The current state and future possibilities of mobile phone “voice analyser” applications, in relation to ENT

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Background: The ENT UK research council recently stated that a research priority was finding the "optimal management for adults with voice problems." Currently there is no universal protocol for voice assessment. Generally however, it includes certain common elements including a medical history, and ENT examination, a subjective voice assessment using tools such as the GRBAS scale, and an objective assessment from analysing voice parameters. Shimmer; jitter; noise-to-harmonics ratio (NHR), and fundamental frequency (F0) are just a few parameters that software can use to analysis a voice.

In recent years, the concept of ‘mHealth’ is rapidly evolving, that is, the use of mobile phones to enhance patient care in the health environment. This is reflected is the vast number of health and fitness apps that are available. Subsequently much research has gone into evaluating the usefulness of these and the evidence base behind them. This includes emerging phone applications to analyse voice. This review was undertaken to assess voice analyser smartphone applications to aid in the management of voice disorders.

Method: A literature search was performed on PubMed using terms created with the help of MeSH. Inclusion criteria were papers published within the last 5 years, using mHealth in ear, nose and throat conditions specifically to monitor voice parameters, who had final results available at the time of writing.

Results: A total of 7 papers meeting these criteria were identified. These have been summarised in the table below. Six out of seven studies concluded that smartphone assessments were comparable to current techniques. Nevertheless there remained some common issues including voice parameters used, voice pathology tested, smartphone software consistency and microphone specifications.

Conclusions: It is clear that there is a way to go before a mobile application can be used widely in voice analysis. However, promising initial results have been obtained, and the benefits of mobile technology in this field, particularly in remote voice rehabilitation, warrant further research into its widespread implementation.

Paper	Objective	Method	Conclusion
Siau et al., (2017) <i>Is OperaVox a clinically useful tool for the assessment of voice in a general ENT clinic?</i> BMC ENT Disorders 17 pp. 4	Is the OperaVox app comparable to perceptual voice analysis?	44 voices of 29 patients assessed using the app and compared to the GRBAS scale	OperaVox correlated with the results from the GRBAS scale
Mat Baki et al., (2015) <i>Reliability of OperaVox against MDVP</i> Clin. Otolaryn. 40 pp.22	Is the operaVox app comparable to MDVP?	50 voice disorder patients and 50 healthy volunteers, 5 second recording in a quiet room	OperaVox is analogous for jitter, F0 and shimmer but not for NHR
Verde et al., (2015a) <i>An m-Health system for the estimation of voice disorders</i> ICMEW	To develop a screening app for the estimation F0 and use this to distinguish a pathological voice from a healthy one	128 voices samples from a database were analysed using the PRAAT software against their app algorithm	F0 estimation using their app was found to have a good estimation and was better than other methods
Verde et al., (2015b) <i>A noise aware methodology for a mobile voice screening application</i> IWASI	To improve upon an app measuring F0 by eliminating the biasing effect of background noise levels	35 female voices (20 had Reinke’s oedema, 215 were healthy) were assessed using the app versus PRAAT	The noise-aware methodology for the voice app gave a reliable estimation of the F0
Fava et al., (2016) <i>The use of SLM apps in the clinical setting</i> Amer. J of speech-language pathology 25 pp.14	To compare 2 SLM readers against 3 iPhone apps	Tested 20 sound levels using 2 SLM readers and 3 iPhone apps using pure tone audiograms and human voices	Measuring sound levels via mobile apps is premature
Van Leer et al., (2015) <i>An iOS-based CPP application: feasibility for patient practice of resonant voice</i> J of Voice 31 p1	To test the utility, usability and self-efficacy of an app the researchers created for analysing and displaying CPP	14 patients monitored for resonant voice quality with and without the app and asked to complete a survey	Good utility , usability and self-efficacy was found using the app
Manfredi et al., (2015) <i>Smartphones offer new opportunities in clinical voice research</i> J of Voice 31 pp.1	To compare 2 smartphone recordings of voice against a clinic microphone	PRAAT software analysed synthetized voices in 2 smartphones versus one clinic microphone	Smartphones appear to be sufficient for recording and digitizing pathologic voices

1 Bohm, N, Marshall, M, Fulop, NJ, Lund, VJ, Schilder, AGM, Philpott, C and Daniel, M (2016) GENERATE: The research agenda for ENT, hearing and balance care – a UK partnership of patients, professionals and the public. ENT-UK. Image from www.direct.com