



”Betydning af fysisk træning”

At cancer diagnosis – A ‘window of opportunity’ for behavioural change towards physical activity for breast cancer patients

Pilot study n=45, RCT n=154

’No conflicts of interests to declare’

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	Patients enrolled Nov. 2015	Final sample size	Intervention adherence rate
Self-esteem in children and young adults during and after cancer treatment - 'RESPECT'	Intervention group: 69	Intervention group: 120	97%
Preoperative & early initiated rehabilitation in patients with operable lung cancer - 'PROLUCA'	Feasibility 40 RCT 213	Feasibility 40√ RCT 213	Feasibility 73%
'Four critical moments' - within rehabilitation in patients with operable lung cancer	58	58√	93%
An exercise intervention in inoperable lung cancer patients undergoing chemotherapy - 'EXHALE'	Feasibility 25 216	Feasibility 25√ 216	Feasibility 73%
Diagnosed with cancer – 'A window of opportunity' to change sedentary lifestyles in patients with breast- or colon cancer undergoing chemotherapy - 'SEDENTARY'	Feasibility 45 RCT 153	Feasibility 45√ 154	70%
The effect of recreational football training in men with prostate cancer receiving Androgen Deprivation Therapy - 'FC-Prostate'	57	57√	77%
Protract Progressive Resistance training and patients with testicular cancer undergoing chemotherapy - 'PROTRACT'	45	45√	70 %
Patient Activation through Counseling and Exercise – Acute Leukemia - 'PACE-AL'	Feasibility 20 RCT 70	Feasibility 20√ 70√	71%
Neuro-Oncology Rehabilitation: Rehabilitation of patients with high-grade glioblastoma and their relatives – 'NEON-REHAB'	84	84√	81%



National Danish recommendations for physical activity: (Screening criteria)

- Udfører mindst 150 minutters moderat fysisk aktivitet pr. uge i fritiden
-
- Udfører mindst 2 X 20 minutters anstrengende fysisk aktivitet om ugen (styrketræning, kondition)

Forskningsprogrammet for fysisk inaktive kvinder med brystkræft indbefatter:

- et randomiseret feasibility/pilotstudie (n=45)
- et eksplorerende kvalitativt studie (n=33)
- et randomiseret kontrolleret effektstudie (RCT) af to forskelligartede 12-ugers interventioner (n=154)
- Et sub-studie af RCT på effekten af træning på lymfødem og styrketræning (n=153)

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Research

BMJ Open Sport & Exercise Medicine

The challenge of preserving cardiorespiratory fitness in physically inactive patients with colon or breast cancer during adjuvant chemotherapy: a randomised feasibility study

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► Prepublication history and additional material is available. To view please visit the journal (<http://dx.doi.org/10.1136/bmjsem-2015-000021>).

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ABSTRACT

Introduction: Anti-neoplastic treatment is synonymous with an inactive daily life for a substantial number of patients. It remains unclear what is the optimal setting, dosage and combination of exercise and health promoting components that best facilitate patient adherence and symptom management in order to support cardio-respiratory fitness and lifestyle changes in an at-risk population of pre-illness physically inactive cancer patients.

Methods: Patients with breast or colon cancer referred to adjuvant chemotherapy and by the oncologists pre-screening verified as physically inactive were eligible to enter a randomised three-armed feasibility study comparing a 12-week supervised hospital-based moderate to high intensity exercise intervention or alternate an instructive home-based 12-week pedometer intervention, with usual care.

Results: Using a recommendation based physical activity screening instrument in order to correspond with cardio-respiratory fitness (VO2 peak) proved to be an applicable method to identify pre-illness physically inactive breast and colon cancer patients. The study demonstrated convincing recruitment (67%), safety and intervention adherence among breast cancer patients; while the attendance rate for colon cancer patients was notably lower (33%). VO2-peak declined on average 12% across study groups from baseline to 12 weeks though indices towards sustaining watt performance and reduce fat mass favoured the hospital-based intervention. Pedometer use was well adapted in both breast and colon cancer patients.

Conclusions: Despite a fair adherence and safety, the current study calls into question whether aerobic exercise, regardless of intensity, is able to increase VO2-peak during taxane-based chemotherapy in combination with Neulasta in physically inactive breast cancer patients.

Trial Registration: ISRCTN24901641

Strengths and limitations of this study

- The feasibility study demonstrated that pre-diagnostic physically inactive patients with breast or colon cancer may be identified by clinicians by using a simple screening instrument based on national recommendations for physical activity that associates with low cardiorespiratory capacity at onset of adjuvant chemotherapy.
- Physically inactive patients with breast cancer may be motivated to participate in supervised comprehensive or home-based exercise interventions of moderate-to-high intensity at onset of adjuvant chemotherapy. The low recruitment and high attrition of patients with colon cancer made it inadequate to raise a clear conclusion on feasibility.
- Both interventions were well timed and showed fair adherence and safety among patients with breast cancer but were partly inconclusive for patients with colon cancer regarding timing and volume of exercise components.
- The current feasibility study calls into question whether aerobic exercise, regardless of intensity, is able to increase cardiorespiratory capacity during taxane-based chemotherapy in combination with Neulasta among patients with breast cancer.

BACKGROUND

In Denmark, 4637 people were diagnosed with breast cancer and 2551 with colon cancer during 2011.¹ Improved treatment has increased the expected 5-year survival rate to 79% for breast cancer and 52% for colon cancer.^{1,2} A European survey among cancer survivors reported recently that <25% meet the current physical activity guidelines.³ Studies on exercise oncology are



12 ugers hjemmebaseret instrueret Skridttæller Intervention (LOW PED)



Table 2 Home-based individual progressive pedometer intervention

Week 1	Week 2	Week 4	Week 6	Week 9	Week 12
Establish baseline level <i>Pedometer instruction</i>	Planning of pedometer use	Pedometer instruction and evaluation	Pedometer instruction and evaluation	Telephone: pedometer instruction and evaluation	Pedometer instruction and evaluation
Baseline	Week 6	Week 12	Week 39		
Health counselling and symptom management (1 h)	Health counselling and symptom management (1 h)	Health counselling and symptom management (1 h)	Health counselling and symptom management (1 h)		



12 ugers hospitalsbaseret superviseret Gruppe Intervention 9 timer/uge (HIGH HOSP)

