



The “Interval Walking in Colorectal Cancer” (I-WALK-CRC) study: Design, methods and recruitment results of a randomized controlled feasibility trial



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ARTICLE INFO

Keywords:

Colorectal cancer
Exercise
Interval walking
Smart-phone application
Survivorship

ABSTRACT

Background: Low physical activity level is associated with poor prognosis in patients with colorectal cancer (CRC). To increase physical activity, technology-based platforms are emerging and provide intriguing opportunities to prescribe and monitor active lifestyle interventions. The “Interval Walking in Colorectal Cancer” (I-WALK-CRC) study explores the feasibility and efficacy a home-based interval-walking intervention delivered by a smart-phone application in order to improve cardio-metabolic health profile among CRC survivors. The aim of the present report is to describe the design, methods and recruitment results of the I-WALK-CRC study.

Methods/Results: The I-WALK-CRC study is a randomized controlled trial designed to evaluate the feasibility and efficacy of a home-based interval walking intervention compared to a waiting-list control group for physiological and patient-reported outcomes. Patients who had completed surgery for local stage disease and patients who had completed surgery and any adjuvant chemotherapy for locally advanced stage disease were eligible for inclusion. Between October 1st 2015, and February 1st 2017, 136 inquiries were recorded; 83 patients were eligible for enrollment, and 42 patients accepted participation. Age and employment status were associated with participation, as participants were significantly younger (60.5 vs 70.8 years, $P < 0.001$) and more likely to be working (OR 5.04; 95%CI 1.96–12.98, $P < 0.001$) than non-participants.

Conclusion: In the present study, recruitment of CRC survivors was feasible but we aim to better the recruitment rate in future studies. Further, the study clearly favored younger participants. The I-WALK-CRC study will provide important information regarding feasibility and efficacy of a home-based walking exercise program in CRC survivors.

1. Introduction

Colorectal cancer (CRC) is the third most common cancer [1] and the fourth most common cause of cancer-related deaths world-wide [2]. Recent evidence has demonstrated that physical activity after a CRC diagnosis is independently associated with overall [3–8], and CRC-specific survival [3–5,7]. Thus, CRC survivors who adhere to the current recommendation of at least 150 min of moderate intensity physical activity per week (approx. 9 MET-hours) have been shown to have 10–40% lower CRC specific mortality and 20–50% lower overall

mortality relative to their sedentary counterparts [3–6,8].

Over the last decade, strong evidence has demonstrated positive effects of exercise interventions in cancer survivors including improved cardiorespiratory fitness [9,10], muscle function [11], body composition [12] and health related quality of life [13]. Typically, exercise-oncology trials have prescribed supervised hospital-based training as feasible and effective health promoting strategies, but important intra-diagnostic differences have been observed. For example, the Physical Activity during Cancer Treatment study [14] aimed to include 300 patients with early stage breast (target $n = 150$) and colon cancer

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<https://doi.org/10.1016/j.conctc.2018.01.008>

Received 12 September 2017; Received in revised form 19 January 2018; Accepted 24 January 2018

Available online 06 February 2018

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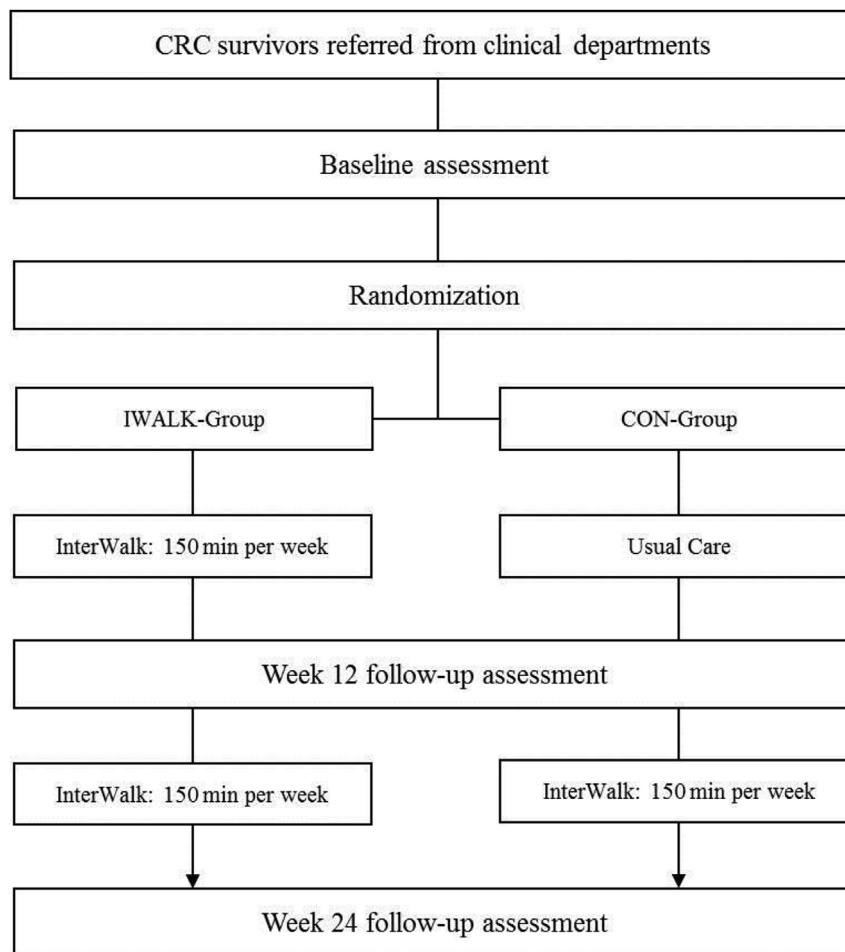


