



# Can we hear a gesture? The influence of gestures on speech.



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## Introduction

Speech and gesture are closely related (McNeill 1992; Kendon 2004). However, the exact relationship between the two is still unclear.

A study by Dobrogaev (1929) states that when we cannot gesture, speech is more monotonous. This study is often cited, but cannot be recovered and has not been replicated.

Other research found limited and mainly semantic effects on speech of not being able to gesture.

Also, Krahmer and Swerts (2007) found an effect of *beat* gestures on some acoustic aspects of speech but it is unclear whether this also holds for *iconic* gestures.

Therefore, the main questions in the present study are:

- Can we hear when somebody gestures?
- Do iconic gestures influence the acoustics of speech?

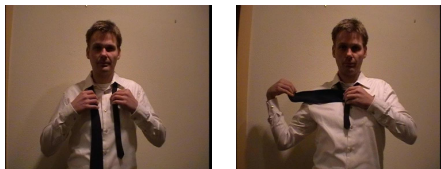
In short, can we replicate Dobrogaev's (1929) findings?

In order to do this, we collected data in "the tie experiment" and used these data in a perception test and for acoustic measurements.

## The tie experiment

38 Dutch director matcher pairs took part in the experiment. The directors watched several video clips depicting tie knotting instructions. Directors then instructed matchers to tie an actual tie in the same manner as in the video clips.

Stimulus examples



Directors had to sit on their hands during half of the experiment, so that they could not gesture while they instructed half of the tie knots.

We collected video and audio recordings of the director's instructions, and selections of these recordings were used in a perception test and in acoustic analyses.

## Perception experiment with tie data

As stimuli we used 20 pairs of lexically and syntactically similar sound fragments from the tie experiment, consisting of:

- One fragment where director could not gesture: E.g. "Nou je pakt hem vast" – *Well, you hold it.*



- One fragment where director could and did produce at least one iconic gesture:

E.g. "Oh je [pakt hem] weer hetzelfde vast." - *Oh you [hold it] again in the same way.* (iconic gesture on bracketed part)



20 Dutch participants, not the same participants as in the tie experiment, listened to the 20 pairs of sound fragments and for each pair answered the following question:

In which of the two sound fragments does the speaker gesture?

Results:

Participants could **NOT** hear when somebody was gesturing.

Mean of 10.95 correct answers out of 20 trials.

Not significantly different from chance level.

(one-sample  $t(19) = 1.843, p = .08$ ).

## Acoustics of tie data

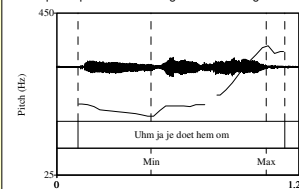
The 20 pairs of sound fragments from the perception test were analysed on several acoustic measures:

- minimum pitch
- maximum pitch
- mean pitch
- pitch range
- mean intensity

There were **NO** significant differences for any of the acoustic measures between the sound fragments in which people gestured and the ones in which they could not gesture:

	Gesture (SD)	No Gesture (SD)	Mean total
Max Pitch	248.5 (83)	251.65 (93.5)	250
Min Pitch	136.5 (47)	138.75 (60)	137.62
Mean Pitch	192.5	195.2	193.85
Mean Pitch range	112 (77)	112.9 (67)	112.45
Mean Intensity	65.40 (5.9)	65.95 (6.2)	65.67

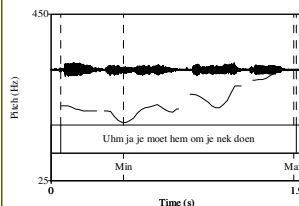
Example of pair of sound fragments showing minimum and maximum pitch:



Director **gestures** and says: "Uhm yeah you [put it around]."



**NO** significant differences



"Director **cannot gesture** and says: "Uhm yeah you have to put it around your neck"

## Conclusion

We found **NO** perceptual differences between speech with and speech without gesture.

We found **NO** acoustic differences between speech with and speech without gesture.

Krahmer and Swerts' (2007) acoustic effects of beat gestures **CANNOT** be generalised to iconic gestures.

We could **NOT** replicate Dobrogaev's (1929) finding that speech becomes more monotonous (smaller pitch range) when we cannot gesture.

**In short, current results suggest that we cannot hear a gesture and that there are no large acoustic effects of gestures on speech.**

## Future work

We have not looked at more detailed aspects, such as pitch of specific words or vowels.

These might be affected by the inability to gesture and could still be studied.

However, the perception test shows us that these possible differences cannot be perceived by the listener.

## Acknowledgements

Many thanks to: Joost Driessen, Martijn Goudbeek, Bas Roset, Hans Westerbeek and Nick Wood.

We received financial support from The Netherlands Organization for Scientific Research, via a Vici grant (NWO grant 277-70-007), which is gratefully acknowledged.

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