Supplementary Motor Area: A view from the left hand of the grip force modulation in unimanual and bimanual symmetric task.

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Introduction:
The grip force modulation (GFM) in relation to the linguistic stimulation has been correlated to the semantic decoding (Frak, Nazir, Goyette, Cohen, & Jeannerod, 2010) and the somatotopic representation of the words (Hauk, Johnsrude, & Pulvermüller, 2004).

Method

Experiment 1: Unimanual group.
Participants
14 right-handed Canadians high school students (14-17 years old).

Stimuli
35 words related to semantic hand action and 35 words not related to hand actions. The words are in the French language.

Equipment and data acquisition
A uniaxial grip force sensor weighing 55g, with a diameter of 5 cm and 1.8 cm in large. Each grip force sensor is connected to an amplificator Honeywell DV10L.

Data acquisition card: Measurement computing series 1608G.
Acquisition Online at 1kHz and extracted on the software dasylab.

Procedure
The participant listened to 2 blocks of stimuli. Half of the blocks were completed with the sensor in the right hand, and the half with the sensor in the left hand.
During each block, participants’ eyes were closed.
The order of the hand and target word category was randomly presented for each participant.

Data analysis
For each target stimulus, an epoch of -300 msec and 1000 msec at the beginning of the stimuli were extracted.

Each epoch was normalized to the participant’s baseline (200 msec to 0 msec).
Where the GFM exceeded +/- 200 mN or presented a modulation over 100 mN in 100 msec was rejected (Nazir et al., 2015)
A participant with less than 75% of data after rejection was excluded.

An outlier test was performed (the corrected Thompson Tau) due to the population size.

This project is about the role of different motor areas in the action linguistic network, thus only the data relating to the action word is analyzed.

In each condition and for each participant, the average was used to observe comparisons to the baseline and ANOVA to observe the differences in their hands.

Experiment 2: Bimanual group.
Participants
45 right-handed Brazilian students (14-17 years old).

Stimuli
Idem to experiment 1, except the words in Brazilian Portuguese.

Equipment and data acquisition
Idem to experiment 1.

Procedure
The participant listened to 2 blocks of stimuli holding a grip force sensors in each hand.

The other part of the procedure was identical to the experiment 1.

Data analysis
Idem to experiment 1.

Conclusion:
In the unimanual task, a difference between the GFM, between the hands and comparisons to the baseline show a different profile than the pretty identity curve of the GFM in bimanual.
At the beginning of the augmentation, we can see in the distance between the curve of the GMF in the unimanual condition disappear in bimanual condition.
These results can be explained by SMA which has shown to be more active in bimanual movements (Naito et al., 2016).
The inclusion of SMA in the action semantic network appears to be act as a facilitator in the network with the intraparietal area, Broca’s area and M1.

References:
Tomasino, B., & Rumiati, R. I. (2014). Looking down upon words with motor content. In La langue au bout des doigts: Les liens fonctionnels entre la motricité et le langage (pp. 7-32).

Acknowledgment:
We would like to thank the personnel of CRER, of the Commission scolaire de Laval, the technicians of the Department des Sciences de l’Activité Physique (SAP) and colleagues and family for all their help and support. A special thanks to Kristina Fundaro for the English correction and Jill Vandermeschen for the statistical support.