Fig. 1. Study design and patient flow.

(target $n = 150$) exploring an 18-week supervised exercise intervention compared to usual care. After three years, the study closed having included more than 200 breast cancer patients [15] and only 33 colon cancer patients, but nonetheless an improvement was observed in physical fatigue among the CRC survivors [16]. Similar reports observed positive effects on cardiovascular fitness [17] and metabolic profile [18] in CRC survivors, and this emphasizes the potential to improve physiological and patient-reported outcomes in this patient group. However, low accrual rates to traditional hospital-based exercise interventions comprise an ongoing challenge for CRC survivors.

To address this issue, recent studies have explored the safety, feasibility and efficacy of various home-based strategies, including telephone phone-based counseling [19] in-home treadmill-interventions [20], and home-based programs with personal exercise trainers [18]. Simultaneously, a rapid development in smart-phone application technology has created a novel platform for clinicians and researchers to deliver and monitor health promoting strategies including physical activity [21]. Recently, the smart-phone application, *InterWalk* [22], was developed to disseminate an interval-walking-program to Danish patients with diabetes. The *InterWalk*-application delivers a home-based interval-walking program of interchanging fast-and-slow cycles: 3 min of fast walking followed by 3 min of slow walking. This program was based on studies showing that interval-walking was associated with high adherence and significant improvements in cardio-pulmonary fitness, plasma lipid-profile, glucose metabolism and insulin sensitivity in patients with type-2 diabetes [23,24]. These cardiometabolic health factors are linked to the risk of disease recurrence and mortality in CRC survivors [25,26], and are therefore important targets for life-style intervention trials in this population. Accordingly, the “Interval-Walking

in Colorectal Cancer“ (I-WALK-CRC) study was designed to explore the *InterWalk*-application as a health promoting intervention in CRC survivors.

2. Aims of this report

We here describe the aims, study design, and methodology of the I-WALK-CRC study: a randomized controlled feasibility trial. Secondly, we present the results of the recruitment procedures and compare sociodemographic, socioeconomic and medical history characteristics in study participants with eligible subjects who declined participation.

3. Study objectives and outcomes

The objectives of the I-WALK-CRC study are to explore the feasibility of a smart-phone application-delivered interval-walking exercise program in CRC survivors, as well as the efficacy of the intervention to improve cardio-metabolic health profile in CRC survivors, who have complete adjuvant treatment for non-metastatic CRC. The primary outcome is difference in baseline-to-week12 change in VO_{2peak} in an intervention group (receiving 12 + 12 weeks *InterWalk*) compared to a waiting-list control group (receiving 12 weeks usual care followed by 12 weeks *InterWalk*). Key secondary outcomes are feasibility evaluated by inclusion rate (above 50% of eligible patients), attrition rate (below 20%); and adherence rate (above 75% of the prescribed program in none-drop out participants). Explorative outcomes include baseline-to-week12 changes in body weight and composition; plasma concentration levels of cholesterol, triglycerides, insulin, glucose and inflammatory cytokines; and glycemic control, by oral glucose tolerance test (OGTT).

Additionally, we will explore 12 vs 24 weeks use of the InterWalk-application use by evaluating changes from baseline-to-week24 in all study outcomes in both groups.

4. Methods

The I-WALK-CRC study is a prospective, randomized controlled trial in CRC survivors approved by the Committees of Biomedical Research Ethics of the Capital Region of Denmark with registration number H-1-2014-111. It is approved by the Danish Data Protection Agency, and was registered with clinicaltrials.gov (NCT02403024). The overall study design and flow of participants is illustrated in Fig. 1.

4.1. Eligibility criteria

Patients who had completed surgery for local stage disease (UICC Stage I-IIa) and patients who had completed surgery and any adjuvant chemotherapy for locally advanced stage disease (UICC stage IIB-III) were eligible for inclusion.

