

WHO Collaborating Centre  
for Palliative Care, Policy and  
Rehabilitation



Cicely Saunders  
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Better care at the end of life

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*College*  
**LONDON**

# Exercise and physical activity during cancer treatment

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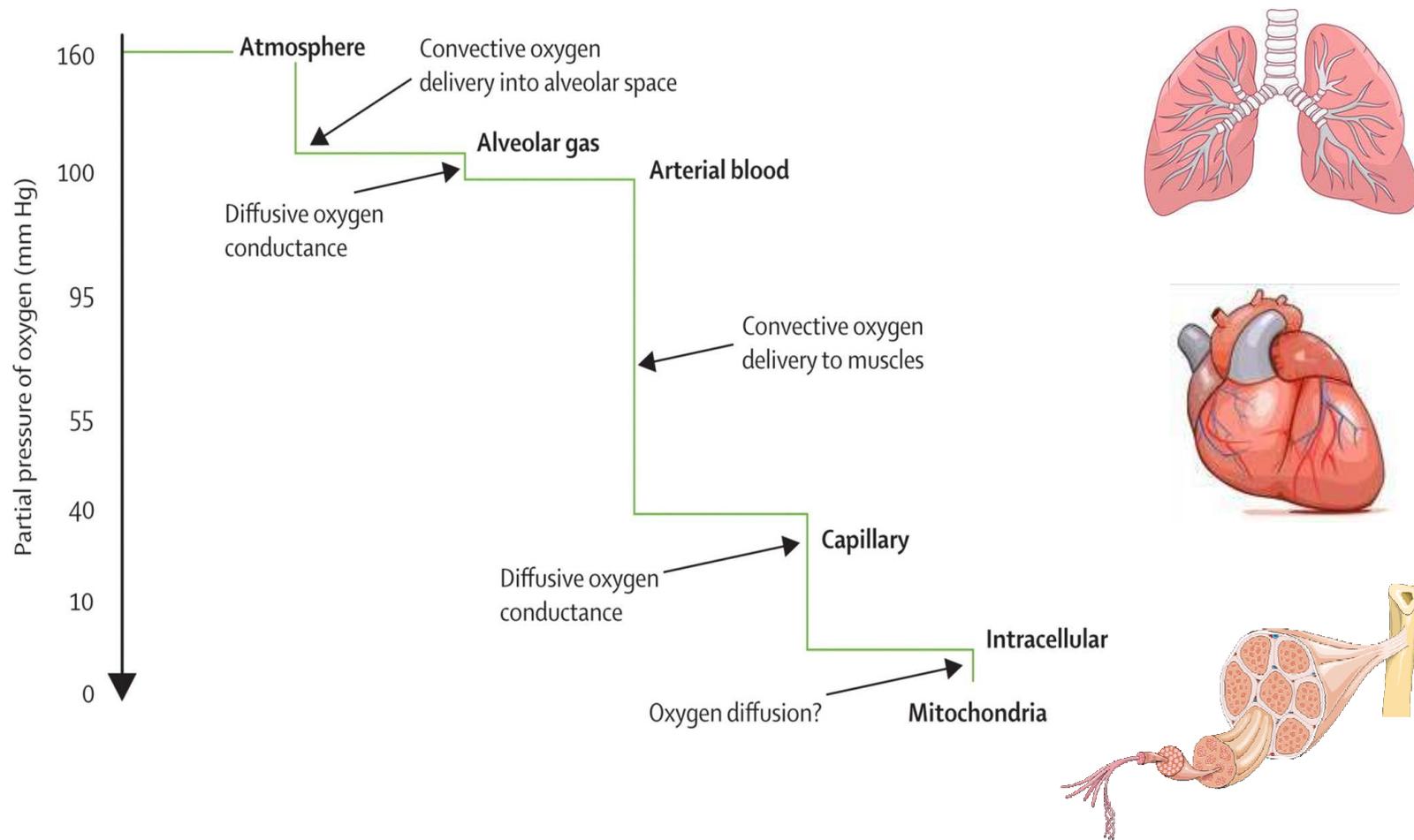


# Outline

- Scene setting and rationale
- Exercise based approaches
- Challenges to a ‘training mind-set’
- Physical activity programmes
- Summary and conclusions

