The effect of manual therapy and exercise on mild chronic obstructive pulmonary disease: a randomised controlled trial

by

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Conflict of interest

No conflicts of interest to declare

Chronic obstructive pulmonary disease (COPD)*

A preventable and treatable disease with significant extra-pulmonary effects that contribute to the severity in individual patients

Characterised by:

- Declining lung function
- Decreasing exercise capacity

Clinical presentation:

- Chronic Bronchitis
- Emphysema
- Chronic Asthma

<u>Exercise capacity is a prognostic indicator for long-term survival</u>

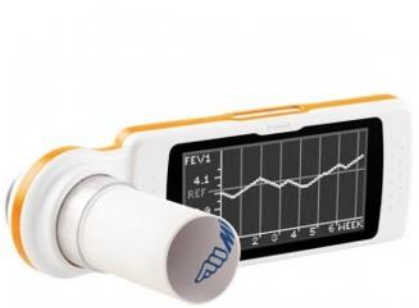
* COPDX Guidelines 2.56 (December 2018)

COPD: Main symptoms

- Increasing breathlessness (dyspnoea) on exertion
- Cough & sputum production
- Chest tightness (decrease in thoracic compliance)
- Wheezing
- Airway irritability
- Frequent chest infections

COPD: Classification*

Classified by lung function (spirometry)



Ability to forcibly blow air out (forced expiration)

- Forced expiratory volume in 1st second (FEV_1)
- Forced vital capacity (FVC)
- Ratio FEV_1 / FVC < 0.70 diagnostic

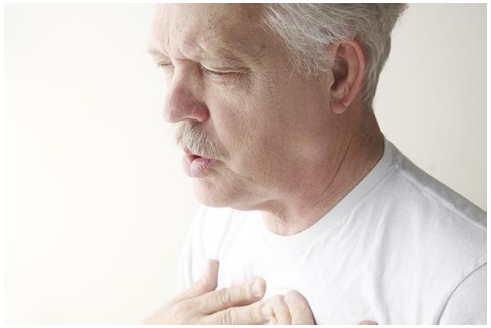
Stages

FEV_1% predicted	Severity	Daily activities
≈ 60-80%	Mild	Little or no effect
≈ 40-59%	Moderate	Increasing limitation
< 40%	Severe	Severely curtailed

* COPDX Guidelines 2.56 (December 2018)

Goals of treatment

Different for various stages of COPD (Chee & Sin 2008)



- Moderate to severe
  - Prevent respiratory complications such as exacerbations
  - Prevent mortality

- Mild
  - Symptom relief
  - Slowing disease progression
  - Mitigating risk of comorbidities such as cardiovascular disease

- Systematic review on exercise for mild COPD (Jacome & Marques 2014)
  Benefits in short-term but medium to long-term uncertain

Current evidence for the use of MT for COPD

12 studies over the past 40 years: N = 216

Study	Design	COPD stage	MT intervention	Size (n)	Risk of Bias	Results
Miller 1975	RCT	Moderate	OMT	23	High	Lung function improved Subjective improvements
Howell *et al* 1975	Pre-post	Moderate	OMT	17	High	Symptom severity score reduced
Witt & MacKinnon 1986	RCT		Spinal Mobilisation	12	High	Lung function improved Subjective improvements
Masarsky & Weber 1988	Case study	Moderate	CMT	1	High	Increase in lung function Subjective improvements
Beeken *et al* 1998	Pre-post	Moderate	NMRT	5	High	Lung function decreased
Noll *et al 2008*	RCT	Severe	OMT (7 techniques)	35	High	Lung function decreased Subjective improvements
Putt *et al* 2008	RCT	Moderate	Muscle stretching	14	High	Lung function improved
Dougherty *et al* 2011	Case series	Severe	CMT	6	High	Short-term increase in FEV_1 Not sustained at 4 weeks post-intervention
Noll *et al* 2009	RCT	Severe	OMT (4 techniques)	25	Low	No change in lung function Only immediate subjective improvements
Zanotti *et al* 2012	RCT	Severe	OMT + Exercise	20	Low	Reduction in RV Increase in exercise performance
Engel *et al* 2013	RCT	Moderate	OMT + Exercise	15	Low	Increase in FVC & exercise performance Decrease in dyspnoea
Engel *et al* 2016	RCT	Moderate /Severe	OMT + Exercise	33	Low	Increase in FVC sustained at 24 weeks Increase in exercise capacity

Underlying mechanism

MANUAL THERAPY PROTOCOL - MTP (2 components)