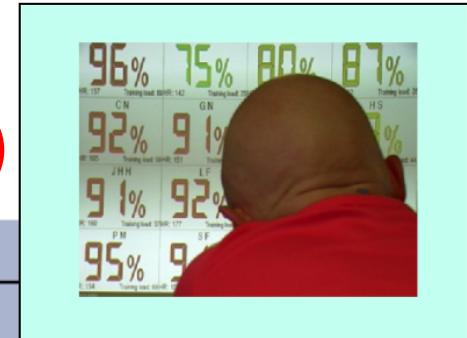


Table 1 Hospital-based supervised group exercise intervention

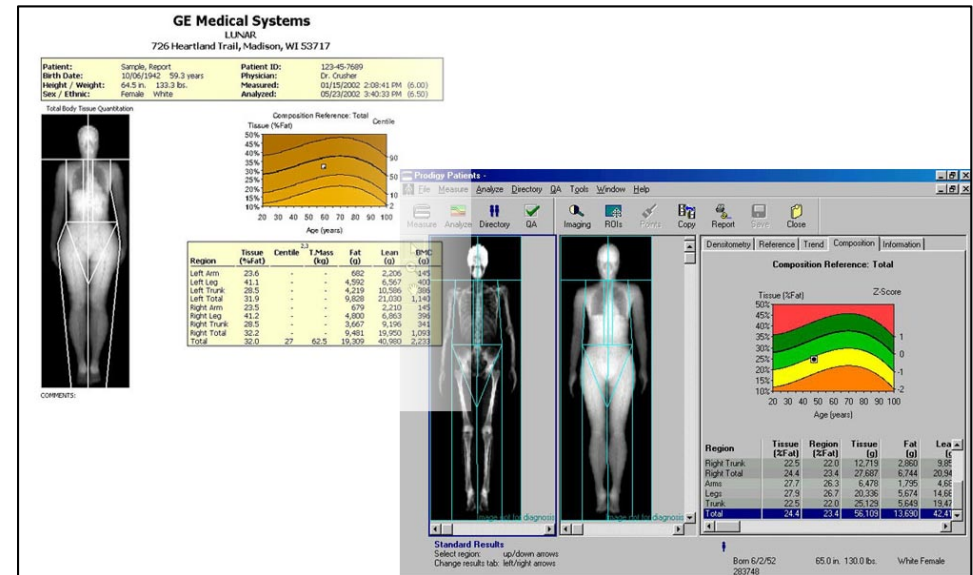
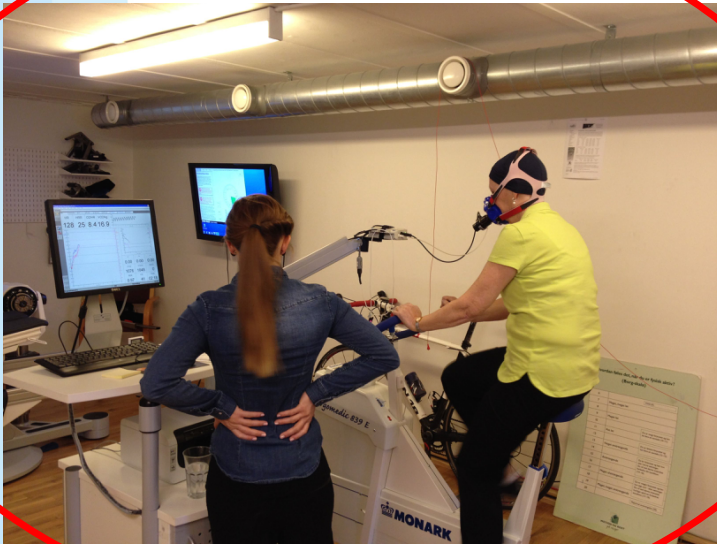
Weekly schedule

	Monday	Tuesday	Wednesday	Thursday	Friday	
Part 1	<i>6 weeks 9 h/week</i>					
	Physical exercise (1.5 h)	Body awareness (1.5 h)	Physical exercise (2 h)		Physical exercise (1.5 h)	
	Relaxation (0.5 h)	Relaxation (0.5 h)	Relaxation (0.5 h)		Relaxation (0.5 h)	
	Massage(0.5 h)				Massage (0.5 h)	
Part 2	<i>6 weeks all-sport training 6 h/week</i>					
	Physical exercise (2 h) eg, ballgames, dancing, resistance and cardio training		Physical exercise (2 h) eg, ballgames, dancing, resistance and cardio training		Physical exercise (2 h) eg, ballgames, dancing, resistance and cardio training	
Baseline	Week 6				Week 12	Week 39
Health counselling and symptom management (1 h)	Health counselling and symptom management (1 h)				Health counselling and symptom management (1 h)	Health counselling and symptom management (1 h)



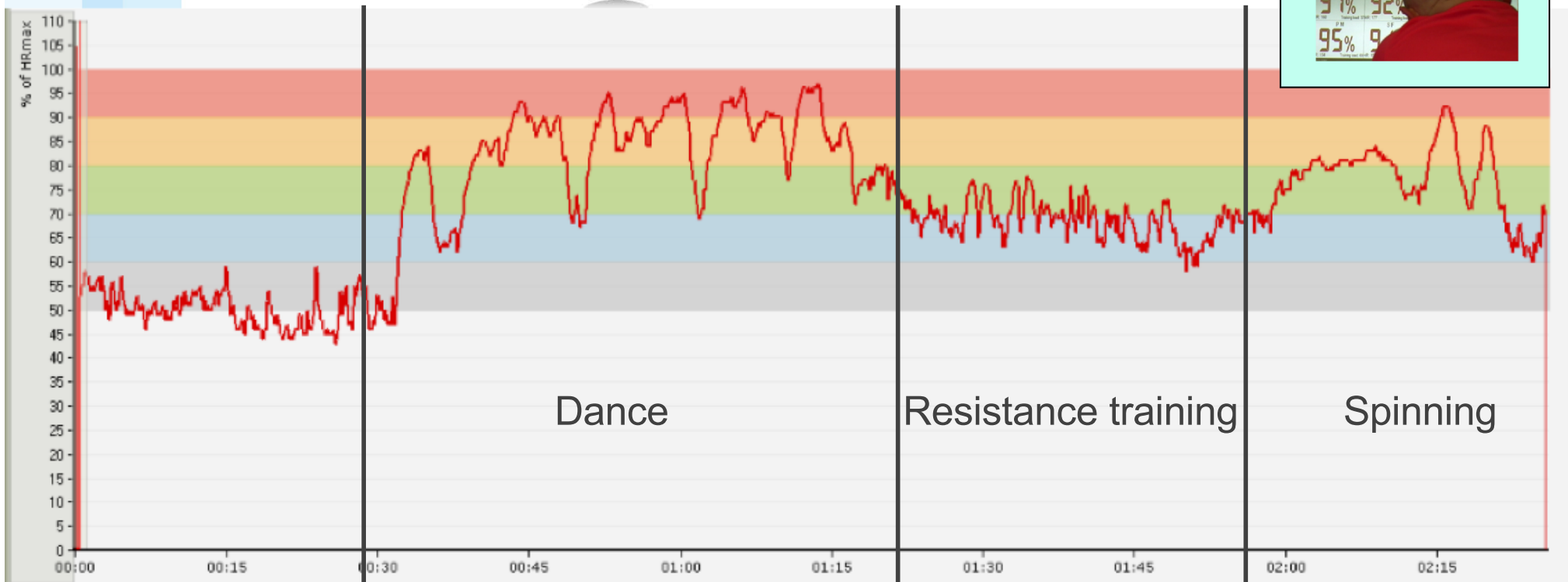
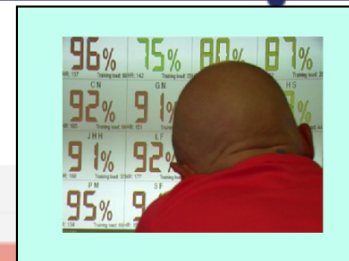
Feasibility and RCT Jan. 2012 – nov. 2016