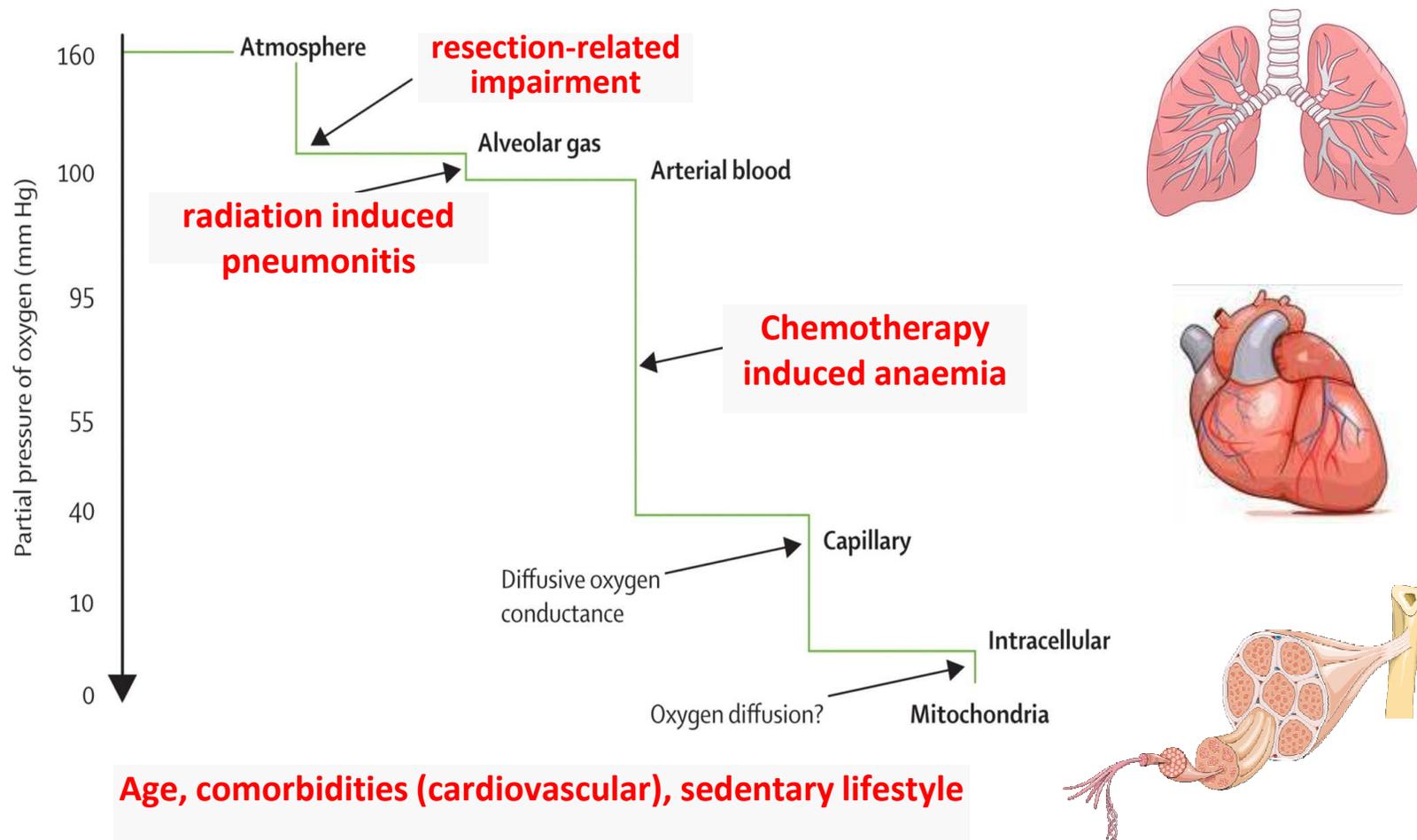


# Whole body exercise performance



*Jones et al. Lancet Oncol 2009;10:598-605*

# Whole body exercise performance



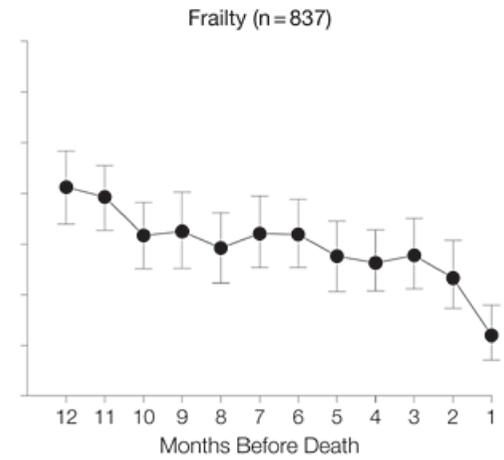
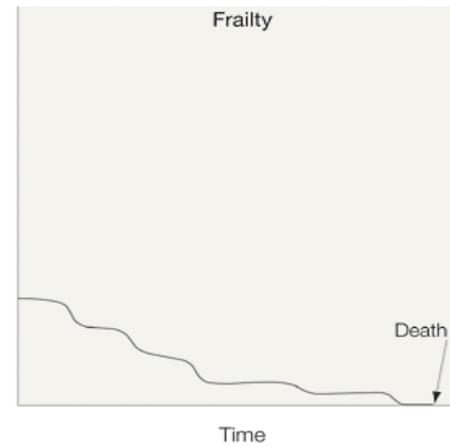
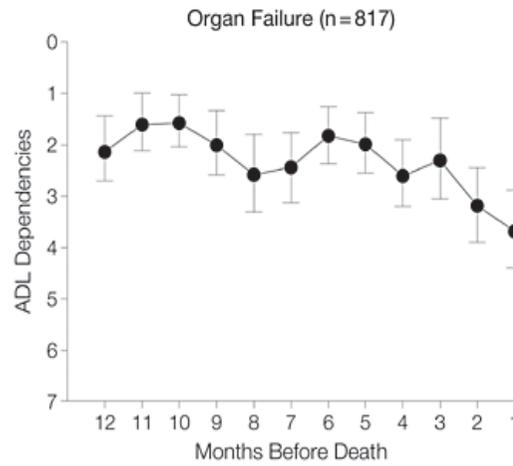
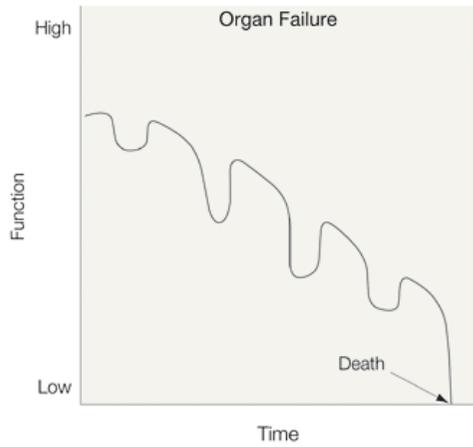
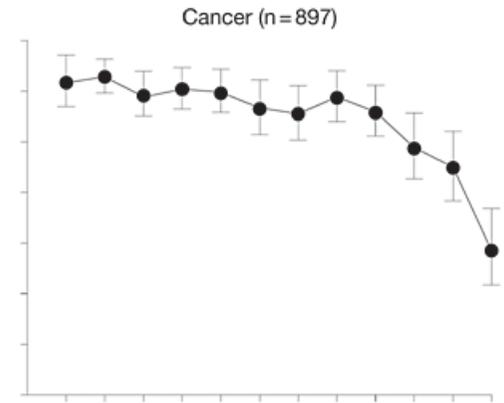
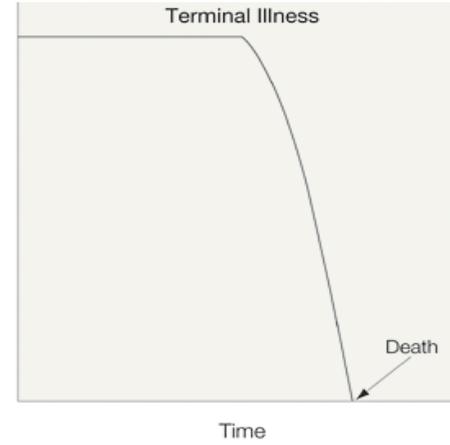
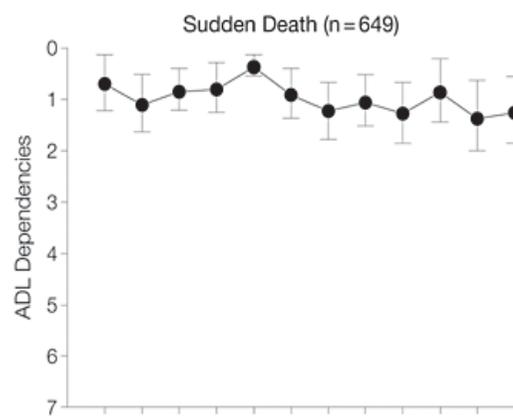
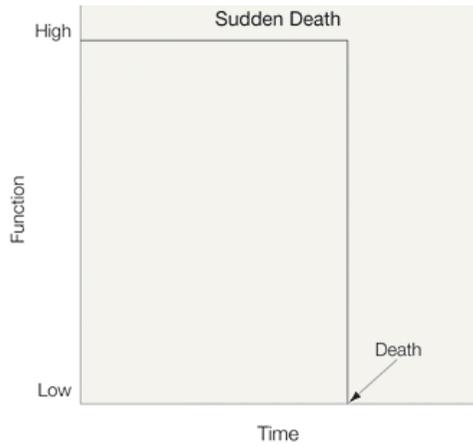
## Effect of bed rest in older adults

**Table.** Effects of 10 Days of Bed Rest in Older Adults

	No. of Participants (N = 12) <sup>†</sup>	Mean (95% Confidence Interval)		Change	P Value
		Bed Rest			
		Before	After		
Muscle fractional synthetic rate, % per h <sup>‡</sup>	10	0.077 (0.059 to 0.095)	0.051 (0.035 to 0.067)	-0.027 (-0.007 to -0.047)	.02
% Change				-30.0 (-7.0 to -54.0)	
DEXA lean mass, kg <sup>‡</sup>	10				
Whole body		48.05 (40.61 to 55.49)	46.51 (39.57 to 53.45)	-1.50 (-0.62 to -2.48)	.004
% Change				-3.2 (-1.4 to -5.0)	
Lower Extremity		15.01 (12.41 to 17.61)	14.06 (11.85 to 16.27)	-0.95 (-0.42 to -1.48)	.003
% Change				-6.3 (-3.1 to -9.5)	
Isokinetic muscle strength, Nm per s <sup>§</sup>	11	120 (96 to 145)	101 (81 to 121)	-19 (-11 to -30)	.001
% Change				-15.6 (-8.0 to -23.1)	

