Effect of eye-controlled beamforming in a dynamic 'cocktail party', a pilot study

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Looking at a speaker in a conversation is a natural strategy. This strategy is often critical for hearing impaired people because it provides benefits in terms of speech intelligibility. However, current hearing aids do not utilise eye-gaze to selectively listen into the direction of a speaker [Kidd et al. (2013); J Acoust Soc Am. 2013 Mar; 133(3): EL202–7.]. Hearing aids could be potentially equipped with eye-controlled beamformers, which would be helpful in a conversation because they could quickly change direction towards an unexpected location. On the other hand, standard head-controlled beamforming amplifies sound only from the front of the head, the movements of which are slower, potentially leading to misperceptions of initial phrases in a dynamic 'cocktail party'. In this experiment we compare these two approaches: head-controlled and eye-controlled beamforming; and we expect that the intelligibility of speech immediately after a change in target location will be more enhanced under the eye-controlled condition. The task of the participants was to listen to a sequence of numbers presented among speech-shaped noise distractors and report them back to the experimenter. The numbers could originate either from the left or right, such that the switch between the sides occurred randomly after a few trials. The subjects listened to the sequence either under the eye-controlled or head-controlled beamformer with different beam widths, which was simulated in the loudspeaker ring using head tracking and eye tracking. A condition with a fixed target location served as a control measurement. In the analysis we focus on the overall performance over the course of a block of measurements, which lasted several minutes, and the performance during the switching period, which we predict would be different during head- versus eye-driven directionality conditions. More generally, we seek to determine the benefits and drawbacks of using horizontal eye-gaze angle as a control signal for hearing aid processing.

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