Soft tissue therapy (STW): Decreases muscle tension + Spinal manual therapy (SMT): Increases joint mobility
Increases muscle length

MTP produces short-term decrease in chest tightness

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Increase in thoracic compliance

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Delayed onset of exercise-limiting dyspnoea

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Increase in exercise performance

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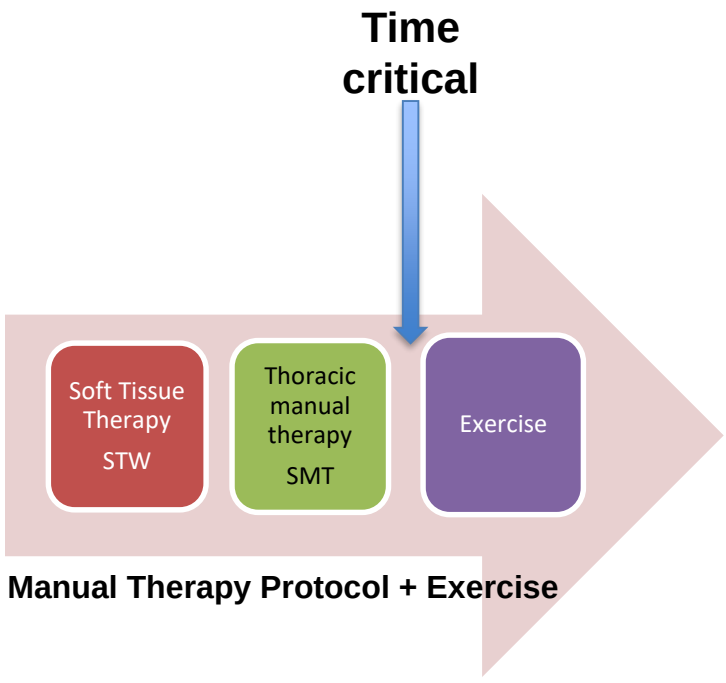
Over time, increase in exercise capacity



Research questions?

1. Does exercise deliver benefits in mild COPD over the medium to long-term?

2. Does adding MT to exercise increase those benefits in mild COPD?

Trial design

Randomised Controlled Trial (Phase III)

NSW public hospital – outpatients with mild COPD

50 to 65 years

2 groups: Exercise

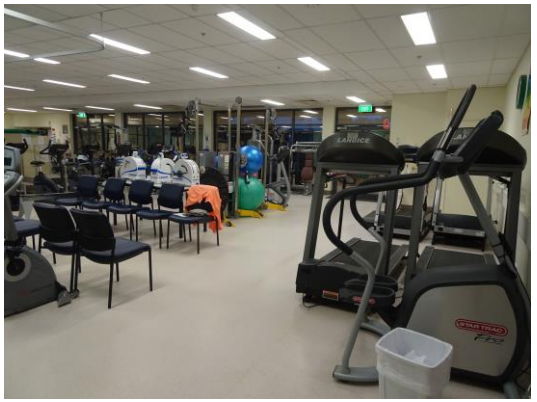
SMT + Exercise

Outcome measures at 0, 4, 8, 16, 24, 32 & 48 weeks

Lung function (FVC, FEV_1)
Quality of Life (SGRQ; HAD)
Exercise capacity (6MWT)

Interventions (SMT & Ex)

16 weeks of exercise (weeks 1-16)
4 weeks of SMT intervention (weeks 5-8)