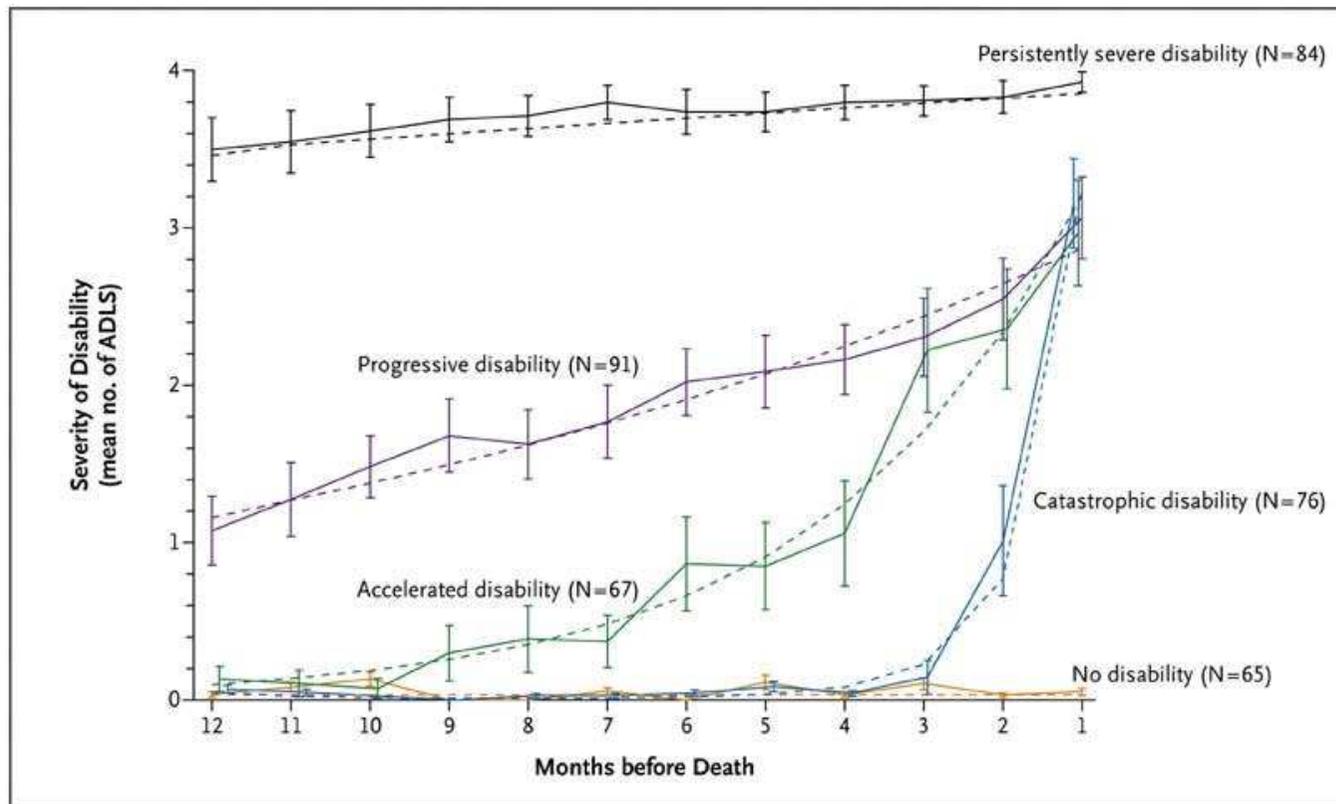
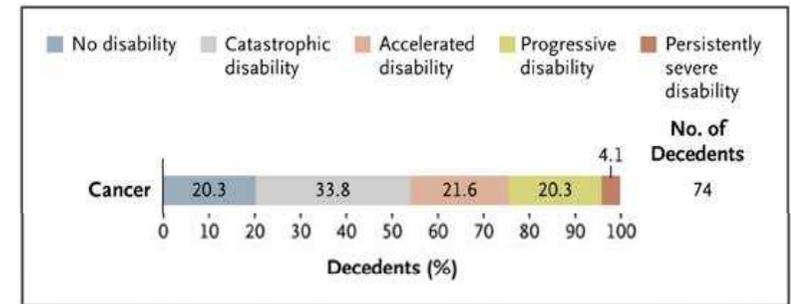
**3-fold loss compared to young adults in 1/3 time**