Exclusion criteria were: age < 18 years; major surgery scheduled within 24 weeks from inclusion; pregnancy; other current malignancy; performance status > 1 [27]; self-reported physical activity level > 150 min of moderate intensity per week; and inability to read and understand Danish. Upon initial medical screening, participants who were diagnosed by the study physician with an unknown and treatment-requiring Type 2 diabetes (2 h glucose level higher than 11.0 mmol/l and/or level of HbA1c higher than 48 mmol/mol) or unknown cardiac conduction abnormality (ECG abnormalities) were excluded and referred to their general practitioner.

4.2. Participant recruitment

CRC patients were recruited from 5 departments (2 medical oncology departments and 3 surgical oncology departments) at the Copenhagen University Hospitals: Rigshospitalet, Herlev Hospital, Hvidovre Hospital and Bispebjerg Hospital. Patients in surveillance within 2 years from primary CRC diagnosis were informed of the study at clinical visits. Patients, who had undergone adjuvant chemotherapy, were informed of the study during their final visit at the oncology clinic. Clinicians in the clinical departments were responsible for introducing the project to possible participants by a simple 1-page recruitment-leaflet describing the design of the study, and major exclusion criteria. Patients gave consent for the I-WALK-CRC study coordinator to contact them by telephone for full information of the study procedures and eligibility screening.

4.3. Telephone-based eligibility screening

Upon receiving an inquiry (recruitment-leaflet), the study coordinator contacted the potential candidate by telephone and informed in detail about the study procedures, and performed a full eligibility screening, which included self-reported sociodemographic and socioeconomic information (i.e. marital status, education level, employment status, alcohol consumption, smoking habits) and medical history (i.e. prevalence of known co-morbidities, i.e. diabetes, hypertension, cardiovascular disease, lung disease, and whether or not patients had received adjuvant chemo- or radiotherapy). After screening, eligible participants were invited to meet at the study center to sign informed consent before they were scheduled for baseline assessment.

4.4. Study assessments

Table 1 outlines the study assessment schedule. Patients met at the laboratory after an 8-h overnight water-only fast. Before any study related test-procedures were initiated, patients underwent a thorough medical screening by a study physician including assessment of cancer-

related information (i.e. time since diagnosis and treatment completion, and information on tumor site). Further, medical history of comorbidities and current medication were collected and followed by an objective physical examination including resting electrocardiography (ECG), resting heart rate and blood pressure to identify any cardiac conduction abnormalities. Upon physician approval to continue, the participants performed the study assessments, including evaluation of fasting blood biochemistry, glycemic control, body composition, cardiopulmonary fitness and patient reported outcomes.

Follow-up assessments were completed at Week12 and Week24 by staff members who were blinded to group allocation. Study participants were specifically reminded before follow-up assessments not to reveal their group allocation to the staff members. The two assessments included the same assessment schedule as the baseline test, except that the medical screening only included measurement of resting heart rate and blood pressure, and reports of any potential changes in medication.

4.5. Study endpoints

4.5.1. Primary endpoint - cardiopulmonary fitness

Cardiopulmonary fitness was determined by maximum oxygen uptake (VO_{2peak}) during a cardiopulmonary exercise test on a stationary bicycle with direct measurement of oxygen uptake and carbon dioxide excretion with gas-exchange online-measurement equipment (Cosmed Quark, Rome, Italy). The participants carried out 3 min warm up by 70 Watt followed by a step-by-step incremental test with workload increasing by 20 Watt every minute until exhaustion where VO_{2peak} , time-to-exhaustion, peak power output, and maximum heart rate were recorded as test scores.

4.5.2. Secondary endpoints

Feasibility was evaluated by; I) an inclusion rate above 50% of eligible patients; II) an attrition rate below 20% at 12 weeks; and III) an adherence rate above 75% of the prescribed program (150 min per week) in participants who completed week-12 assessments. The study intervention was considered feasible if all three criteria were met.

Body composition included evaluation of anthropometry and whole-body Dual-Energy X-ray Absorptiometry (DXA) scan. The participants' weight, height, body mass index (BMI) hip- and waist size were measured, before body composition was analyzed using whole-body dual-energy x-ray absorptiometry (DXA; DPX-IQ Lunar, Lunar Corporation Madison, WI, USA). Transverse scans at 1 cm intervals were made from head to toe measuring the absorption of x-ray beams at two different energy levels absorbed at a different intensity by different chemical compounds (bone, fat, and fat-free mass) allowing for valid determination of bone mass, fat mass, fat percentage and fat-free (lean) mass.

Blood biochemistry was analyzed in fasting blood samples. After placement of a venous elbow-catheter, a blood sample was collected to determine fasting lipid concentrations (total, HDL, LDL-cholesterol, and triglycerides), blood glucose, insulin and hemoglobin A1c (HbA1c), by standard laboratory analyses. Additionally, a separate fasting blood sample was drawn, spun and plasma was frozen (-80°C) and stored for potential future exploratory analyses.