Copenhagen Capital Region





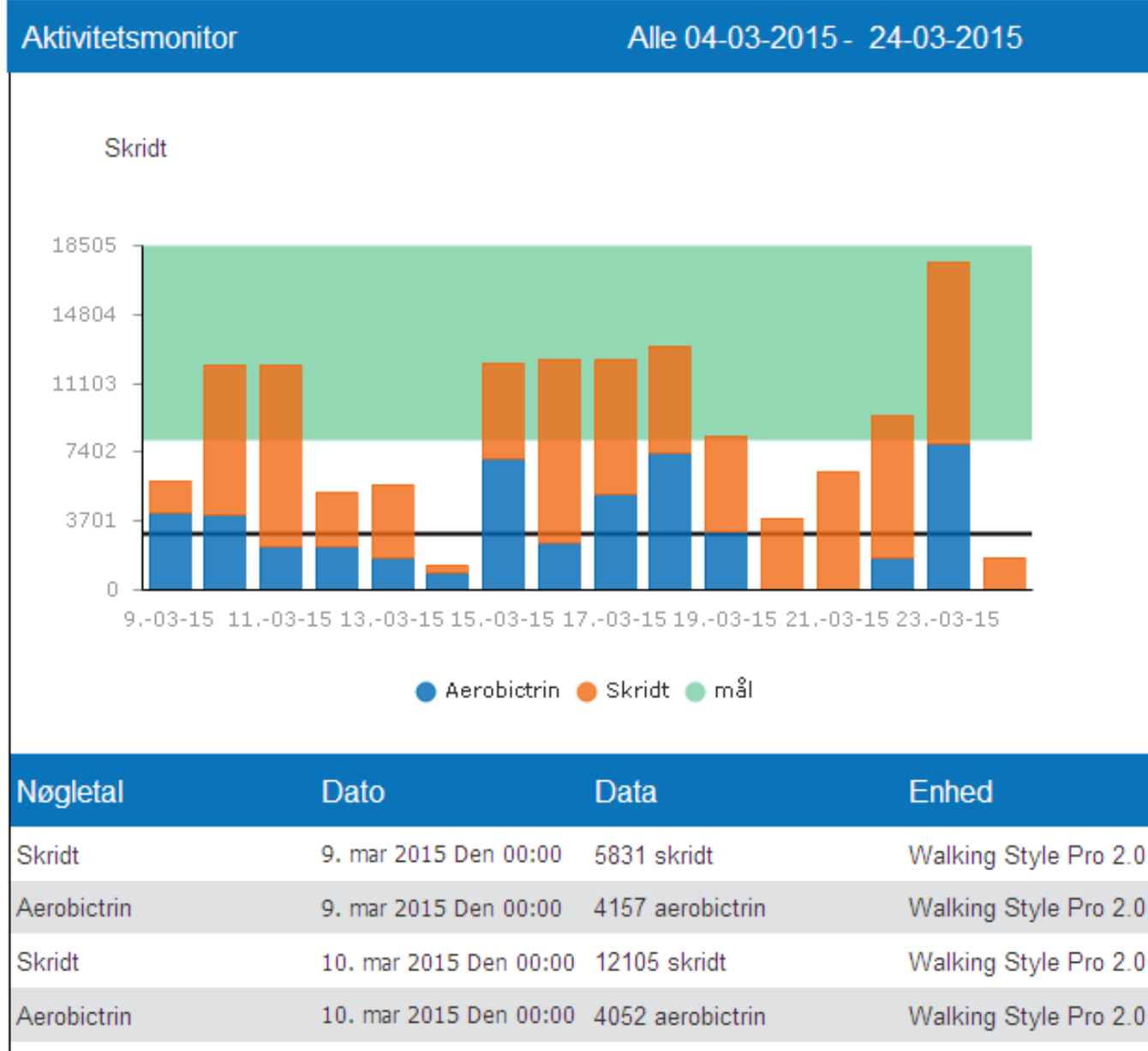
Pulsmåler



HR

Time in sport zones

	02:25:55	HR			Time in sport zones				
		Minimum	Average	Maximum	50-59	60-69	70-79	80-89	90-100
		77	127	187	00:32:15	00:28:00	00:36:45	00:33:40	00:15:15
Max HR: 177		43,0%	71,0%	105,0%	22,0%	19,2%	25,2%	23,1%	10,5%



Rigshospitalet

DET SUNDHEDSVIDENSKABELIGE FAKULTET
KØBENHAVNS UNIVERSITET



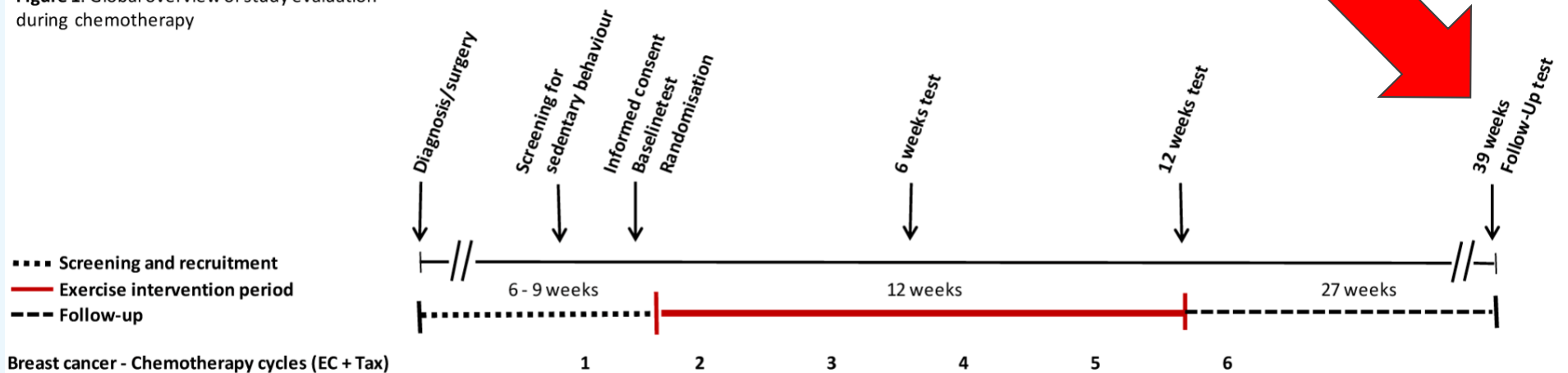
REGION





Relevans - Timing - Dosis - Respons??

Figure 1: Global overview of study evaluation during chemotherapy





BMJ Open

Open Access Research

BMJ Open Rethinking exercise identity: a qualitative study of physically inactive cancer patients' transforming process while undergoing chemotherapy

Lis Adamsen,^{1,2} Christina Andersen,¹ Christian Lillelund,¹ Kira Bloomquist,¹ Tom Møller^{1,2}

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► Publication history and additional material for this paper are available online. To view please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2017-016689>).

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ABSTRACT
Objective: To explore physically inactive breast and colon cancer patients' prediagnosis exercise history and attitudes to physical activity (PA) and experiences in initiating PA while undergoing adjuvant chemotherapy.
Design: An explorative qualitative study guided the interpretive analysis of semistructured, open-ended interviews conducted at initiation of chemotherapy and after 12 weeks. The study was embedded in a pilot randomised controlled trial.
Setting: Participants were recruited from the Oncological Department at a hospital in Copenhagen, Denmark.
Participants: 33 patients with cancer, median age 49 years: 25 patients with breast cancer and 8 with colon cancer, 72% with a low cardiac respiratory fitness level and the majority with a high level of education. Patients received adjuvant chemotherapy, oncologist's PA recommendation and exercise, cancer nurse specialist's counselling prior to allocation to PA interventions or waitlist control group.
Results: Prediagnosis exercise had been excluded from patients' daily lives due to perceptions of exercise as boring, lack of discipline and stressful work conditions for both genders. Recommendations from oncologists and nurses inspired the patients to reconsider their attitudes and behaviour by accepting recruitment and participation in PA interventions during chemotherapy. Despite extensive side effects, most patients adhered to their PA commitment due to their perception of the bodily, emotional and social benefits and support of healthcare professionals, peers and family.
Conclusion: The patients' attitude towards exercise transformed from having no priority in patients' daily lives prediagnosis to being highly prioritised. This study identified four important phases in the exercise transformation process during the patients' treatment trajectory of relevance to clinicians in identifying, motivating and supporting physically inactive patients with cancer at long-term risk. Clinicians should address young, highly educated patients with cancer at onset of adjuvant chemotherapy due to their specific risk of a sedentary lifestyle resulting from being in stressful, ambitious careers.