# Trajectories of functional decline



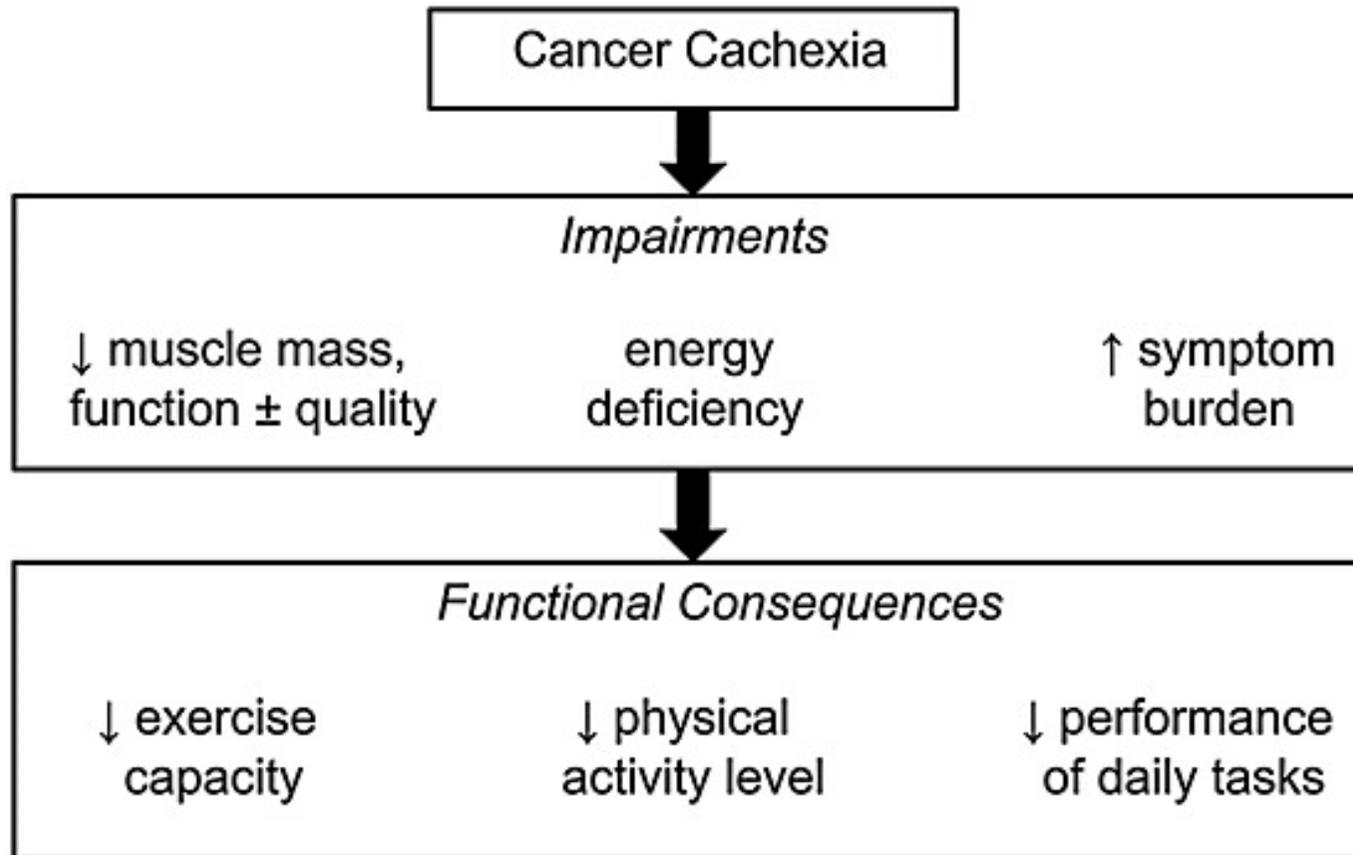
*Lunney et al. JAMA 2003;289:2387-92*

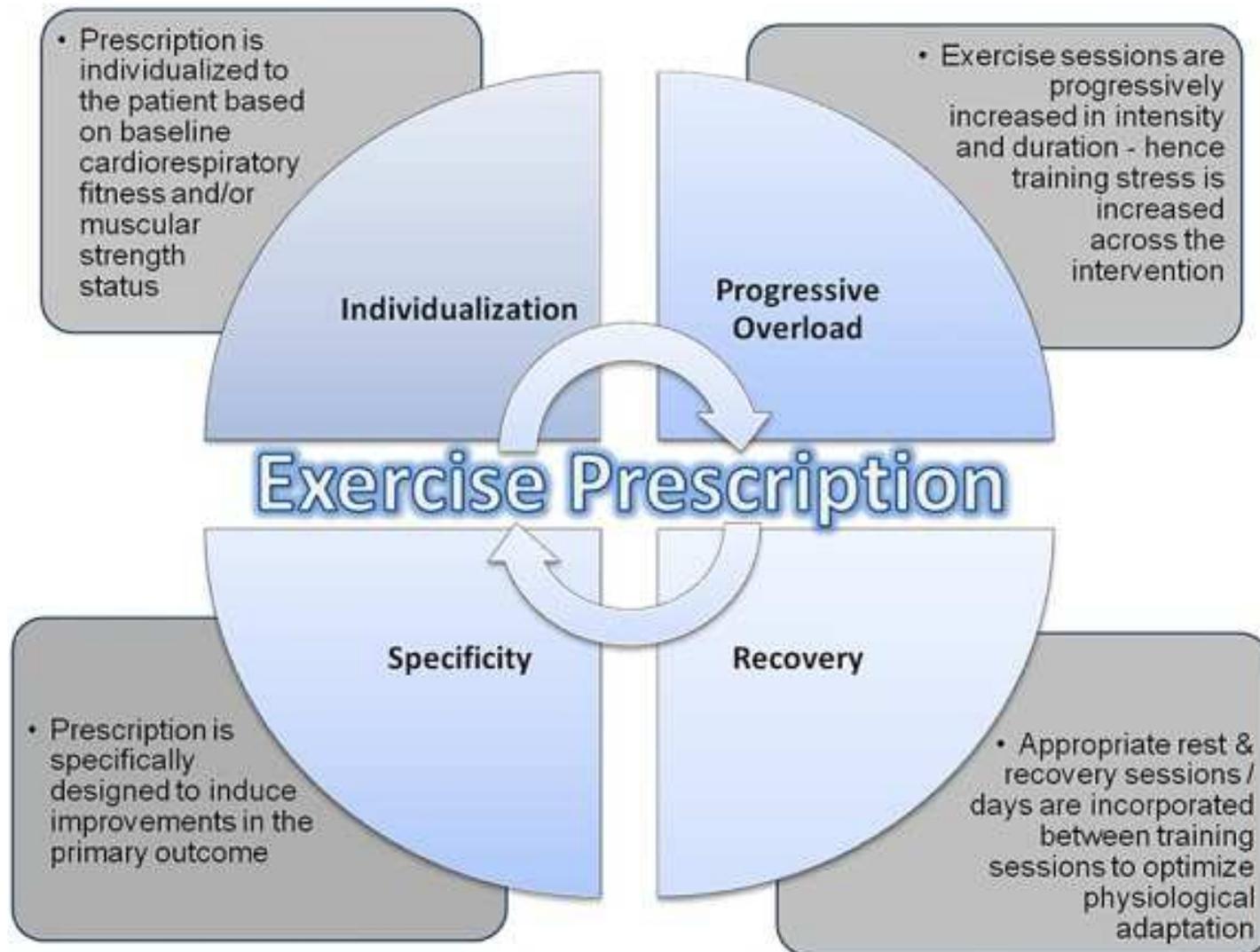
# Trajectories of functional decline



Gill et al. NEJM 2010;362:1173-80

# Impact of cancer on function





Described by:  
**F**requency  
**I**ntensity  
**T**ype  
**T**iming



## Short-Term Preoperative High-Intensity Interval Training in Patients Awaiting Lung Cancer Surgery: A Randomized Controlled Trial

n=151  
30 min, 3x/wk  
High A>R, 3-  
4 wks

- >80% underwent major resection via open thoracotomy
- ↑ peak VO<sub>2</sub> (15%), peak work rate (6%) and 6MWD (15%) compared to deterioration in usual care
- Primary endpoint: 30 day mortality or in-hospital complications (Grade ≥2 TMM)
- *Change in sample size after interim analysis*

**Table 4. Primary and Secondary Outcomes after Lung Resection**

Outcomes	Usual Care (n = 77)	Rehabilitation (n = 74)	p Value
Primary composite end point	39 (50.6)	27 (36.5)	0.080
30-Day mortality	2 (2.6)	2 (2.7)	0.640
Respiratory complications	33 (43)	17 (23)	0.009
ARDS	1 (1.3)	2 (2.79)	0.972
Ventilation (>6 h)	5 (6.5)	8 (10.8)	0.512
Pneumonia	15 (19.5)	8 (10.8)	0.209
Atelectasis	28 (36.4)	9 (12.2)	<0.001
Cardiovascular complications	10 (13)	13 (17.6)	0.578
Acute coronary syndrome	1 (1.3)	2 (2.7)	0.972
Acute heart failure	0 (0.0)	2 (2.7)	0.460
Pulmonary embolism	1 (1.3)	2 (2.79)	0.972
Stroke	0 (0.0)	1 (1.4)	0.984
Arrhythmias	8 (10.4)	11 (14.9)	0.560
Surgical complications			
Reoperation	2 (2.6)	8 (10.8)	0.089
Bronchopleural fistula	3 (3.9)	3 (4.1)	0.714
Wound infections	4 (5.2)	3 (4.1)	0.957
Renal dysfunction <sup>a</sup>	4 (5.2)	2 (2.7)	0.731
Length of stay in PACU, h	25 (10)	17 (7)	<0.001
Unplanned ICU admission	14 (18.2)	10 (13.5)	0.574
Length of stay in hospital, d	9 (7-13)	10 (8-12)	0.223