Glycemic control was determined by 2-h oral glucose tolerance test (OGTT). Participants consumed 83 g glucose suspended in 300 ml of water and had a blood samples drawn after 30, 60, 90 and 120 min to measure 2-h responses in insulin, glucose and C-Peptide.

Patient reported outcome measures (PROMs) included three questionnaires comprising the evaluation of health related quality of life by *Functional Assessment of Cancer Treatment (FACT)-C*, sleep quality by *Pittsburgh Sleep Quality Index (PSQI)* and exercise-motivation by *Behavioral Exercise Regulations Questionnaire (BREQ)-2*.

Table 1
Assessments schedule.

Assessments	Week -1	Week 0	Week 4	Week 8	Week 12	Week 16	Week 20	Week 24
Medical screening								
Medical history	×							
Electrocardiography	×							
Medication	×				×			×
Resting HR/BP	×				×			×
Body Composition								
Anthropometry	×				×			×
DXA scan	×				×			×
Blood Biochemistry								
Fasting blood sample	×				×			×
Glycemic Control								
Oral Glucose Tolerance test	×				×			×
Cardiopulmonary Fitness								
CPET	×				×			×
Patient Reported Outcomes								
FACT-C	×				×			×
PSQI	×				×			×
BREC-2	×				×			×
Self-reported PA								
IPAQ-short form	×		×	×	×	×	×	×
Randomization		×						

HR, heart rate, BP, blood pressure, DXA, Dual Energy X-ray Absorptiometry CPET, Cardio Pulmonary Exercise Test, FACT-C, PSQI Pittsburg Sleep Quality Index, BREC-2, IPAQ-short form, International Physical Activity Questionnaire short form.

4.6. Randomization and group allocation

Following successful baseline assessment, the un-blinded physiotherapist randomly allocated the participant to an interval walking (IWALK) intervention group or a waiting-list control (CON) group. Participants were stratified by treatment (adjuvant chemotherapy/no adjuvant chemotherapy), and randomized participants remained in the same group for the entire duration of the intervention. A computer-generated list of random group-assignments was created by the trial statistician using a permuted block design with allocation weight of 1:1 and stored on a password-protected web-server. Only the trial statistician and an un-blinded study physiotherapist had access to the list. The study physiotherapist, who was not involved in any data-assessments, performed the randomization and subsequently contacted the randomized participant with information on group allocation.

4.7. Intervention and prescription

4.7.1. The InterWalk smart-phone application

On the day of the baseline test, participants were introduced to the InterWalk smart-phone application and received thorough instructions. If participants did not own an IOS platform smart-phone or did not wish to download the InterWalk-application onto their own device, they were provided with an I-POD with the InterWalk-application installed for the duration of the study period.

The InterWalk-application consists of 2 primary functions: a test-function (individual adaptation), and a training-function. All participants were introduced to the application and received thorough guidance on how to use it. A staff member helped to enter and save individual information in the application. Afterward the staff member showed how to manage the test-function and the training-function by thoroughly reviewing a user guide together with the participant. The InterWalk test-function [28] is an individual adaptation procedure where participants perform an incremental walking capacity test consisting of the following steps by audio-instructions: "Stand still" for 30 s; "walk slowly" for 2 min; "walk at medium pace" for 2 min; "walk fast" for 2 min; "walk as fast as you can" for 1 min, and finally "stand still" for 1 min to conclude the test. The InterWalk-training function hereafter instructs repeating cycles of 3 min 'slow walking' and 3 min 'fast walking'. The target-intensity for the different levels were determined

from the test-function with the "slow walking" intensity corresponding to the average of the participants' walking speed during the "walk slowly" phase and the "walk at medium pace" respectively. The "fast walking" intensity in the training function corresponds to the average of the participants walking speed during the "walk a medium pace" and "walk fast" phase of the test. If participants walk too fast during slow intervals or too slow during fast intervals compared to the individualized walking paces, a speaker instructs the user to "walk slower" or "walk faster", respectively. Participants were instructed to perform a new individualization test at least every third week to ensure progression in the program. All participants were supplied with a number to the un-blinded physiotherapist if they had any problems or question regarding the application.

4.7.2. Interval walking group

Participants randomized into the intervention I-WALK group were prescribed interval walking by use of the InterWalk-application for a total of 150 min per week over the full study period of 12 + 12 weeks. It was optional how the interval walking exercise was planned and executed over any given week with the only prescription being the overall target volume of 150 min per week.

4.7.3. Waiting list control group

Participants randomized into the CON group were requested not to use the InterWalk-application for the initial 12 weeks of the study period and otherwise maintain the pre-study level of physical activity. After week12 follow-up visit (the control period), participants in this group received the same instructions for use of the InterWalk-application and were prescribed 150 min of interval walking per week in for the following 12 weeks.

4.7.4. Physical activity during the study period

Throughout the study period, all participants are contacted every fourth week by telephone by the non-blinded physiotherapist who assessed physical activity level by the International Physical Activity Questionnaires (I-PAQ) short-form.

