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Title: Severity classification of DSP in COPD

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Body: Introduction: We have previously demonstrated in a non-specific lung disease group that the Distance Saturation Product (DSP) correlated better with total lung gas transfer(TLCO) than FEV1 and 6MWD but there is currently no method for categorising DSP severity. The BODE score for COPD patients utilises 6MWD to categorise severity. Our aims were to determine whether DSP severity score ranges can be generated and if these categories correlated with lung function (LF) parameters in patients with COPD. Method: 83 COPD patients' 6 minute walk data were retrospectively analysed to generate the DSP which incorporates walking distance and minimum saturation (6MWD*(minSpO2/100). Contemporaneous lung function parameters were also analysed. The differences in LF between the severity groups were analysed for statistical significance using Jonckheere-Terpstra and correlation between LF and DSP severity was assessed using Spearman-rho. Results: Using the BODE 6MWD categories and an assumed normal minimum saturation of 95%, the ranges established were: ≥475 Normal, 474-333 Mild, 332-238 Moderate, 237-143 Severe and ≤142 Very Severe. Significant differences ($p<0.05$) were demonstrated in FEV1, TLCO, KCO, RV, ITGV % predicted and FER% across all DSP severity groups. Significant correlations ($p<0.01$, $r>0.350$) were demonstrated in all parameters. Conclusion: We have demonstrated that DSP could be a useful clinical tool to categorise exercise intolerance in COPD patients. The demonstrated association between DSP and LF highlights the relationship between LF decline and the ability to exercise in this patient group.