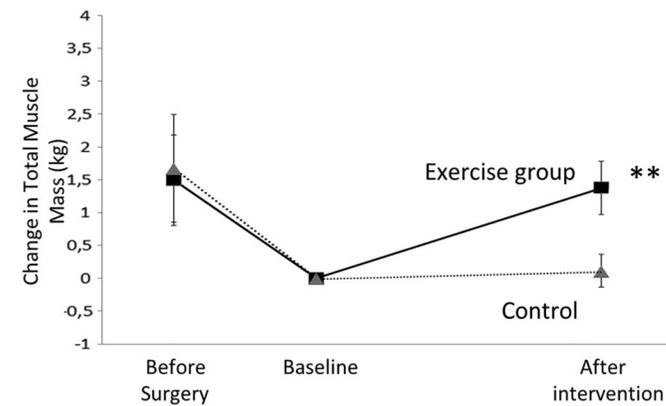
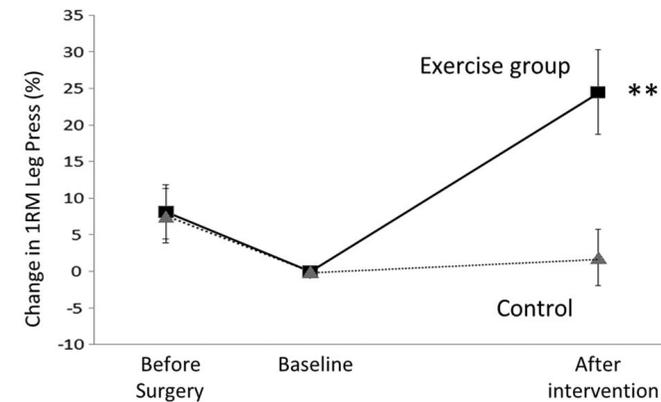
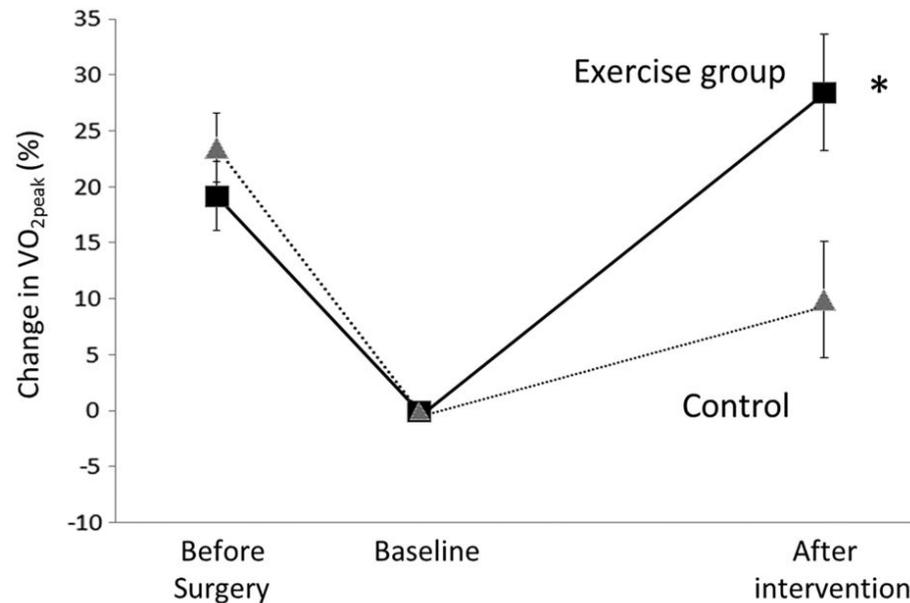
Licker et al. *J Thorac Oncol* 2017;12:323-33

## Lung cancer

ORIGINAL ARTICLE

### High-intensity training following lung cancer surgery: a randomised controlled trial

n=61  
60 min, 3x/wk  
High A>R,  
20 wks

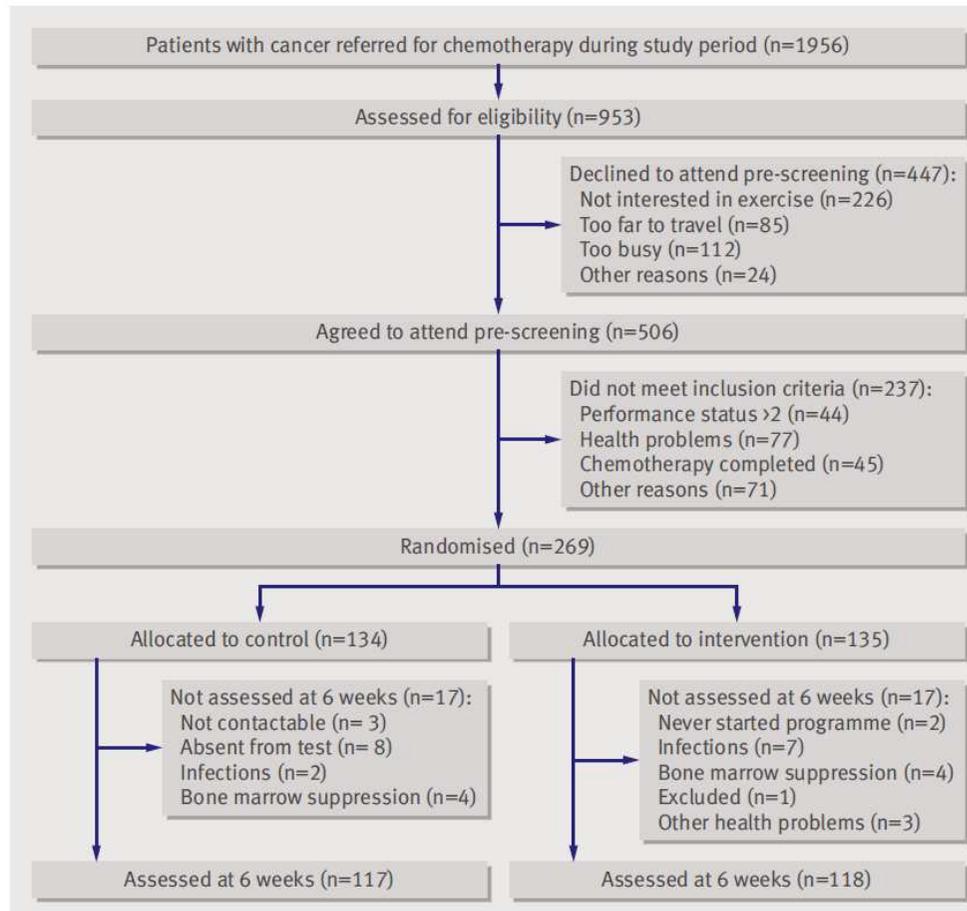


- ↑ SF-36 physical + mental
- ↑ EORTC C30 dyspnoea

Edvardsen et al. Thorax. 2015;70:244-50

## Effect of a multimodal high intensity exercise intervention in cancer patients undergoing chemotherapy: randomised controlled trial

n=269  
120 min, 4x/wk  
High A+R, 6 wks



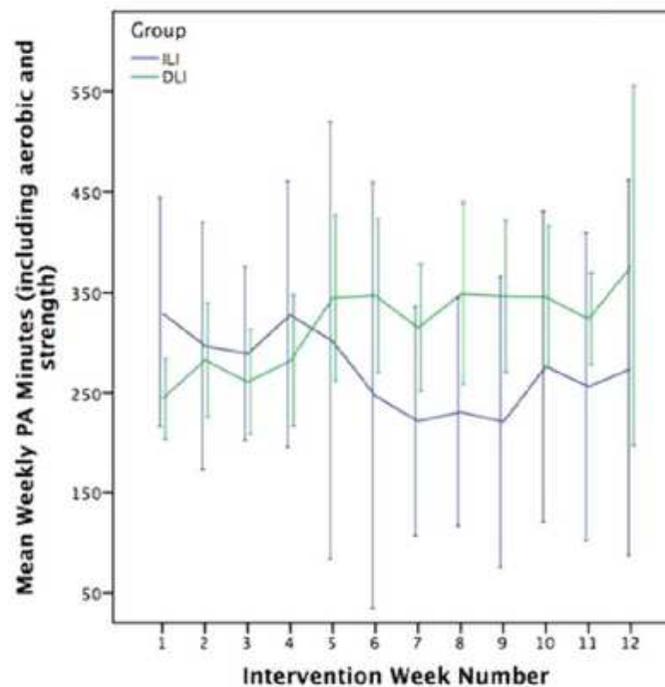
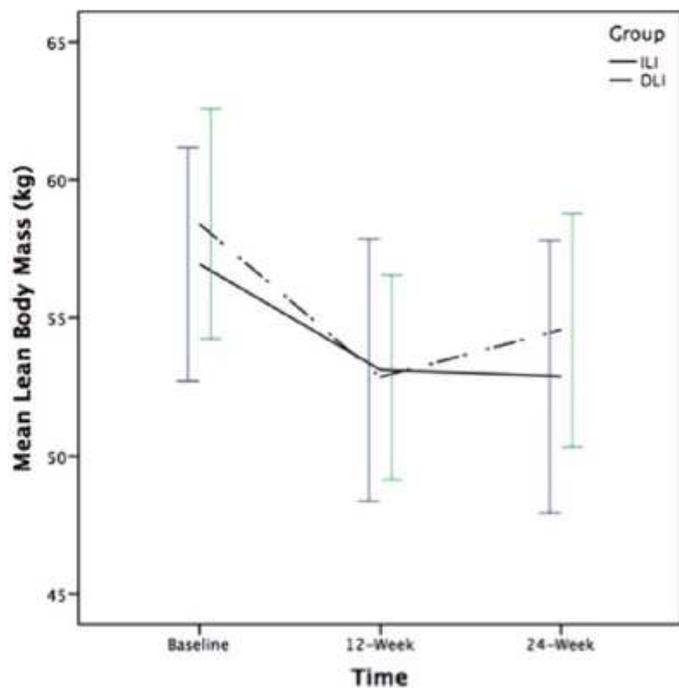
- Large but select group
- ↓ fatigue
- ↑ exercise capacity
- ↑ muscle strength
- ↑ PAL
- ↑ SF-36 scores
- EORTC-C30 unchanged