4.8. Statistical considerations

The primary analysis will compare difference in changes in study

outcomes from baseline-to-week12 between the two treatment arms (IWALK vs CON). For the primary outcome, VO_{2peak} , assuming a standard deviation of 2 ml/kg/min, 16 patients in each group provided 80% power to detect a between group difference of +2 ml/kg/min. To account for a potential attrition-rate of up to 20%, we aimed to include 20 patients in each group. The primary analysis is performed using a random effect model using study outcomes as dependent variables, the covariates "group", "time" and their interaction as fixed effects, and a random effect of "patient".

Patients who wished to drop-out of the study during the intervention-periods were offered to remain in the study with regard to test-assessments. All analyses are performed as 'intention-to-treat' analyses, thus all patients remained in the originally allocated treatment arms regardless of compliance to the intervention. Potential drop-outs and missing observations are handled by the "missing at random" principle.

4.9. Statistical analyses

For the present report, characteristics associated with participation among eligible candidates in the present study were explored by logistic regression analyses to compare participants with subjects who declined participation. Logistic regression analysis was used to compare the social-demographic variables assessed at the telephone-based eligibility screening for participation vs non-participation presented as odds ratios with 95% confidence intervals. All tests were univariate analyses, two-sided and significance level was set at 0.05. All statistical analyses were performed using STATA IC 14.1.

5. Results

Between October 1st, 2015, and February 1st, 2017, we received 136 inquiries (recruitment leaflets) from potentially eligible CRC survivors, who were referred from one of five surgical or medical oncology departments at Copenhagen University Hospitals (Fig. 2). From the total number of inquiries, 38 patients were excluded prior to any eligibility screening due to: 'failed to contact' (n = 10), 'withdrew interest' (n = 26) and 'non-Danish speaking' (n = 2), thus a total of 98 were assessed for full telephone-based eligibility screening. Fifteen subjects were excluded based on the following exclusion criteria: performing more than 150 min moderate intensity physical activity per week (n = 5), physically unable to perform the walking program (performance status > 1) (n = 7), had major surgery planned within the 24 weeks study-period (n = 2), or was still in chemotherapy (n = 1).

Thus, a total of 83 CRC patients (61% of all inquiries) were eligible for inclusion and were invited to participate in the study. From these, 42 patients (51%) accepted participation, and 41 patients (49%) declined participation. Reasons for declining participation were: 'not interested' (n = 27), 'did not have time' (n = 3), 'did not feel they could manage study participation' (n = 5), 'did not wish to commit to study participation' (n = 2), or 'lived too far from the hospital' (n = 4). Following baseline-assessment, additional 3 subjects were excluded/dropped out prior to randomization. One withdrew consent prior to randomization, and 2 were diagnosed with previously unknown Type 2 diabetes based on elevated 2 h blood glucose level above 11.0 mmol/l during the OGTT, and were referred to medical treatment by the primary physician. Accordingly, 39 CRC survivors were randomized to the I-WALK or CON group. The final participant was randomized in January 2017, and the final 24-week endpoint assessment was scheduled for September 2017.

In univariate analyses, CRC survivors who accepted participation were younger (Age > 65 years: OR 0.20 [95% CI: 0.08–0.51], $P < 0.001$; Table 2), precisely they were more than a decade younger (60.4 years vs 70.8, $p < 0.001$; Table 2), and more likely to be working (Working: OR 5.04 [95% CI: 1.96–12.98], $P < 0.001$; Table 2) compared to subjects who declined participation. Participants who accepted participation tended to have higher educational level, but this

difference did not reach statistical significance ($p = 0.092$), while no other baseline-characteristics differed significantly between participants and subjects declining participation.

6. Discussion

The I-WALK-CRC study was designed to develop and optimize exercise-interventions in patients following CRC treatment. Despite a wealth of studies reporting a strong inverse association between physical activity level and survival in CRC survivors, this population has been found to be among the least physically active relative to other cancer diagnoses [29]. The I-WALK-CRC study will serve to explore the feasibility and efficacy of interval-walking exercise, delivered by a smart-phone application in CRC survivors, and will provide initial information on the health promoting potential of a home-based, un-supervised exercise intervention using on a technology-based platform.

