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Clinical paper

Promising results from a residential rehabilitation intervention focused on fatigue and the secondary psychological and physical consequences of cardiac arrest: The SCARF feasibility study

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Abstract

Aims: This study investigated the feasibility and potential effect of SCARF (Survivors of Cardiac ARest focused on Fatigue) a multidisciplinary residential rehabilitation intervention focused on fatigue and the secondary psychological and physical consequences of cardiac arrest (CA).

Methods: This was a prospective one-armed feasibility study. Six progression criteria were identified related to the feasibility of the intervention and viability of a future effect study in terms of: participant recruitment (1), participant retention (2,3,4), and completeness of outcomes (5,6). Data on participant/clinician satisfaction with the intervention was also collected along with self-reported outcomes: fatigue, quality of life, anxiety, depression, function and disability, and physical activity (at baseline, 12 weeks and 6 months) and physical capacity (baseline and 12 weeks).

Results: Four progression criteria were met including retention (87.5%) and completion of baseline outcomes (97.5%). Two criteria were not met: recruitment rate was 2.9 participants per month (estimated rate needed 6.1) and completion of final outcomes was 65% (estimated proportion needed 75%). Participant/clinician satisfaction with the intervention was high. Three months after the SCARF intervention small to moderate effect size changes of $r = 0.18–0.46$ were found for self-reported fatigue, quality of life, anxiety, depression, function and disability and for two of the physical capacity tests ($d = 0.46–0.52$).

Conclusion: SCARF was found to be a feasible intervention with high participant/clinician satisfaction, high participant retention and the possible potential to improve self-reported and physical capacity outcomes. Procedures for study recruitment and collection of final outcomes should be modified before a fully powered randomised controlled trial is conducted.

Keywords: Cardiac arrest, Survivorship, Fatigue, Rehabilitation

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Introduction

The number of survivors of cardiac arrest (CA survivors) is increasing due to successful improvements in prehospital and acute medical care.[1] While most CA survivors return home and live independently,[2] CA can also cause debilitating long term cognitive, psychological and physical problems.[3] Cognitive impairments caused by hypoxic brain injury include deficits in attention, memory, and executive function.[4–7] Though rarely severely disabling these problems may continue beyond a year for 30–50% of CA survivors.[8,9] Psychological problems such as anxiety[10,11] and depression[11,12] can also be common and persistent. However, the most prevalent symptom is fatigue[2] reported by up to 70% of CA survivors.[13,14]

The specific cause of fatigue in CA survivors is unknown[2] but is likely related to the multiple interconnected secondary consequences of CA such as the increased effort required for cognitive processes,[8,15] psychological distress, sleep disturbances,[15] ongoing cardiac disease[16] and reduced physical activity levels.[17,18] Long-term fatigue after CA is associated with decreased physical activity[18], social participation,[18] and return to work.[14] While rehabilitation for the secondary consequences of CA, including fatigue, is recommended in international guidelines,[3,19,20] evidence is sparse and of low quality.[21] Though, one small (n = 18) existing pilot study did find self-reported fatigue in CA survivors improved with telephone-based energy conservation and problem-solving therapy (EC + PST).[22] Considering brain injury in general, there are no evidence-based treatment recommendations for fatigue.[2,23,24] However, treating modifiable psychological or lifestyle factors through education[25] and behavior change strategies has been shown to reduce fatigue, and improve psychological well-being and social participation,[15,26] suggesting this may also be effective for CA survivors.

Testing the effect of any new rehabilitation intervention is crucial but survival after CA remains relatively rare making recruitment to research studies challenging. Thus, we designed a residential intervention inspired by residential programmes for cancer[27–29] with multiple intervention components in a short time frame enabling national recruitment and participation of survivors. This intervention, SCARF (Survivors of Cardiac ARest focused on Fatigue) was designed through a systematic intervention development process based on our best current knowledge. However, there are key uncertainties to be tested before progressing to a fully powered randomised controlled trial (RCT) if the intervention is to be successfully implemented in the future.[30] Hence, the primary aim of this study was to determine the feasibility of the SCARF intervention and viability of a future RCT in terms of acceptable recruitment rate, retention of participants, and completeness of outcomes with a secondary aim to investigate change from baseline to follow-up in relevant self-reported outcomes and physical capacity tests.