# Patient-Reported Outcomes, Body Composition, and Nutrition Status in Patients With Head and Neck Cancer: Results From an Exploratory Randomized Controlled Exercise Trial

Lauren C. Capozzi, PhD Candidate<sup>1</sup>; Margaret L. McNeely, PT, PhD<sup>2</sup>; Harold Y. Lau, MD<sup>3</sup>; Raylene A. Reimer, PhD, RD<sup>1,4</sup>; Janine Giese-Davis, PhD<sup>3,6</sup>; Tak S. Fung, PhD<sup>5</sup>; and S. Nicole Culos-Reed, PhD<sup>1,2,6</sup>

n=60  
60 min, 4x/wk  
Mod R+A, 12 wks

- + Physician referral
- + Health education
- + Behaviour change support
- + Individualised nutrition
- + Social support



Adamsen et al. Cancer 2016;112:1185-1200

### Physical Exercise for Cancer Patients with Advanced Disease: A Randomized Controlled Trial



**Table 3.** Estimated differences in fatigue (physical, mental, and total) and physical performance outcomes between the physical exercise group (PEG) and the usual care group (UCG) using multiple imputation

Outcome variable	Baseline Mean (SD)	8 Wks Mean (SD)	Estimated mean difference (95% CI)	p-value <sup>a</sup>
<b>Total fatigue</b>				
UCG	18.0 (0.58)	17.2 (0.62)	-0.5 (-2.0-1.0)	0.53
PEG	18.1 (0.48)	16.8 (0.60)		
<b>Physical fatigue</b>				
UCG	12.6 (0.43)	12.1 (0.50)	-0.3 (-1.6-1.0)	.62
PEG	12.9 (0.37)	11.9 (0.51)		
<b>Mental fatigue</b>				
UCG	5.4 (0.22)	5.2 (0.19)	-0.3 (-0.6-0.3)	.53
PEG	5.2 (0.19)	4.9 (0.19)		
<b>Shuttle walk test, m</b>				
UCG	390 (17.8)	369 (21.5)	60 (16.0-103.4)	.008
PEG	339 (17.1)	380 (24.2)		
<b>Sit-to-stand, times per 30 seconds</b>				
UCG	11.6 (0.38)	11.9 (0.48)	0.5 (-0.5-1.5)	.34
PEG	10.9 (0.32)	11.7 (0.47)		
<b>Maximal stepping, cm</b>				
UCG	92.0 (2.2)	90 (2.0)	3.0 (-1.8-7.7)	.22
PEG	85.8 (2.3)	88.9 (2.3)		
<b>Handgrip strength, kg</b>				
UCG	29.6 (0.94)	28.3 (0.97)	2.0 (0.4-3.5)	.01
PEG	26.4 (0.85)	27.5 (0.95)		

<sup>a</sup> Analysis of covariance with baseline measurement and group as covariates (coefficient for treatment group in analysis of covariance). Abbreviations: CI, confidence interval; SD, standard deviation.

n=231  
60 min, 2x/wk  
Mod R>A, 8wks

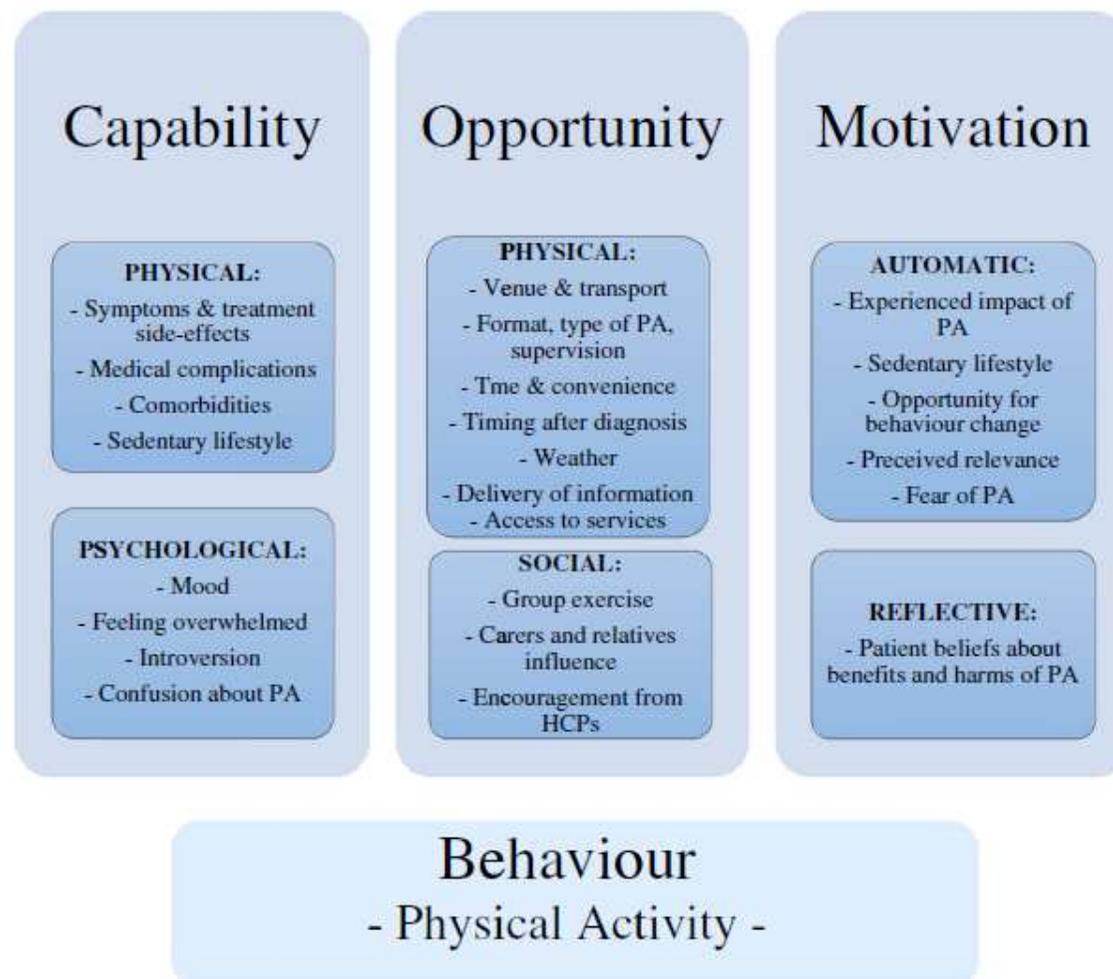
- Loss to follow up 36% vs. 23%
- Survival markedly different in non-completers
- Fatigue unchanged but function improved