A key component of the study rationale was that a home-based walking exercise would appeal more to CRC survivors. We defined successful feasibility *a priori* to require an inclusion rate above 50% of eligible patients. We only just reached this threshold as 42 of 83 (51%) eligible participants were included for baseline assessment. 3 were subsequently excluded prior to randomization and the 39 participants were randomized over a period of approximately 16 months, which corresponded to a rate of 2.4 participants randomized per month. Several studies have described that recruiting CRC survivors into lifestyle modification studies can be challenging. For example, Pinto et al. [19] implemented a variety of recruitment strategies (informational mailings, in-clinic recruitment, and community presentations), to explore a telephone-based intervention to increase physical activity and improve quality-of-life outcomes. The study required a sample size of 134 participants, but after 39 months, the study closed with 46 randomized participants (~1.5 per month). In comparison, the COURAGE trial [20], a phase 2 study exploring different exercise doses, enrolled 39 colon cancer survivors over 7 months (5.4 participants per month), however this required information letters to be sent to over 1500 potential candidates derived from cancer registries. Despite larger setups in the above described studies, recruitment barriers seem to be present. Danish Colorectal Cancer Group has in 2015 registered more than 600 CRC operations at the 3 recruiting surgical departments [30] which correspond to more than 50 per month, and we only received 136 inquiries in 16 month which correspond to 8.5 every month. A barrier in the I-WALK-CRC study recruitment process was the dependency of the recruitment staff at the hospitals since their commitment to the project may vary. Many trials have found variability in the ability of staff to achieve high level of recruitment [31]. We can only speculate about reasons for the low recruitment rate. This may stem from a lack of perceived importance of the study question and/or lack of capacity among recruiting staff members, or evaluation conducted by clinicians at the hospitals concerning the project's potential relevance to individual patients. Consequently, we cannot determine to what extend the referred subjects represents the true background population of the CRC survivors.

For the present study, in-clinic recruitment was chosen as the only strategy based on previous experiences emphasizing the importance of doctors' recommendation for exercise participation in cancer patients [32,33]. Our inclusion rate was comparable to previous reports but required recruitment from 5 departments covering most of the greater Copenhagen area, which complicated the on-site monitoring by study personnel and increased the risk of missing potentially eligible subjects. One potential way to improve the recruitment barriers may be to intensify on-site monitoring by including fewer recruiting departments. This may lead to a change in the responsibility of the recruitment from the clinical staff to the study personnel, and hereby initiate a more intensive and effective recruitment.

We further hypothesized that if the intervention was more appealing to CRC survivors, the risk of selection bias would be reduced

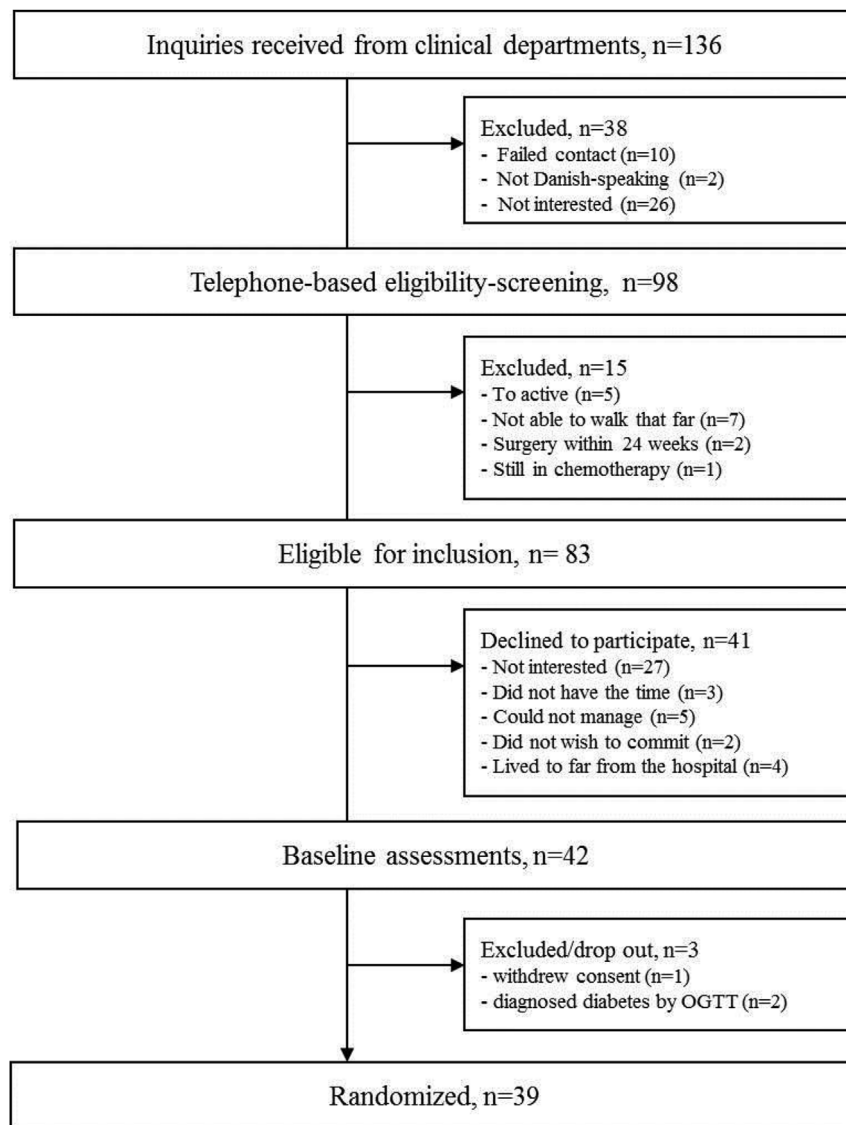


Fig. 2. CONSORT Diagram. Overview of recruitment results and reasons for exclusion and drop-out prior to randomization.

