

## Effects of different types of face covering on speech acoustics and intelligibility: some preliminary observations

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In October 2006 the then Leader of the House of Commons Jack Straw MP published an article in the *Lancashire Telegraph* in which he made remarks to the effect that the veil (*niqāb*) worn at meetings by some of his female constituents hampered effective face-to-face communication. More fuel was added to the ensuing debate when that same month a school in West Yorkshire suspended Aishah Azmi, a bilingual support worker, because she insisted on wearing a veil during classes in spite of her pupils having claimed to find it difficult to understand what Azmi was saying. The following month, the President of the UK Asylum and Immigration Tribunal Mr Justice Hodge issued all British courts with temporary guidelines on the permissibility of wearing the Islamic veil during court proceedings. The guidelines were drafted in reaction to a case halted after a legal adviser refused to remove her veil during a tribunal in Stoke-on-Trent. The presiding judge reported that he was unable to hear her properly.

This paper presents some initial results from a pilot study for a larger set of experiments, the aim of which is to investigate the extent to which speech intelligibility is impaired if the talker's face is veiled by a *niqāb*. Two adult Scottish English speakers – one male, one female – were video- and audio-recorded while reading a set of test utterances while wearing a *niqāb*, as well as with their faces not covered. So as to test whether similar impairment of intelligibility occurred with other types of forensically-relevant face coverings, the talkers substituted the *niqāb* with first a surgical mask and then a balaclava during further reading sessions. The test sentences were of the form 'Say X again', where X was one of a set of 40 monosyllabic (CVC) test words containing a range of stop, fricative and nasal consonants, and the vowels /i ɪ a ɔ/.

A panel of 13 subjects then listened to the recordings over headphones while viewing the video footage on a computer screen. As they did so, they were asked to write down the target words they believed they had heard. So as to separate the visual and auditory channels during the experimental procedure, subjects heard the recordings from the four face covering conditions (*niqāb*, surgical mask, balaclava, no covering) a second time without any visual information present (i.e. with a blank computer screen). The video+audio conditions are labelled 'seen', while the audio-only conditions are labelled 'unseen'. In total, each subject watched and/or listened to 16 blocks of 40 utterances, as per Table 1 below.

**Table 1.** The 16 viewing/listening conditions used in the perception task. Bracketed numbers indicate the randomised sequence in which subjects heard the blocks.

	<b>Niqāb</b>	<b>Surgical mask</b>	<b>Balaclava</b>	<b>No covering</b>
<b>Male</b>	seen (9) unseen (6)	seen (3) unseen (16)	seen (11) unseen (8)	seen (13) unseen (2)
<b>Female</b>	seen (1) unseen (12)	seen (7) unseen (14)	seen (15) unseen (4)	seen (5) unseen (10)

The results of the perceptual part of the study show that intelligibility was impaired by the various face coverings less than we had expected. This may be the result of one or a combination of strategies used by the talkers on the one hand, and by the listeners on the other, that help to preserve or even promote intelligibility. At any rate, it appears from spectrographic observations of veiled

speech that the signal is attenuated in intensity as well as in the 3kHz+ frequency range, especially for the female talker. To this extent it seems likely that listeners attempt to compensate to some degree for the degradation of the acoustic signal.

The results reported here will inform the redesign of more detailed experiments we plan to carry out using a similar paradigm. The findings of this larger study will be reported on in due course.