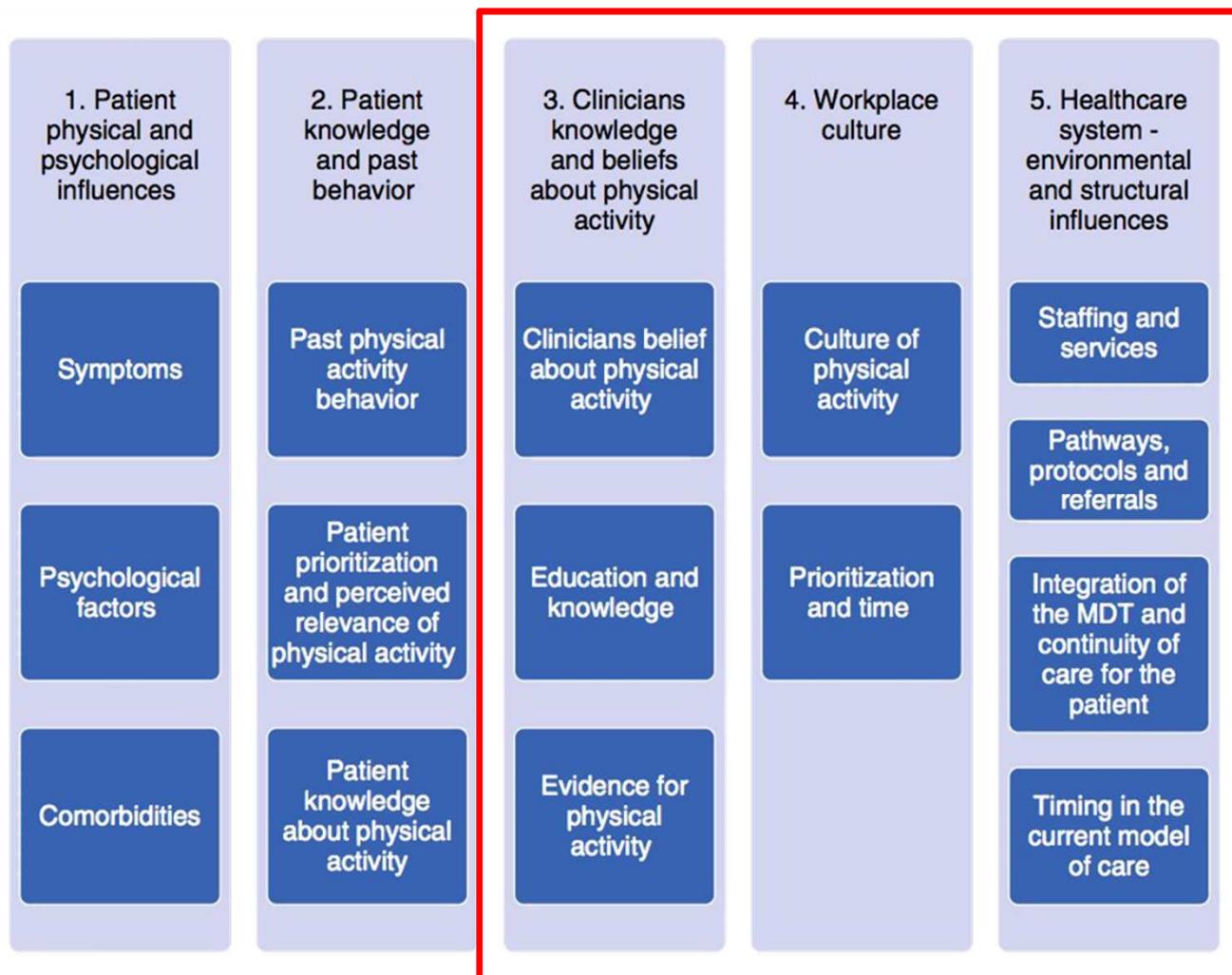
# EXERCISE

Some motivation required.

# Individual factors influencing behaviour



# Contextual factors influencing behaviour



## Improving accessibility of exercise

### - Offer programme proactively -

- more likely patients have capacity
- focus on maintenance may allow benefit from low dose programmes
  - dose response
  - ‘more the better’
  - ‘any better than none’
- low intensity or low volume models sufficient to prevent disuse atrophy

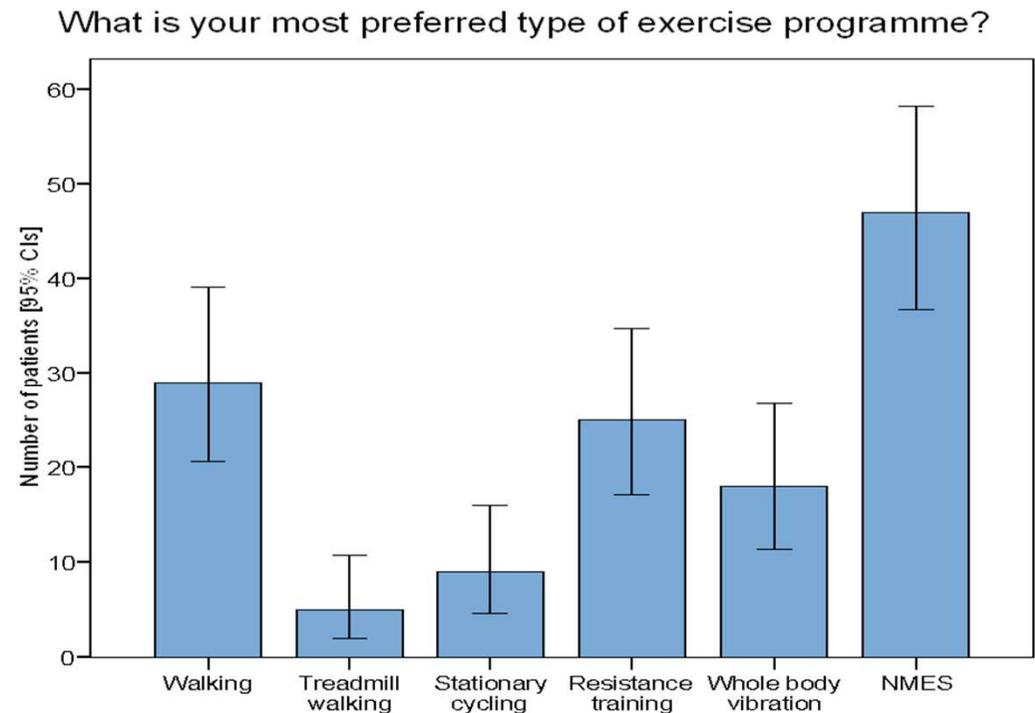
# Improving accessibility of exercise

## - Offer a range of programmes -

Typically  $\geq 2/3$  patients asked about an exercise programme report interest.

General preference to undertake exercise:

- at home
- alone and unsupervised
- following systemic treatment.