Strengths and limitations of this study

- Understanding the transformation of behaviour among physically inactive patients with cancer is crucial to developing effective patient-clinician collaborative strategies to reduce comorbidities and minimise cancer recurrence. To address this issue, we performed a qualitative study involving in-depth, pre and post semistructured interviews with 33 patients with cancer who were physically inactive prior to their diagnosis.
- This qualitative study incorporated exclusively physically inactive patients with cancer by means of a systematic screening procedure based on national guidelines conducted in the oncology clinic.
- The study is limited by not incorporating patients who declined to participate in physical activity interventions.
- The study revealed ethical challenges and dilemmas associated with randomised controlled trial designs aimed at prediagnosis, physically inactive patients when they were not randomly allocated to their preferred type of exercise.

INTRODUCTION
Breast and colon cancers are two of the most common cancers in the West, the former representing 27% and the latter 8% of new cancer incidence in Denmark annually.¹ Reviews and meta-analyses document that exercise and physical activity (exercise PA) interventions for patients with cancer following treatment beneficially affect physical, psychological and quality of life parameters,^{2,3} whereas the evidence during adjuvant breast cancer therapy is promising but inconclusive.^{4,5} Several observational studies have shown that regular PA among breast and colon cancer patients may reduce the incidence and risk of cancer recurrence.⁶⁻⁸ However, a European survey among cancer survivors revealed that less than 25% met current PA guidelines; therefore physically inactive patients



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BMJ

Adamsen L, et al. *BMJ Open* 2017;21:e016689. doi:10.1136/bmjopen-2017-016689

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●— Diagnosis — Early Intervention — Chemotherapy — Treatment completion —

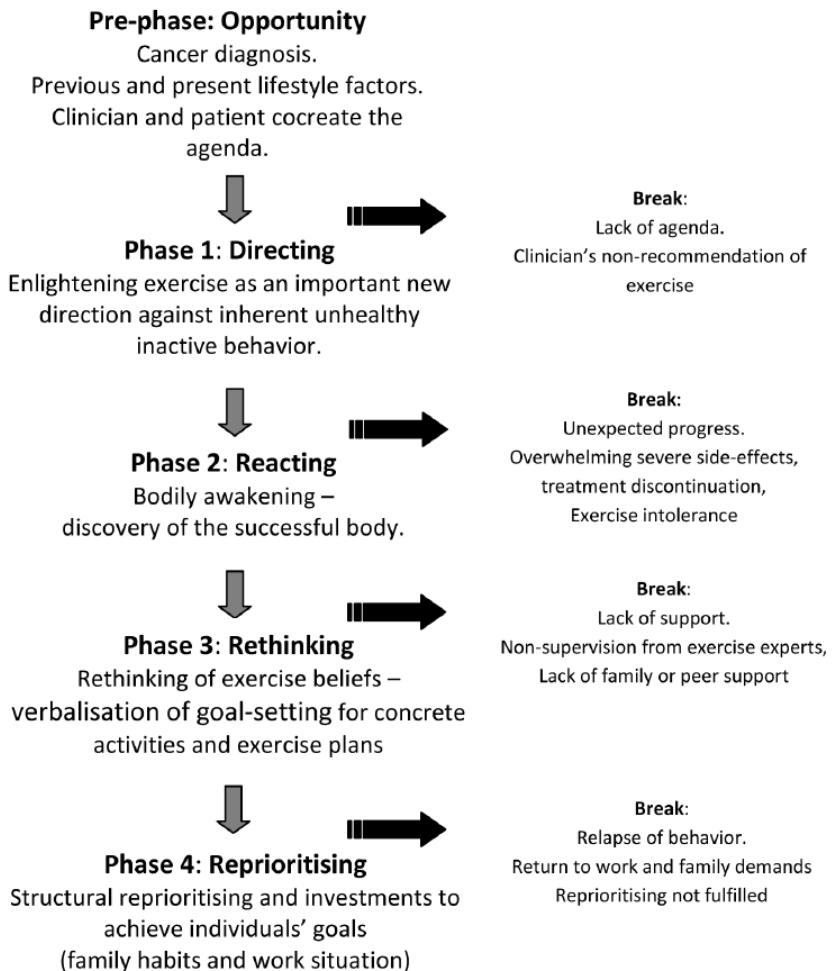


FIGURE 2: Model of the exercise transforming process for physically inactive cancer patients during chemotherapy

Figure 2 Model of the exercise transforming process for physically inactive cancer patients.



Baggrund og relevans:

Er fysisk inaktivitet et særligt sundhedsproblem hos kvinder med brystkræft?

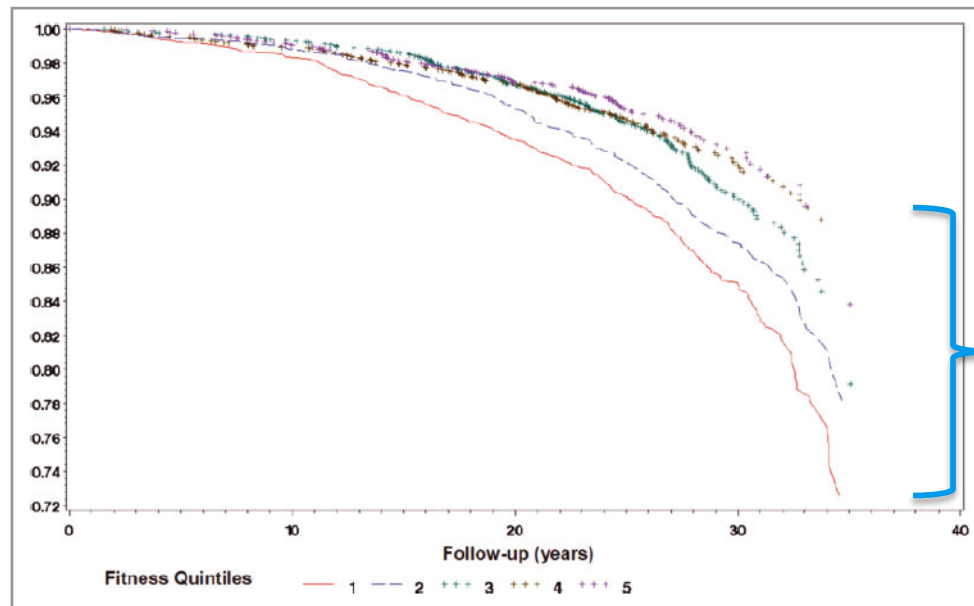
Cardiorespiratory Fitness and Long-Term Survival in “Low-Risk” Adults

Carolyn E. Barlow, MS; Laura F. DeFina, MD; Nina B. Radford, MD; Jarett D. Berry, MD, MS; Kenneth H. Cooper, MD, MPH; William L. Haskell, PhD; Lee W. Jones, PhD; Susan G. Lakoski, MD, MS

Fitness and Long-Term Survival in Low-Risk Adults Barlow et al

n=11.190

Low risk Framingham score



90 % survival vs. 72 %

Figure 1. Thirty-year survival by cardiorespiratory fitness quintile among individuals classified as low risk by FRS at 30 to 50 years of age. Cardiorespiratory fitness quintiles (Q) were based on age- and sex-specific strata. Red line indicates Q1 (n=2072); blue line, Q2 (n=2191); green line, Q3 (n=2369); black line, Q4 (n=2294); and purple line, Q5 (n=2264).