and the enrolled sample would comprise a more representative subset of the background population. The mean age of all eligible subjects were 65.5 years, which closely mirrors the estimated median age for newly diagnosed CRC patients [34]. However, the mean age of participants was more than a decade lower than non-participants. Elderly patients are generally less likely to participate in exercise-oncology trials [19,20,35], however few studies have distinguished between candidates who are not-eligible due to various exclusion criteria (e.g. prevalence of co-morbidities associated with advanced age), and subjects who are actually eligible but elects not to participate. The true background population comprises all eligible subjects and this group is important to characterize in order to evaluate the external validity of a trial. Our finding that eligible subjects who declined participation were more than a decade older than participating subjects emphasizes the on-going challenge to adapt these types of interventions to elderly cancer survivors. It is possible, that the technology-based nature of our intervention may have particularly precluded elderly subjects. However, in direct comparison the entire group invited to participate in the COURAGE trial ($n = 1,433$, mean age 68) were even older (13 years) than the population randomized ($n = 39$, mean age 55 years) [20], which suggests that age-discrepancy occurs across interventions with or without technology as a key component.

We also found difference in employment status between participants

and non-participants, with participants being more likely to work. This is most likely associated with the age-discrepancy, and is also consistent with previous reports [19]. Besides age and employment status, no other background characteristics were significantly associated with study participation. An important observation was that we enrolled approximately equal number of patients who had undergone surgery only, and patients who had also undergone adjuvant chemotherapy. Previous exercise trials have typically included most patients received adjuvant chemotherapy and less patients who had received surgery only. The general trend toward higher proportion of included patients who have undergone adjuvant chemotherapy likely stems from the motivation to use physical exercise to improve or accelerate the course of rehabilitation after chemotherapy. However the available epidemiological evidence have not shown differences between tumor stages regarding the relative reduction in overall- and CRC-specific mortality risk associated with high level of physical activity, and patients who have only received surgery report similar (low) physical activity level as patients who have received both surgery and adjuvant chemotherapy [36]. From this perspective, the need to develop feasible and effective exercise-strategies in patients receiving surgery only is of equal importance, but appears to be under-prioritized in current exercise-trials.

Strengths of the I-WALK-CRC study include a novel technology-based intervention with a pragmatic aim of increasing physical activity

Table 2
Baseline characteristics of participants (n = 42) and non-participants (n = 41).

	All subjects (n=83)	Participants (n=42)	Non-participants (n=41)	Odds Ratio [95%CI]	P-value
Age					
Mean, range	65.5 [37;86]	60.4 [37;76]	70.8 [55;86]	N.A	< 0.001
< 65, n (%)	36 (43.4)	26 (61.9)	10 (24.4)	1.00(ref.)	
≥ 65, n (%)	47 (56.6)	16 (38.1)	31 (75.6)	0.20[0.08-0.51]	0.001
Gender					
Men, n (%)	39 (47.0)	21 (50.0)	18 (43.9)	1.00(ref.)	
Women, n (%)	44 (53.0)	21 (50.0)	23 (56.1)	0.78[0.33-1.86]	0.578
Marital status					
Married/cohabitant (%)	55 (66.3)	31 (73.8)	24 (58.5)	1.00(ref.)	
Divorced/Widow (%)	28 (33.7)	11 (26.2)	17 (41.5)	0.50[0.20-1.27]	0.144
Education level					
Less or finished 10 th grade (%)	11 (13.2)	3 (7.1)	8 (19.5)	1.00(ref.)	
High school/short higher education (%)	39 (47.0)	20 (47.6)	19 (46.3)	2.81[0.65-12.18]	0.168
Medium/long higher education (%)	33 (39.8)	19 (45.2)	14 (34.2)	3.62[0.81-16.15]	0.092
Employment status					
Not working ^a (%)	47 (56.6)	16 (38.1)	31 (75.6)	1.00(ref.)	
Working (%)	36 (43.4)	26 (61.9)	10 (24.4)	5.04[1.96-12.98]	0.001
Smoking					
Never (%)	34 (41.0)	19 (45.2)	15 (36.6)	1.00(ref.)	
Earlier (%)	39 (47.0)	20 (47.6)	19 (46.3)	0.83[0.33-2.09]	0.694
Present (%)	10 (12.0)	3 (7.1)	7 (17.1)	0.34[0.07-1.54]	0.160
Units of alcohol per week					
0-7 (%)	54 (65.1)	27 (64.3)	27 (65.9)	1.00(ref.)	
8-14 (%)	16 (19.3)	10 (23.8)	6 (14.6)	1.67[0.53-5.23]	0.342
> 14 (%)	13 (15.6)	5 (11.9)	8 (19.5)	0.63[0.18-2.16]	0.457
Diabetes					
No (%)	73 (87.9)	38 (90.5)	35 (85.4)	1.00(ref.)	
Yes (%)	10 (12.1)	4 (9.5)	6 (14.6)	0.61[0.16-2.36]	0.479
Hypertension					
No (%)	50 (60.2)	27 (64.3)	23 (56.1)	1.00(ref.)	
Yes (%)	33 (39.8)	15 (35.7)	18 (43.9)	0.71[0.29-1.72]	0.447
Cardiovascular disease^b					
No (%)	73 (87.9)	35 (83.3)	38 (92.7)	1.00(ref.)	
Yes (%)	10 (12.1)	7 (16.7)	3 (7.3)	2.53[0.61-10.57]	0.202
Lung disease^c					
No (%)	71 (85.5)	36 (85.7)	35 (85.4)	1.00(ref.)	
Yes (%)	12 (14.5)	6 (14.3)	6 (14.6)	0.97[0.29-3.30]	0.964
Adjuvant chemotherapy					
No (%)	44 (53.0)	20 (47.6)	24 (58.5)	1.00(ref.)	
Yes (%)	39 (47.0)	22 (52.4)	17 (41.5)	1.55[0.65-3.70]	0.320