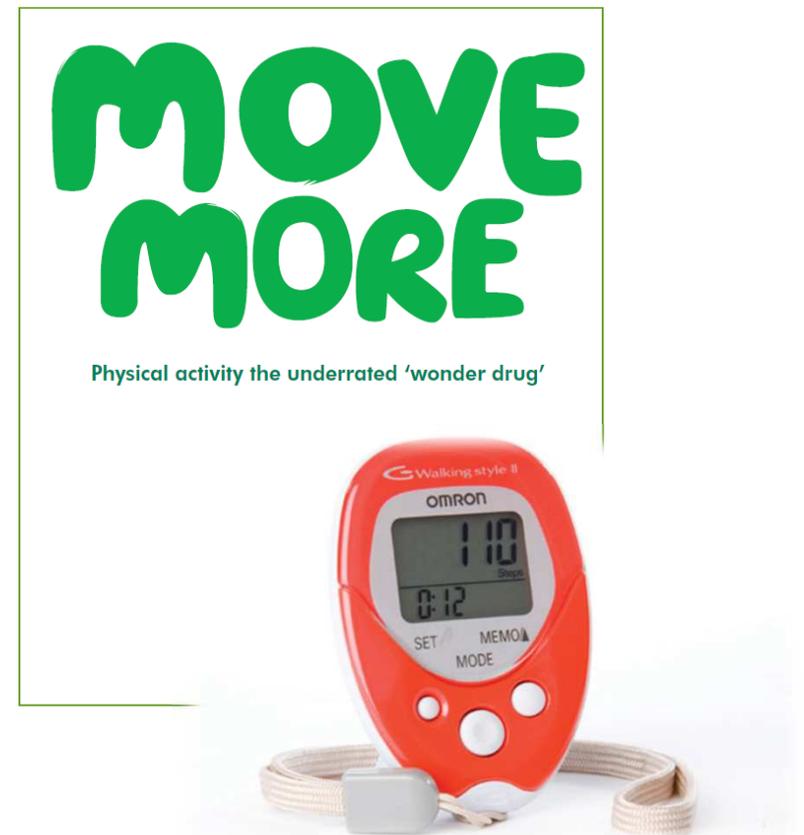
*Maddocks et al. Psycho-Oncology 2011;20:173-8*

*Lowe et al, Support Care Cancer 2010;18:1469-75*

# Improving accessibility of exercise

## - Promote usual physical activity-

- Treat activity as a 'vital sign'
- Reassure patients around normal exertion symptoms
- Promote opportunities to be active by 'licensing' daily tasks, active hobbies and interests
- Ask the patient about their goals

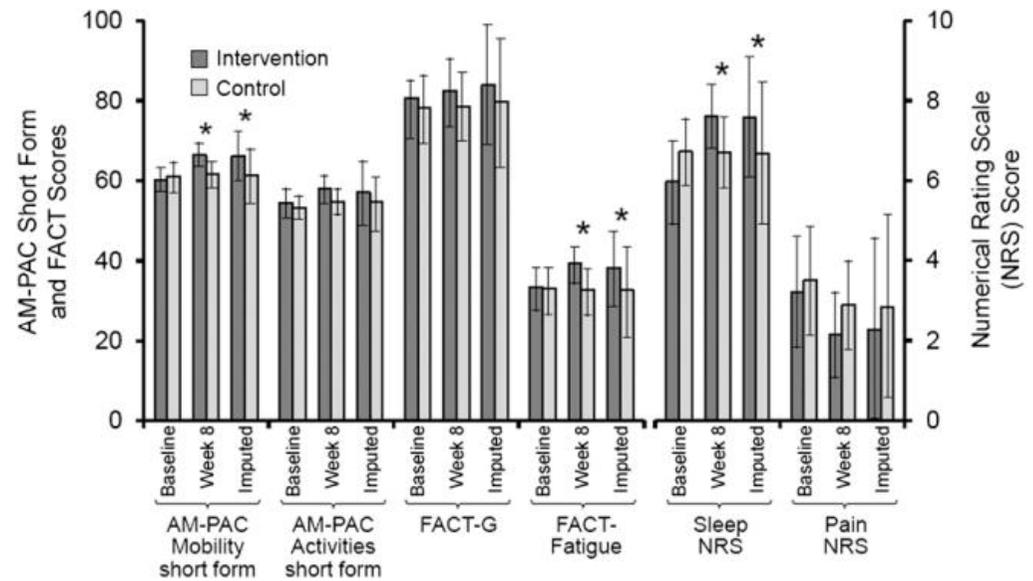


Original Article

# A Home-Based Exercise Program to Improve Function, Fatigue, and Sleep Quality in Patients With Stage IV Lung and Colorectal Cancer: A Randomized Controlled Trial

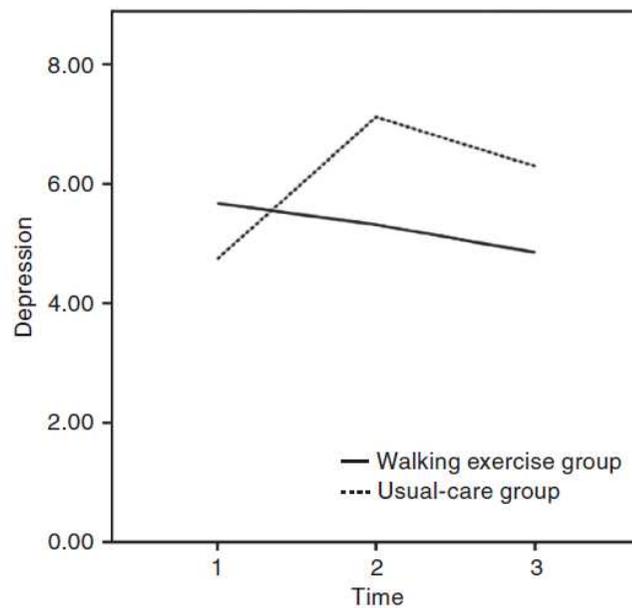
n=66  
90 min, 4x/wk,  
Low-Mod, A+R  
8 wks

- ‘REST’ programme
- Rapid Easy Strength Training
- Simple pedometer
  
- ↓ fatigue
- ↑mobility
- ↑ sleep quality

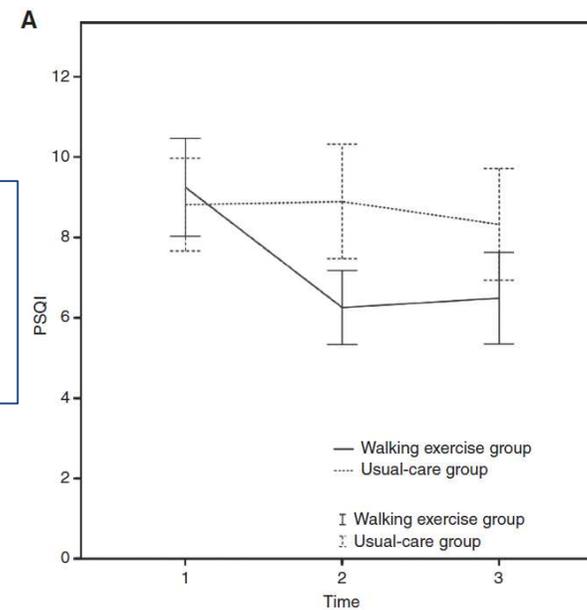


### Randomised controlled trial on the effectiveness of home-based walking exercise on anxiety, depression and cancer-related symptoms in patients with lung cancer

### Effect of walking on circadian rhythms and sleep quality of patients with lung cancer: a randomised controlled trial



n=116  
40 min, 3x/wk  
Low-Mod A,  
12 wks



**BMJ Open** CanWalk: a feasibility study with embedded randomised controlled trial pilot of a walking intervention for people with recurrent or metastatic cancer

n=42  
30 min, 3-4x/wk  
Low A, 24 wks

*It had a revolutionary effect on me... It was just the right thing at the right time. I think more about walking now, I think I can walk there instead of catching the bus.*



*I would recommend it, particularly to people who are not sporty... When I'm on the walks I forget about the cancer.*

*It (the group) makes me do more than I would if I was walking on my own, as I live on my own it's great being out and meeting other people*

*I no longer dwell on being terminal – just on getting on with making life as enjoyable as possible, greatly helped by friends made on regular walks*

## Conclusions

- Cancer and its treatment reduce physical function through an effect on cardiovascular and muscular fitness
- Exercise and physical activity can help alleviate the consequences of these impairments on patients.
- Intensive, supervised exercise programmes are effective across a range of outcomes, but are not always acceptable or practical.
- Early intervention with a focus on physical activity may help improve acceptability and accessibility.