Cardiorespiratory fitness, METs, mean (95% CI)						<0.001
Men	8.7 (4.4–9.9)	10.2 (9.4–10.8)	11.4 (10.3–12.2)	12.6 (11.3–13.5)	14.8 (12.6–22.5)	
Women	6.6 (4.4–7.6)	7.7 (6.3–8.5)	8.7 (8.1–9.4)	9.5 (8.5–10.3)	11.5 (9.9–18.3)	



Cardiopulmonary Function and Age-Related Decline Across the Breast Cancer Survivorship Continuum

Lee W. Jones, Kerry S. Courneya, John R. Mackey, Hyman B. Muss, Edith N. Pituskin, Jessica M. Scott, Whitney E. Hornsby, April D. Coan, James E. Herndon II, Pamela S. Douglas, and Mark Haykowsky

Listen to the podcast by Dr Schwartz at www.jco.org/podcasts

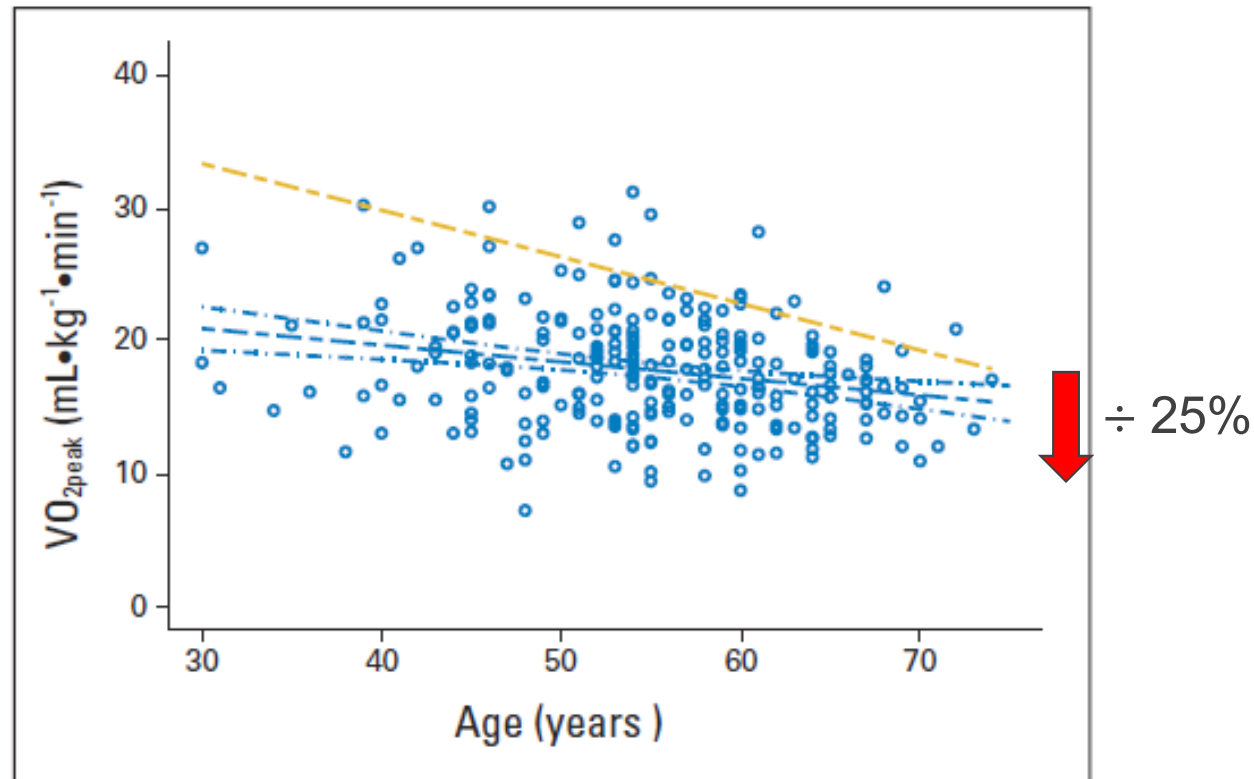


Fig 2. The linear relationship between peak oxygen consumption (VO_{2peak}) and age for patients with breast cancer (scatterplot and blue regression line with 95% CI; regression equation: $VO_{2peak} [mL \cdot kg^{-1} \cdot min^{-1}] = 24.701 - [0.1251 \times age]$), and healthy, sedentary adult women (gold dotted regression line; regression equation: $VO_{2peak} [mL \cdot kg^{-1} \cdot min^{-1}] = 46.82 - [0.35 \times age]$).



Effects of Exercise Dose and Type During Breast Cancer Chemotherapy: Multicenter Randomized Trial

Kerry S. Courneya, Donald C. McKenzie, John R. Mackey, Karen Gelmon, Christine M. Friedenreich, Yutaka Yasui, Robert D. Reid, Diane Cook, Diana Jespersen, Carolyn Proulx, Lianne B. Dolan, Cynthia C. Forbes, Evyanne Wooding, Linda Trinh, Roanne J. Segal

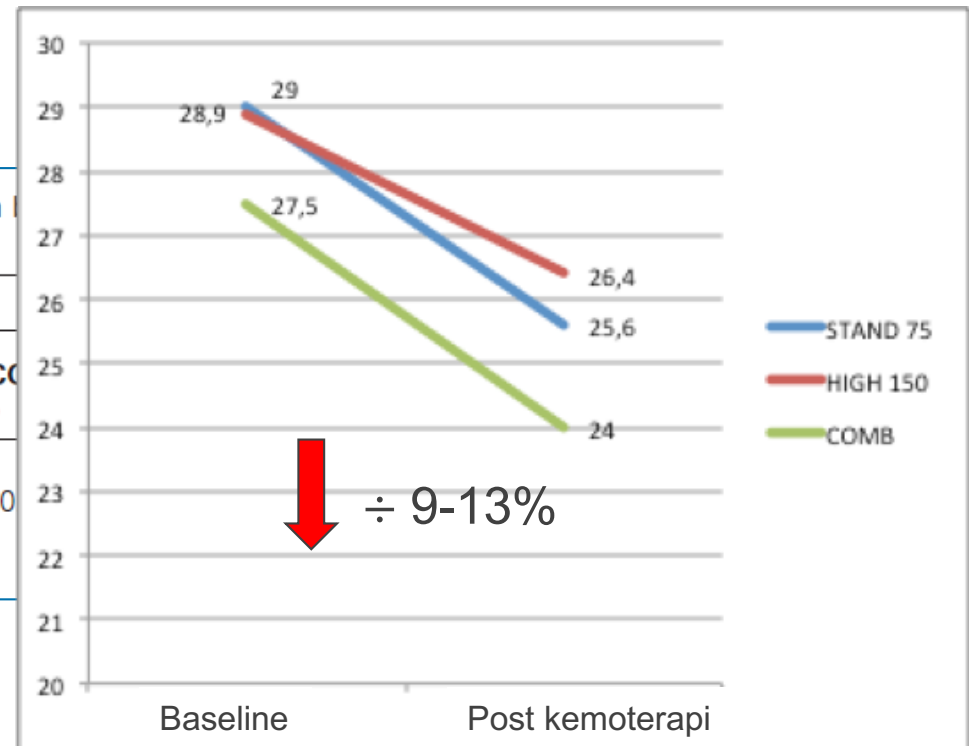
Manuscript received April 22, 2013; revised August 14, 2013; accepted August 15, 2013.

