Comment on 'Concordant validity of a digital peak cough flow meter to assess voluntary cough strength in individuals with ALS'

Abstract: not applicable

Dear Editor

I read with interest the recent publication by Tabor-Grey, Vasilopoulos and Plowman in Dysphagia [1]. The authors compared volitional peak cough flow measurements obtained with a handheld digital peak flow meter (PF100, Microlife) against measurements obtained with a laboratory system with Lilly type pneumotachograph (MLT1000L, ADInstruments). The purpose was to examine concordance between the measurements, based on the hypothesis that the more convenient and inexpensive handheld device could substitute the laboratory pneumotachograph system. Data from 109 participants with amyotrophic lateral sclerosis (ALS) were analysed using paired t-test (showing no significant difference in group means), Pearson's correlation coefficient ($r=0.826$, $p<0.001$), and Lin's concordance correlation coefficient ($p_c=0.824$). The authors' interpretation of these statistics is that these demonstrate 'high reproducibility and agreement between devices' and support the use of the handheld flow meter in individuals with ALS [1].

Several aspects of the study by Tabor-Grey, Vasilopoulos and Plowman invite further discussion, such as the description of the Microlife PF100 as a 'handheld, digital peak cough flow meter', which could mislead readers to believe that the device has been designed and developed for the purpose of measuring peak cough flow (which it has not – it is a device developed and calibrated for the measurement of peak flow and forced expiratory volume in 1 second). But I would like to highlight an important limitation to the statistical analysis conducted by the authors, which relied on correlation analysis. Bland and Altman have cautioned that correlation analysis of measurements does not address absolute dis/agreement between measurements [2,3]. In fact, correlation analysis can produce high correlation coefficients despite considerable (and potentially clinically relevant) inaccuracy in individual measurements, resulting in misleading interpretations. As an alternative to correlation analysis, Bland and Altman have described the widely used Bland-Altman method. Where individual differences in absolute measurements remain 'hidden' in correlation analysis, these differences are made apparent in Bland-Altman analysis. Importantly, this allows clinicians to judge whether the magnitude of observed individual differences is clinically relevant [2,3].

Individual differences in absolute measurements have not been presented in the paper by Tabor-Grey, Vasilopoulos and Plowman; but a visual assessment of the scatterplot in figure 2 reveals many data points, where the difference between the two measurement methods appears to be in the range between 50 to 200 L/min [1]. On a measurement scale from zero to 800 L/min, this represents considerable inaccuracy of absolute measurements. It would be helpful, if the authors could analyse and present their data in a manner that makes these individual differences apparent to the reader. A descriptive table presenting the two measurements per participant could be offered, as well as a Bland-Altman analysis of these data [2,3].

It is important that the problem of inaccuracy in the measurement of peak cough flow is highlighted in the literature, especially for clinical audiences who may not be familiar with advantages and disadvantages of different statistical analysis methods. Our group have recently published a letter, in

which we have summarised the available evidence of inaccuracy in the measurement of peak cough flow when different instruments are used; and we have argued the clinical importance of making apparent the magnitudes of differences in absolute measurements [4]. I would encourage Tabor-Grey, Vasilopoulos and Plowman to provide this type of analysis to readers, as their data will make a valuable contribution to this field of research.

Yours faithfully

Conflict of interest: The author declares no conflict.

References

[1] Tabor-Grey L, Vasilopoulos T, Plowman EK (2019) Concordant validity of a digital peak cough flow meter to assess voluntary cough strength in individuals with ALS. Dysphagia 06 September 2019. https://doi.org/10.1007/s00455-019-10060-7

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[4] Kulnik ST, Lewko A, MacBean V, Spinou A (2020) Accuracy in the assessment of cough peak flow: good progress for a “work in progress”. Respir Care 65:133-134.