OR = Odds ratio, CI = Confidence intervals

Significant values in bold (p < 0.05).

^a Not working includes unemployed, sick leave and retirement.

^b Diagnosed cerebral apoplexy (ischemic or hemorrhagic stroke) or any other diagnosed blood clots.

^c Asthma or/and COPD.

level to 150 min per week as per standard guidelines. The study includes gold-standard assessments of participants cardio-metabolic health profile, including CPET, DXA-scan, OGTT, and PRO assessments, by blinded assessors, and will serve to determine the capacity of a walking-intervention to improve these outcomes.

Limitations of the I-WALK-CRC study may be the enrollment of a heterogeneous population within a small sample size. While this may broadly represent the background population, some participants may be too fit to improve significantly from walking-based exercise, while others may struggle to perform the prescribed program of 150 min per week. Further, in the recruiting phase we did not assess to which extend potentially eligible CRC survivors were not informed of the study, either due to lack of time and resources in the clinics or due to 'pre-screening' by the clinical personnel. Also, we do not have self-reported data on non-participants primary cancer site (colon or rectum cancer), and thus, it cannot be determined if this variable was associated with participation. Finally, we did not stratify subjects by weight/BMI, which may be an important mediating factor, and we can only speculate on to which extend any potential health improvements may be derived from weight loss or a direct effect of the exercise-intervention.

7. Conclusion

In the present study, recruitment of CRC survivors was feasible by in-hospital procedures, but the trial clearly favored younger participants. The I-WALK-CRC study will provide novel and important information regarding the feasibility and efficacy of home-based walking exercise in CRC survivors, who are highly underrepresented in the current exercise-oncology literature. These findings will contribute to determine the relevance and perspectives of a smart-phone application based exercise intervention can be applied as standard rehabilitation among CRC patients. If the present study documents significant improvements in cardio metabolic health outcomes, a large-scale RCT will be required to determine if these changes translate into clinical benefits. However, exploration of different recruitment methods is necessary to establish a more effective recruitment strategy in order to improve recruitment rates.

Disclosure statement

The authors declare no conflicts of interest.

Acknowledgements

The Center for Physical Activity Research (CFAS) is supported by a research grant from TrygFonden. JFC is supported by research grants from Rigshospitalet, The Danish Cancer Society, The Capital Region of Denmark and TrygFonden. We gratefully acknowledge the assistance of all clinicians from recruiting departments at Copenhagen University Hospitals. Particularly, we wish to thank Maj-Britt Ferm Petersen and Julia S. Johansen (Dept. of Oncology Herlev Hospital), Lotte Jakobsen (Dept. of Gastric-Surgery Hvidovre Hospital), Sigrid Nikoline Bank Nielsen (Digestive Disease Center, Bispebjerg Hospital), and Olivia Johansen (Dept. of Oncology, Rigshospitalet) for their excellent assistance in this study. We also thank CFAS affiliates Naja Zenius Jespersen, Kristian Karstoft, Grith Elster Legård and Ulrik Winning Iepsen for their assistance in the medical screening and examination, and Sarah Leggett, Maria Brinkkjær and Annette Blom Nielsen for assistance in test-assessments of participants.

Appendix A. Supplementary data

Supplementary data related to this article can be found at <http://dx.doi.org/10.1016/j.conctc.2018.01.008>.

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