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N=301

Table 4. Effects of exercise dose and type on health-related fitness in 2008–2011*

Fitness variables	Baseline Mean (SD)	Adjusted within-group change at postintervention Mean (95% CI)
VO _{2peak} , mL/kg/min		
STAN	29.0 (6.4)	-3.4 (-4.1 to -2.7)
HIGH	28.9 (6.4)	-2.5 (-3.2 to -1.8)
COMB	27.5 (6.4)	-3.6 (-4.3 to -2.9)





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ORIGINAL REPORT

Effect of Low-Intensity Physical Activity and Moderate- to High-Intensity Physical Exercise During Adjuvant Chemotherapy on Physical Fitness, Fatigue, and Chemotherapy Completion Rates: Results of the PACES Randomized Clinical Trial

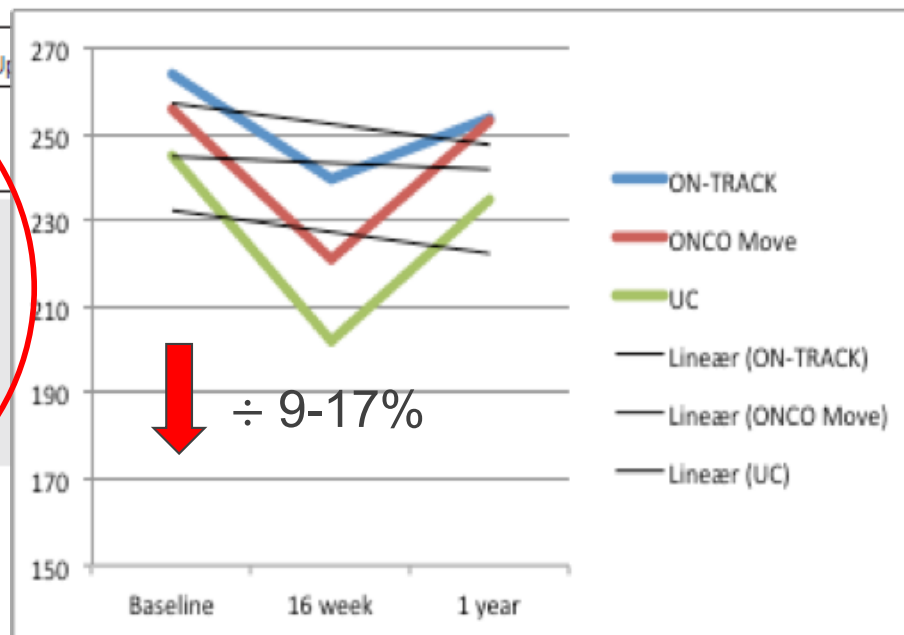
Hanna van Waart, Martijn M. Stuiver, Wim H. van Harten, Edwin Geleijn, Jacobien M. Kieffer, Laurien M. Buffart, Marianne de Maaker-Berkhof, Epie Boven, Jolanda Schrama, Maud M. Geenen, Jetske M. Meerum Terwogt, Aart van Bochove, Vera Lustig, Simone M. van den Heiligenberg, Carolien H. Smorenburg, Jeannette A.J.H. Hellendoorn-van Vreeswijk, Gabe S. Sonke, and Neil K. Aaronson

Hanna van Waart, Martijn M. Stuiver, Wim H. van Harten, Jacobien M. Kieffer, Marianne de Maaker-Berkhof, Gabe S. Sonke,

N=230

Table 3. Mean Values at Baseline, End of Chemotherapy, and 6-Month Follow-Up

Measure	T0: Mean (SD)	T1: Mean (SD)	T2: Mean (SD)
Maximal short exercise capacity, watts			
OnTrack	263.7 (49.3)	239.3 (57.3)	254.1 (56.6)
Onco-Move	256.1 (48.2)	221.0 (63.4)	253.6 (52.2)
UC	245.0 (48.9)	202.4 (66.5)	234.9 (53.9)
OnTrack v UC			
Onco-Move v UC			
OnTrack v Onco-Move			





2009 Jones et al, The 'Multiple-Hit' hypothesis

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STATE-OF-THE-ART PAPER

Early Breast Cancer Therapy and Cardiovascular Injury

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John R. Mackey, MD§
Durham, North Carolina; and Edmonton, Alberta, Canada

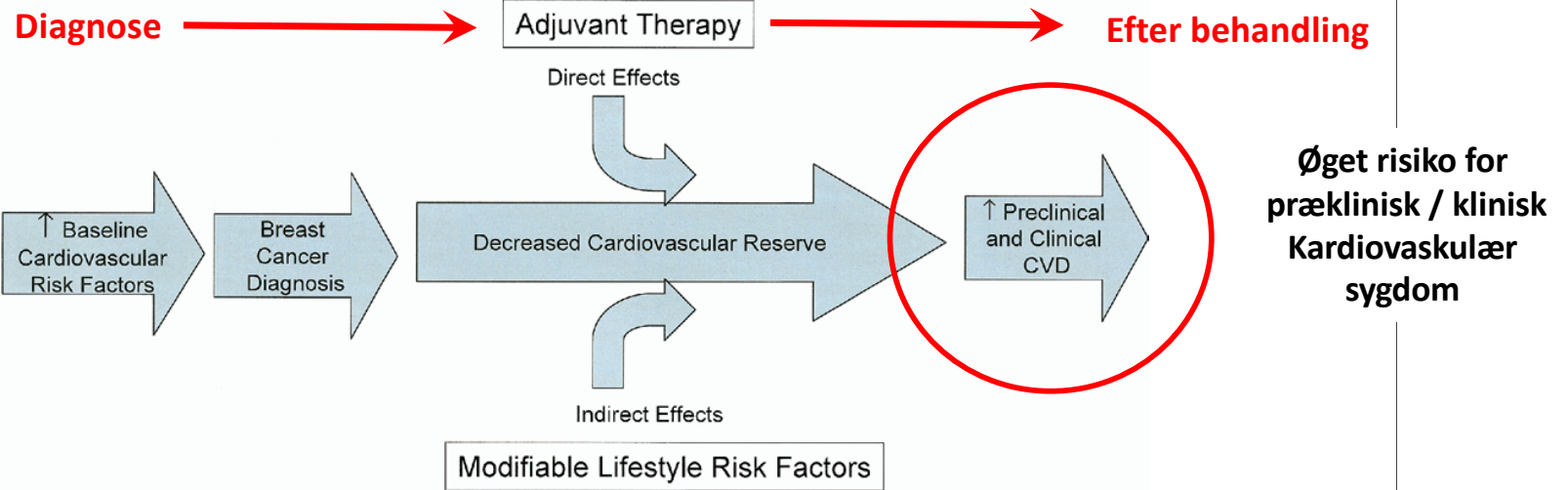


Figure 1 The "Multiple-Hit" Hypothesis



Resultater (ikke publiceret)