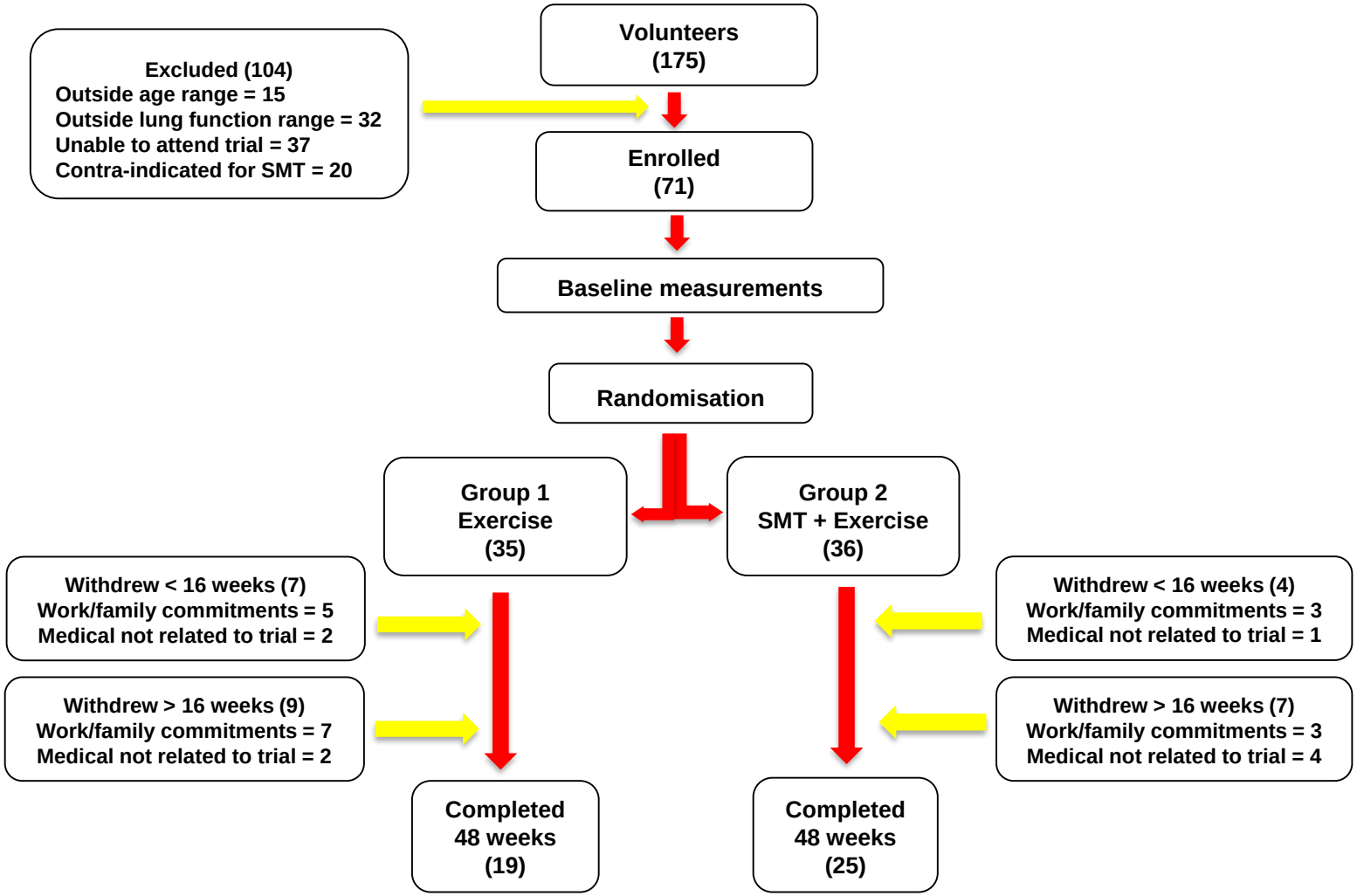
Ethics approval: SESLHD HREC (approval no:13/004)
Data collection October 2014 - February 2019

Trial registration: ANZCTRN:12614000766617

Statistical analysis

- Linear mixed effects model to examine change over time between groups
- $P < 0.004$ (0.05/12 to account for multiple comparisons – Bonferroni)
- Intention-to-treat (ITT) analysis undertaken via linear mixed-effects model
- Tukey all-pairwise comparisons used to compare time points

Participant flow chart



Baseline characteristics[a]

Characteristic	Group 1: Ex n = 35	Group 2: MT+Ex n = 36	All groups n = 71
Age (years)	58.5 (4.0)	58.6 (3.8)	58.5 (3.9)
Gender (F:M)	29:6	24:12	53:18
FEV_1 (litres)	2.31 (0.43)	2.59 (0.66)	2.46 (0.56)
FVC (litres)	3.16 (0.57)	3.71 (1.00)	3.5 (0.87)
SGRQ total	25.2 (15.0)	19.0 (14.4)	21.8 (14.9)
symptoms	33.4 (23.2)	30.1 (20.4)	31.8 (21.5)
activity	37.9 (19.8)	23.4 (16.5)	29.9 (19.3)
impact	14.8 (13.3)	11.8 (14.3)	13.2 (13.9)
HAD anx	6.5 (4.1)	4.5 (2.3)	5.5 (3.4)
HAD dep	4.0 (3.4)	2.7 (2.4)	3.3 (2.9)
6 MWT (metres)	575 (59)	615 (59)	597 (66)

