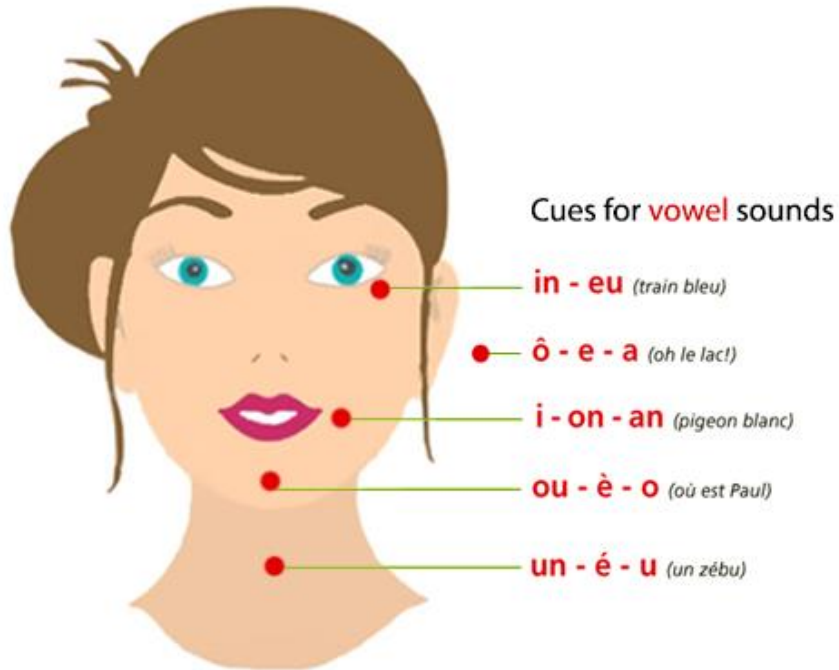
With CS

- AO+ gave more fusion and audio response than AO-

AO-



DISCUSSION



**Auditory
modality**



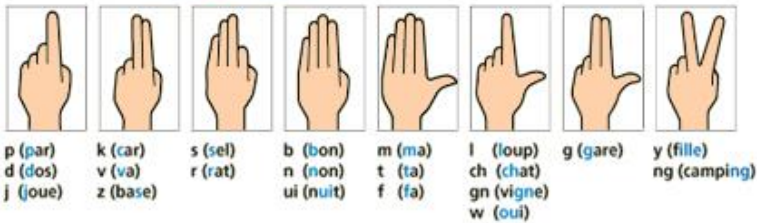
&

**Visual
modality**

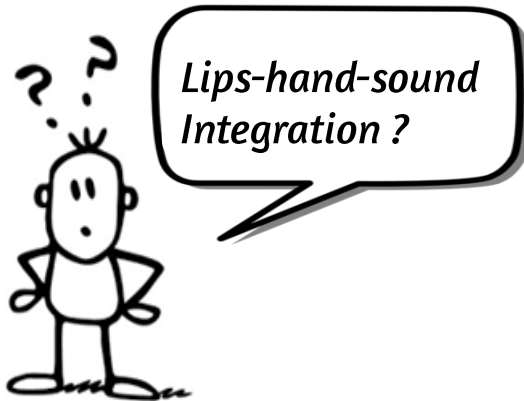


CS is an original and good way to examine integrative process in speech perception