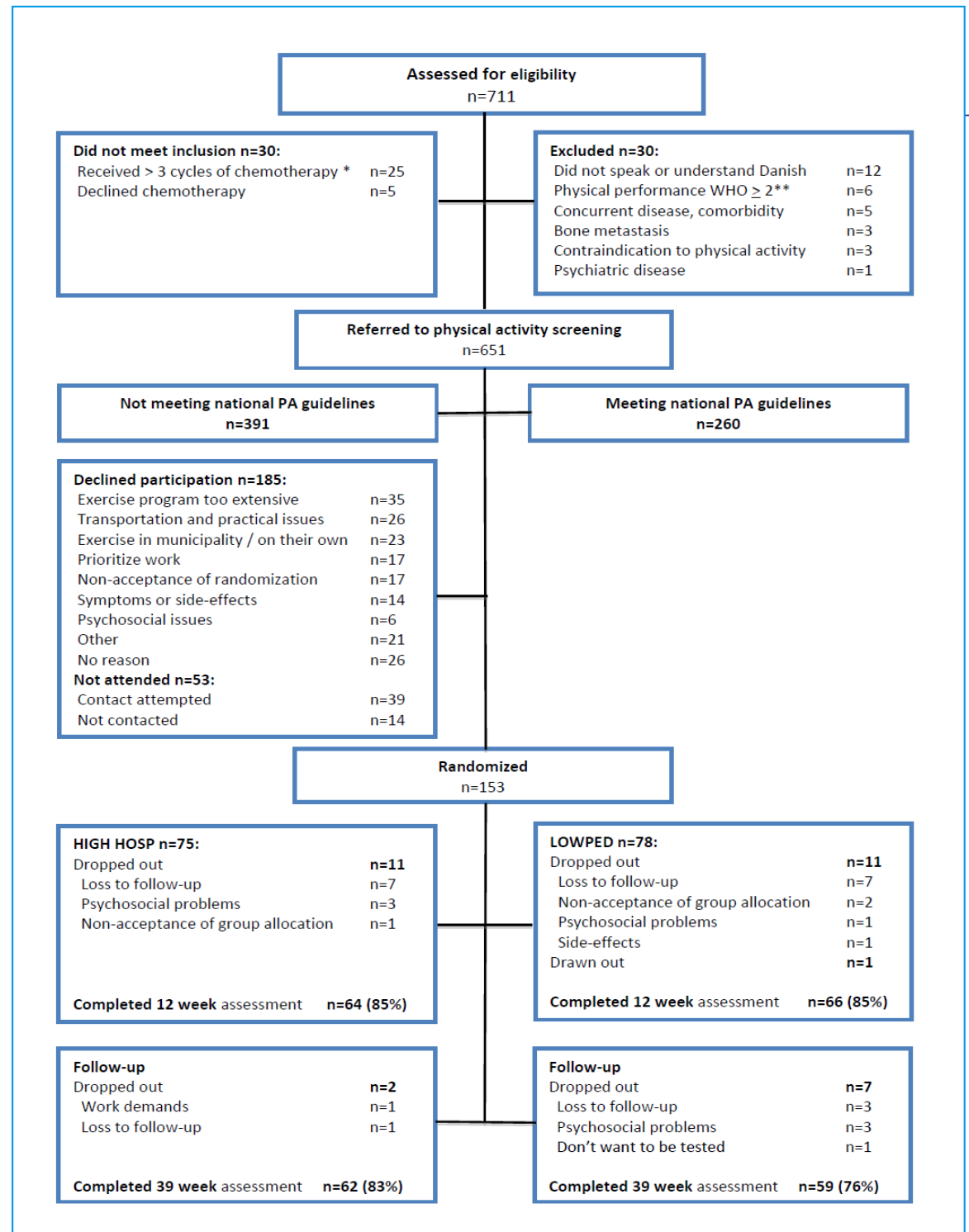




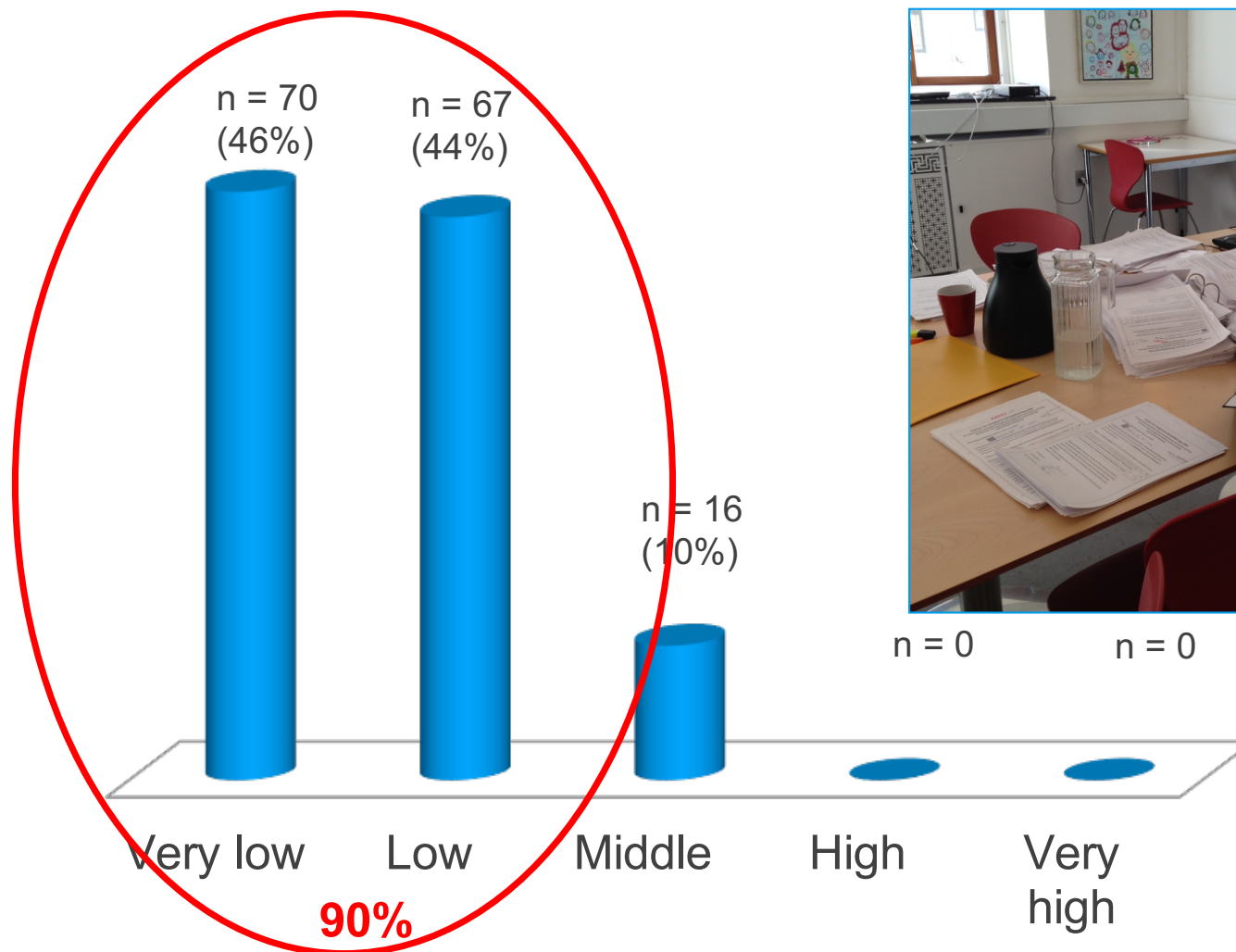
Table X. Baseline Sociodemographic characteristics