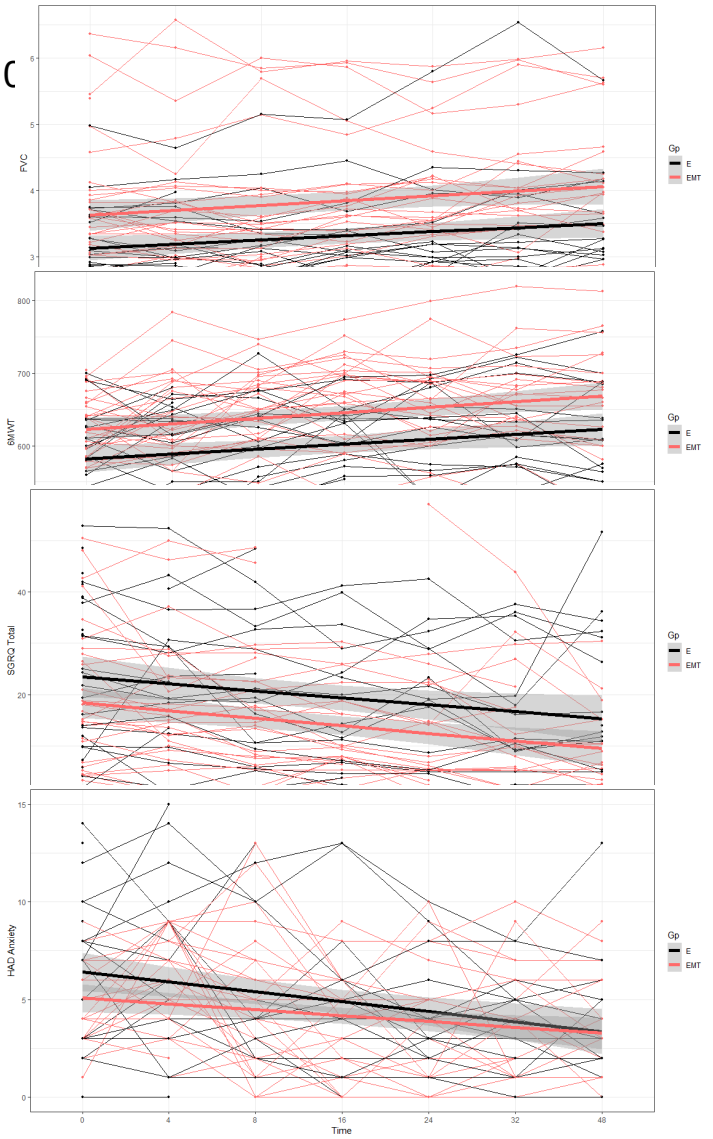
[a] All values except gender are given as means with standard deviation in parentheses. Ex, exercise; MT+Ex, manual therapy plus exercise; FEV_1, forced expiratory volume in the 1st second; FVC, forced vital capacity; SGRQ, St George's respiratory questionnaire; HAD anx, hospital anxiety and depression scale – anxiety score; HAD dep, hospital anxiety and depression scale – depression score; 6MWT, 6-minute walking test.

Results

- No difference in effect between groups over time (p>0.(
  - SMT did not produce any additional benefits
  - Breathing mechanics not as affected in mild v moderate COPD
  - Limited scope for increasing thoracic compliance

- Change over time (no interaction model)
  - Improvements in:
    - Lung function (FEV_1 & FVC; p<0.001)
    - Exercise capacity (6MWT; p<0.001)
    - Quality of Life (SGRQ activity, impact & total; p<0.001)
    - Anxiety and Depression (HAD; p<0.001)

- Clinically meaningful average change from baseline (weeks)
  - FVC: 32 & 48 (MCID: 200 mL)
  - 6MWT: 8,16,24,32 & 48 (MCID: 25m)
  - SGRQ activity, impact & total: 16,24,32 & 48 (MCID: 4 units)
  - HAD anxiety: 24 & 32 (MCID: 1.5 units)



Safety - Adverse events related to Thoracic SMT

Total of 512 x thoracic mobilisations/manipulations

- 32 participants received SMT + Ex intervention
- 2 x mobilisations/manipulations per session x 8 sessions

Adverse Events (AE)

- No severe
- No moderate
- 21 mild AEs from 14 participants
- Incidence rate = 4.1% (very low compared to previous studies in COPD)

In summary

- Exercise delivers medium to long-term benefits in lung function, exercise capacity and quality of life in mild COPD
- Potential to improve prognosis of mild COPD
  Exercise capacity is a prognostic indicator for long-term survival
- In mild COPD, Thoracic Manual Therapy does not deliver additional benefits in LF, EC and QoL compared to exercise alone
  Different to previous results for moderate/severe COPD
- Thoracic SMT appears to be relatively safe for 50-65 year olds with mild COPD
  Similar to results for moderate COPD

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Thank you

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