Introduction

- Objective evaluation of voice such as acoustic analysis provides additional evidence in treatment monitoring.
- Systematic and routine measurement of voice quality following any treatment is only possible in hospitals.
- **OperaVOX™ (On Person RApid VoiCe eXaminer)**, a voice analysis software running on an Apple™ iPod, iPhone and iPad, developed to enable remote voice quality assessment.

Objectives

To evaluate reliability of **OperaVOX™** against **MDVP** (Multidimensional Voice Program, KayPentax, NJ, USA).

Methods

- Participants: 50 healthy volunteers, 50 dysphonic patients.
- 9 patients with severe aperiodic voice were excluded from analysis.
- Supervised recordings using OperaVOX™ (see Figure 1) were performed in a quiet room.
- Lanyard (47cm length) was used to standardise 30cm mouth-OperaVOX™ distance.
- A five seconds recording of a sustained vowel /a/ was used to measure:
  - Fundamental frequency (F0),
  - Jitter %,
  - Shimmer %
  - Noise to harmonic ratio (NHR).
- All participants – RNTNE staffs, UCL students and staffs and patients.

Results

- High correlation (ICC) for inter- and intra-software reliability in measuring acoustic parameters in which the lower limit of 95% confidence interval >0.75 except for NHR (Table 2).
- BA plot analysis for inter-software (Figure 3) and Intra-software (Figure 4) had shown that the 95% limit of agreement (LOA) was within clinically acceptable levels.

Discussion

- **OperaVOX™** is a new acoustic analysis software that requires reliability investigation.
- Previous studies had shown that acoustic parameters are not transferrable between software programmes due to different algorithms used.
- Mean F0 was the least variable.
- Jitter, shimmer and noise measurements such as NHR or HNR was found to be poor to moderately reliable when measured inter- or intra-software programme.
- In a study, MDVP and Praat was compared – the correlation value was high, r>0.9 for the mean F0 and more than 0.7 for the jitter percent, shimmer percent and NHR.
- Another study, WPCVox vs MDVP, the acoustic parameters except the NHR produced by the WPCVox are highly correlated with the MDVP with r>0.8.
- This study, OperaVOX™ vs MDVP, there was high ICC (>0.8) for all acoustic parameters except the NHR and the BA plot 95% LOA was acceptable clinically.

Conclusion

- **OperaVOX™** had shown to be comparable to the MDVP in measuring F0, jitter % and shimmer % of voice but not NHR.
- Given its portability and applicability to a range of settings in the home or clinic, OperaVOX may has greater utility in monitoring treatment outcome in research.

**Table 1: Demographic data**

<table>
<thead>
<tr>
<th></th>
<th>Volunteers</th>
<th>Patients</th>
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<tbody>
<tr>
<td>Mean age</td>
<td>35.14 ± 10.52</td>
<td>48.96 ± 14.35</td>
</tr>
<tr>
<td>Female/Male</td>
<td>28/22</td>
<td>15/35</td>
</tr>
<tr>
<td>Mean VH10</td>
<td>1.98 ± 2.41</td>
<td>23.54 ± 8.00</td>
</tr>
</tbody>
</table>

**Table 2: Bland Altman analysis and ICC of inter- and intra-software reliability**

<table>
<thead>
<tr>
<th>Acoustic parameters</th>
<th>Inter-software (N = 91)</th>
<th>Intra-software (N = 67)</th>
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<tr>
<td><strong>F0</strong></td>
<td>Mean difference (SD)</td>
<td>0.81 (5.36)</td>
</tr>
<tr>
<td><strong>95% LOA</strong></td>
<td>12.32 and -8.71</td>
<td>18.43 and -21.39</td>
</tr>
<tr>
<td><strong>ICC (95% CI)</strong></td>
<td>0.99 (0.99 to 1.0)</td>
<td>0.99 (0.97 to 0.99)</td>
</tr>
<tr>
<td><strong>Jitter %</strong></td>
<td>Mean difference (SD)</td>
<td>-0.13 (0.71)</td>
</tr>
<tr>
<td><strong>95% LOA</strong></td>
<td>1.26 and -0.52</td>
<td>1.31 and -1.21</td>
</tr>
<tr>
<td><strong>ICC (95% CI)</strong></td>
<td>0.85 (0.78 to 0.90)</td>
<td>0.89 (0.82 to 0.93)</td>
</tr>
<tr>
<td><strong>Shimmer %</strong></td>
<td>Mean difference (SD)</td>
<td>-0.52 (1.12)</td>
</tr>
<tr>
<td><strong>95% LOA</strong></td>
<td>1.68 and -2.72</td>
<td>2.87 and -2.89</td>
</tr>
<tr>
<td><strong>ICC (95% CI)</strong></td>
<td>0.90 (0.82 to 0.94)</td>
<td>0.85 (0.76 to 0.90)</td>
</tr>
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</table>

**References**