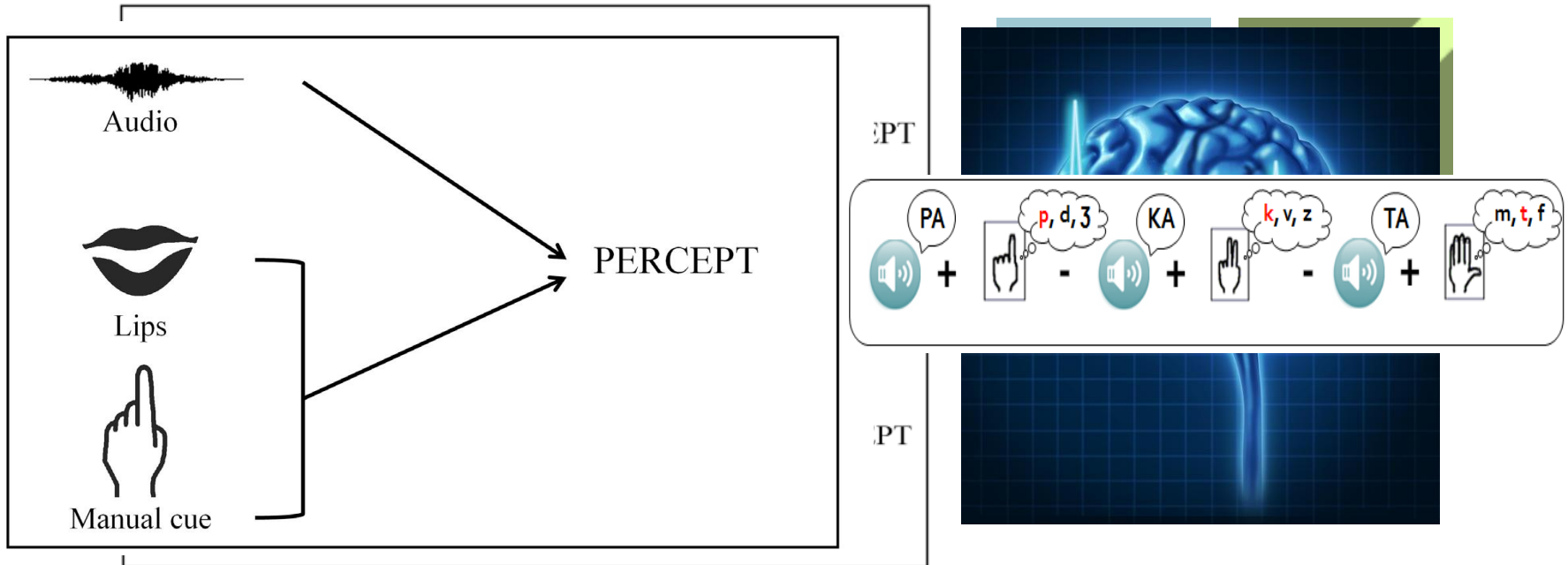
Cues for **consonants** sounds



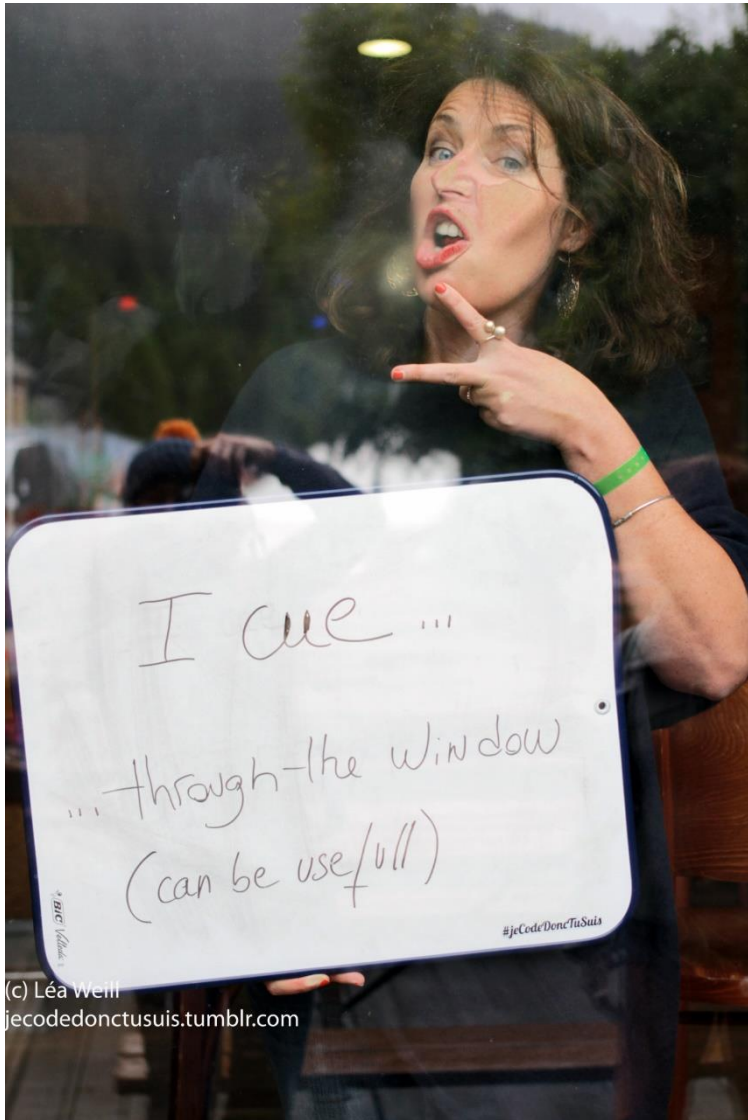
DISCUSSION



- AO+ rely more on auditory information
- AO- rely more on visual information (lips and hand).



DISCUSSION



(c) Léa Weill
jecodedonctusuis.tumblr.com

Successful cognitive graft



CLINICAL IMPLICATION

- T
- N



THANKS FOR YOUR ATTENTION !

