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Title: The effect of pulmonary rehabilitation on exercise recovery times in COPD

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Body: Background The incremental shuttle walk (ISW) is an exercise outcome used in pulmonary rehabilitation (PR). The minimum clinically important difference (MID) for the ISW in COPD is 47.5 metres. Many COPD patients report improvement in exercise capacity following PR despite not achieving the MID for the ISW. We hypothesised that ISW recovery times improve in COPD patients who do not achieve the ISW MID with PR. Aim To determine whether heart rate (HR), BORG score and oxygen saturation (O₂) recovery times improve with PR in patients who show limited or no improvement in ISW. Method We retrospectively analysed data from 156 consecutive COPD patients completing an 8 week PR program who showed a +/-47.5 metre change in ISW. HR, BORG and O₂ were measured pre and post ISW prior to starting PR and at completion. Recovery times were calculated as the time taken for the HR, BORG and O₂ to return to their baseline after the ISW. Values were normalised to ISW distance. Pre and post PR data was analysed using Wilcoxon Tests. Results Baseline characteristics are presented as median (25th, 75th percentiles). Age 71 years (65, 76), FEV₁ % predicted 42.5 (28.0, 57.8), MRC 4 (3, 4) and ISW 190 (90, 270). The median pre-post change in ISW was 20 (0, 40). There were statistically significant improvements in normalised HR, BORG and O₂ recovery times.

	PRE-REHAB	POST-REHAB	p value
BORG recovery time/ISW	0.62 (0.34, 1.29)	0.57 (0.30, 1.00)	p < 0.001
HR recovery time/ISW	0.68 (0.39, 1.22)	0.58 (0.35, 1.01)	p < 0.001
SpO ₂ recovery time/ISW	0.26 (0.10, 0.66)	0.26 (0.08, 0.52)	p = 0.02

Conclusion HR, BORG and O₂ recovery times following ISW are responsive to change with PR. This may be an alternative method of showing physiological response to PR in COPD patients.