Methods

Study design

A prospective one-armed feasibility study was conducted of the SCARF intervention, a new multidisciplinary residential rehabilitation intervention focused on fatigue and the secondary psychological and physical consequences of CA. A priori, six progression criteria[31] were agreed to provide a transparent decision process on readiness to progress to a fully powered RCT and identify necessary modifications to the intervention and/or study design.[31] The study is reported according to the CONSORT extension for pilot and feasibility trials.[32]

Setting and timeframe

Danish healthcare is universal and tax-funded. There are approximately 800 new CA survivors per year in Denmark. The proportion with rehabilitation needs and eligible for this study was unknown.[33] CA survivors are usually offered cardiac rehabilitation if their cause of CA is ischemic heart disease.[34] They may also be referred to psychological therapies, cognitive rehabilitation or physiotherapy for specific problems. However, this provision is inconsistent across Denmark and there is no specific rehabilitation for CA survivors.[34] The SCARF study was conducted at REHPA, the Danish Knowledge Center for Rehabilitation and Palliative Care in Nyborg, Denmark.

The SCARF programme was delivered on four occasions at REHPA from October 2019 to March 2021 with final follow-up data collected in June 2021. SCARF consisted of an initial five-day residential programme at REHPA followed by 12-weeks at home before returning for a further 2-day programme (Fig. 1).

Study population and recruitment

CA survivors with a self-identified need for rehabilitation could be referred to SCARF by their cardiologist or general practitioner. They must be ≥3 months after their CA, ≥18 years old, and able to speak and understand Danish. Participants must be independent with self-care unless this could be provided by their attending relative. Self-identified rehabilitation need was determined by a score of ≥3 on the REHPA scale. This is a linear analogue scale, where participants indicate how close they are to living the life they desire after their CA.[35] The scale ranges from 0= 'goal reached' to 9= 'infinitely far from'. Participants with no permanent residence in Denmark were excluded.

Study recruitment information was publicised on the websites of REHPA, the Danish Heart Foundation and the Danish Resuscitation Council, via leaflets at the five tertiary cardiac centers in Denmark, and to clinicians with a special interest in post-CA care.[36]

Intervention

The SCARF intervention is described according to the TIDieR guidelines.[37] SCARF was a residential rehabilitation intervention (Fig. 1) including group education and individual activity sessions (Tables S1, S2, S3, supplementary, detail the SCARF intervention programme and components). Participants could choose to attend with a close relative. SCARF's delivery structure was adapted from an existing residential rehabilitation intervention provided by REHPA to people with cancer.[35,38,39] CA and cancer survivors share some similar problems, for example, fatigue,[40] fear,[41] anxiety and depression.[42] Hence, some components were adapted from the existing REHPA intervention and others were developed specifically for SCARF. Intervention development (detailed in Table S4 and Fig. S1, supplementary) was based on current research with CA survivors[21,22] and similar patient groups (Table S2, supplementary) informed by clinical experience and refined through user-involvement activities[36] and feedback from preliminary courses. A theory of change model illustrates how and why the intervention would deliver improvements (Fig. 2) and a logic model identified necessary resources/inputs and activities, expected outputs, outcomes and long term impact[43] (Table S5, supplementary).

