# The Science behind Clang Bang Swoosh Boom

## What are we trying to find out?

The acoustics of our speech are somewhat determined by the size of our vocal apparatus, which varies with our age and sex. However, we can still control many aspects of the way we speak, and we do this to adapt our speech in different situations (e.g., we speak more slowly, with higher pitch and clearer vowels when speaking to young children). **We are investigating how people adapt their speech to make communication easier when speaking to someone who has difficulty hearing them** (e.g., due to background noise, a hearing loss or because they are not native speakers).

## How did we design our study?

We record pairs of participants while they complete a 'spot the difference' picture task together. They have to work out what differences there are between their two pictures without seeing each other's picture. In some recordings, we make it difficult for one person to hear the other and we analyse their speech to see what adaptations they make to their speech to ensure that they can still communicate effectively.

## What did we find?

Young adults tend to make specific adjustments to their speech that are well matched to counteracting the effect of a communication barrier (e.g. noise in the environment, conversing with a friend with simulated hearing loss). Older adults and young children also make adjustments to the way they speak in these difficult conditions but they tend to be less attuned to the specific environment.

*The recordings that you heard in Clang Bang Swoosh Boom are from the many hours of recordings that we have made of around 200 children, young and older adults while they do this task in pairs in difficult listening conditions. In our studies, we carry out acoustic measurements on these speech recordings to get estimates of measures such as pitch, speaking rate, loudness and vowel articulation, and we see how these measures change across the different test conditions and across the different age and gender groups. This installation demonstrates how background noises of all types affect our ability to understand and produce speech, and how it makes it harder for us to think about and remember things. You can try this out by focusing on understanding the message when there are four simultaneous speakers describing the same picture; you can also try and focus on individual speakers and listen how they change their speech to make themselves understood when they are speaking with someone who has difficulty hearing them.*

## Do you want to find out more?

Visit our project website at: http://valeriehazan.com/wp/index.php/research/ and see our demo on Youtube: www.youtube.com/watch?v=80512hO_6pA


## Acknowledgements

The research reported here was carried out by Valerie Hazan and Outi Tuomainen (Speech, Hearing and Phonetic Sciences, UCL), and was funded by the UK Economics and Social Research Council (ES/L007002/1). We acknowledge Michèle Pettinato's contribution to the project involving child speakers. All individuals included in this sound installation had given consent for their recordings to be used without restriction.

# Clang Bang Swoosh Boom: The team

## Valerie Hazan and Outi Tuomainen (Speech Hearing & Phonetic Sciences, UCL)

Valerie and Outi both work within the Department of Speech, Hearing and Phonetic Sciences at UCL: Valerie as Professor of Speech Sciences and Outi as Postdoctoral Research Associate. They are currently working on an research project entitled 'Speaker-Controlled Variability in Connected Discourse: Older adults' funded by the Economics and Social Sciences Research Council, which also funded two previous research projects investigating speech communication in young adults and children using a similar approach. Outi and Valerie have presented their work in previous public engagement events at the Royal Society and Royal Institution but this is the first time their work has been used in a sound installation.

## Thor McIntyre-Burnie (ASWARM)

Thor McIntyre-Burnie is an Artist & Sound Designer and Director of transformative public arts company Aswarm (www.aswarm.com). An early pioneer of sound as a medium for public art, Thor's internationally award-winning work is largely site-responsive and immersive. Rather than create objects of art, Thor prefers to create interventions that transform a public or architectural space into giant tools we can walk within and to discover new ways of using a place or interacting with a medium. Redefining new notions of soundtrack and how entities & swarms can exist as sound threads its way through much of his work. Recent awards for his work include 'Best Temporary Installation Project' Award Winner 2015 for Thor McIntyre Burnie/ Tannoy (Wind Tunnel Project) from International ProSound Awards 2015.

***Valerie and Thor first met over 15 years ago when they discussed a joint science-art project on speaker identity. They are excited to have this opportunity to collaborate for this sound installation as part of the Bloomsbury festival.***

**Credits:** The *Clang Bang Swoosh Boom* installation includes Aswarm works created with support from Nutkhut.