Characteristics	Total (n = 153)	HIGH HOSP (n = 75)	LOW PED (n = 78)	
Age, mean (SD)	51.25 (9.4)	51.01 (9.6)	51.47 (9.3)	ns
Weight, mean (SD)	74.58 (14.4)	75.11 (14.7)	74.07 (14.2)	ns
BMI, mean (SD)	26.31 (5.1)	26.36 (5.4)	26.26 (4.9)	ns
Marital status, No. (%)				ns
Single/divorced/widowed	48 (31)	24 (32)	24 (31)	
Married/living together	101 (66)	47 (63)	54 (69)	
Missing value	4 (3)	4 (5)	0 (0)	
Education level, No. (%)				ns
Lower	7 (5)	3 (4)	4 (5)	
Secondary	53 (35)	27 (36)	26 (33)	
Advanced	91 (59)	43 (57)	48 (62)	
Missing value	2 (1)	2 (3)	0 (0)	
Smoking status, No. (%)				ns
Never/past*	138 (90)	68 (91)	70 (90)	
Current	14 (9)	7 (9)	7 (9)	
Missing value	1 (1)	0 (0)	1 (1)	
Alcohol intake per week, mean (SD)	3.67 (4.3)	4.07 (4.7)	3.29 (3.9)	
Physical activity prior to diagnosis, No. (%)				ns
<150 min moderate activity per week/>150 min week	95 (64) / 55 (36)	44 (59) / 31 (41)	54 (69) / 24 (31)	
<2x20 min strenuous activity per week/>2x20 min week	148 (97) / 5 (3)	73 (97) / 2 (3)	75 (96) / 3 (4)	
Days since diagnosis**, mean (SD)	69.01 (22.5)	71.00 (27.8)	67.03 (15.5)	ns
missing	N = 7	N = 2	N = 5	

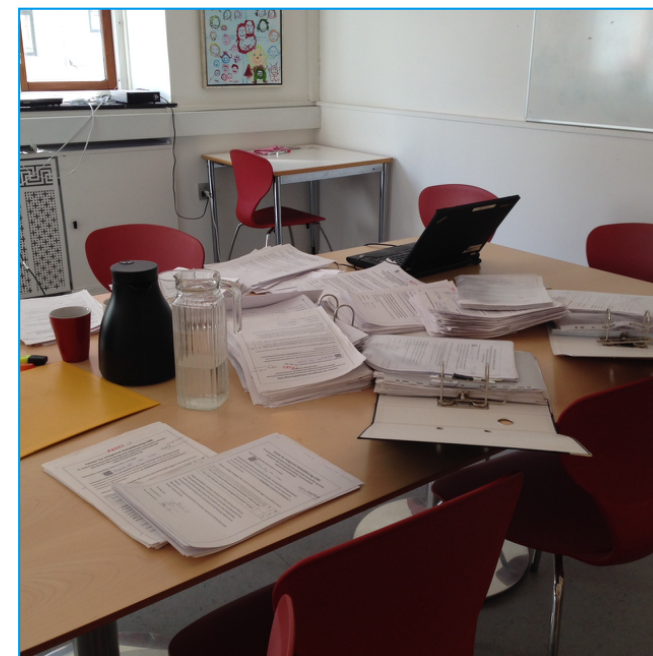
Characteristics	Total (n = 153)	HIGH HOSP (n = 75)	LOW PED (n = 78)	
Chemotherapy regimen, No. (%)				
Standard adjuvant 1*	129 (84)	65 (87)	64 (82)	
Standard adjuvant 2**	10 (7)	5 (7)	5 (6)	
Other regime	7 (5)	3 (4)	4 (5)	
Missing value	7 (5)	2 (3)	5 (6)	
Chemotherapy cycles before study inclusion, mean (SD)	1.41 (0.6)	1.47 (0.5)	1.36 (0.6)	
missing	n = 7	n = 2	n = 5	
Chemotherapy cycles applied during intervention, mean (SD)				
All	4.03 (0.7)	4.07 (0.7)	3.99 (0.7)	
Taxotere (1 cycle = 1 treatment in three weeks)	2.43 (0.6)	2.53 (0.6)	2.34 (0.7)	
Paclitaxel (1 cycle = 3 treatments in three weeks)	2.50 (0.5)	2.60 (0.5)	2.40 (0.5)	
missing	N = 7	N = 2	N = 5	
Surgery, No. (%)				ns
Mastectomy	58 (38)	27 (36)	31 (40)	
Lumpectomy	88 (58)	46 (61)	42 (54)	
Missing value	7 (5)	2 (3)	5 (6)	
Cancer stage, No. (%)				ns
Stage I	55 (36)	32 (43)	23 (29)	
Stage II	76 (50)	33 (44)	43 (55)	
Stage III	15 (10)	8 (11)	7 (9)	
Missing value	7 (5)	2 (3)	5 (6)	
Breast cancer subtype, No. (%)				ns
HER2-, ER+	84 (55)	41 (55)	43 (55)	
HER2-, ER-	19 (12)	9 (12)	10 (13)	
HER2+, ER+	30 (20)	18 (24)	12 (15)	
HER2+, ER-	13 (8)	5 (7)	8 (10)	
Missing value	7 (5)	2 (3)	5 (6)	
Herceptin treatment, No. (%)				
Yes	41 (27)	21 (28)	20 (26)	
No	111 (73)	54 (72)	58 (74)	
Unknown	1 (1)	0	1 (1)	
Neulasta treatment, No. (%)				
Yes	114 (75)	56 (75)	58 (74)	
No	22 (14)	11 (15)	11 (14)	
Unknown	17 (11)	8 (11)	9 (12)	



VO₂-peak i RCT (brystkræft) overfor normalbefolkning



Rekruttering / sygeplejerskernes screening



n = 0

n = 0



Exercise safety: Lymphedema

(ACTA Oncol)

Heavy-load resistance exercise in pre-diagnosis, physically inactive women at risk of breast cancer-related lymphedema during adjuvant chemotherapy: a randomized trial

Kira Bloomquist¹, Lis Adamsen¹, Sandra C Hayes², Christian Lillelund¹,
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Fysiologiske fund / VO_2 -peak: RCT



Præliminær konklusion: RCT

- Erhvervsaktive fysisk inaktive kvinder med brystkræft i medicinsk adjuverende behandling kan verificeres ved screening i klinikken og udgør 'en *ny* risikopopulation'.
- Kvinderne er *via intervention* i stand til at vedligeholde deres maksimale ydeevne fra tidspunktet for opstart af adj. kemoterapi til afsluttet primær behandling med kemo- og radioterapi.

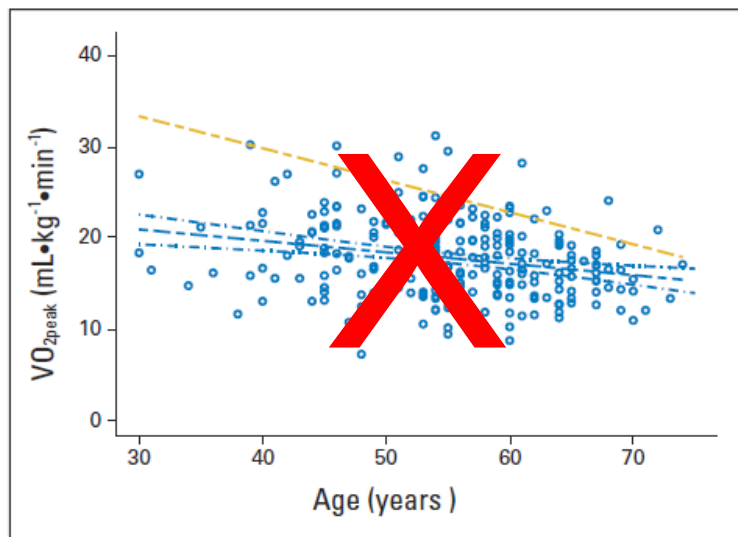


Fig 2. The linear relationship between peak oxygen consumption (VO_{2peak}) and age for patients with breast cancer (scatterplot and blue regression line with 95% CI; regression equation: $VO_{2peak} [mL \cdot kg^{-1} \cdot min^{-1}] = 24.701 - [0.1251 \times age]$), and healthy, sedentary adult women (gold dotted regression line; regression equation: $VO_{2peak} [mL \cdot kg^{-1} \cdot min^{-1}] = 46.82 - [0.35 \times age]$).