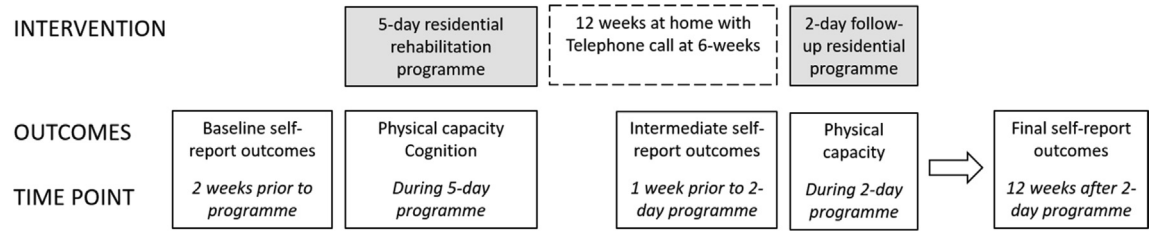

Fig. 1 – Structure of SCARF study.

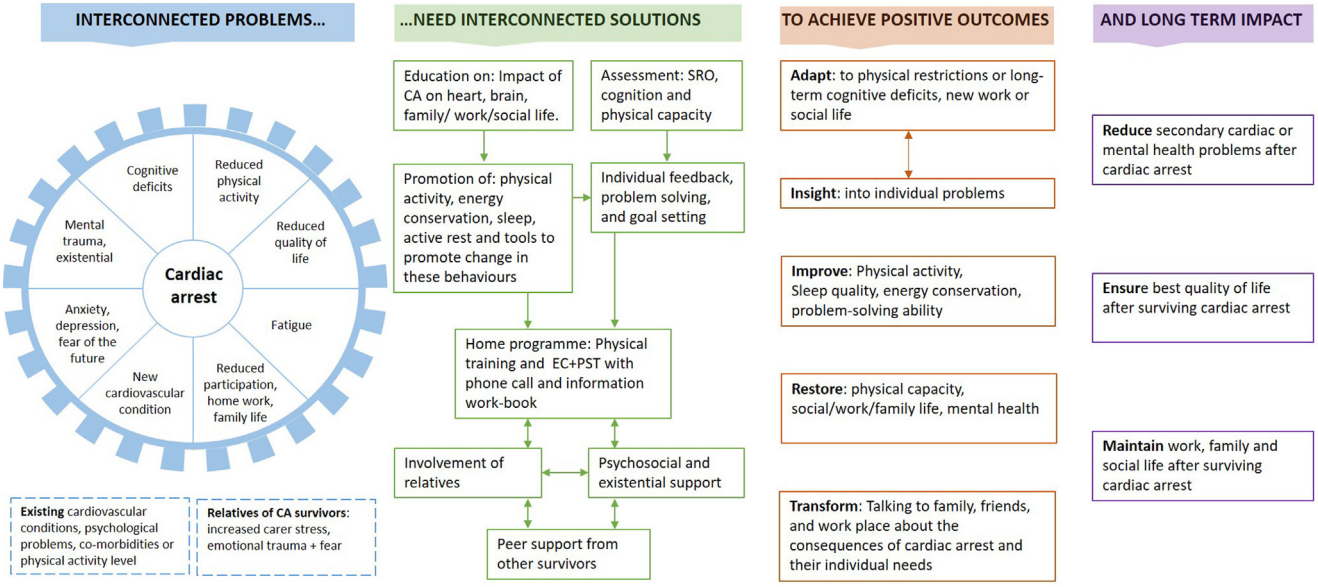

Fig. 2 – SCARF Theory of change model.

Outcomes

Progression criteria

To determine the feasibility of the intervention and study design six progression criteria were identified by the research group based on key uncertainties that could influence the success of a future RCT.[31] Traffic light style categories were defined as stated in Table 1.[31]

A power calculation based on the change in total Modified Fatigue Impact Scale (MFIS) score found in a previous intervention study with CA survivors[22] indicated 124 study participants is needed to have sufficient statistical power to identify a treatment effect.[22] Assuming a recruitment period of three years and a 25% loss from initial application to participation in the intervention (progression criteria 2) and a 25% loss from baseline to completion of final outcomes (progression criteria 6) a future RCT would need to receive 220 applications or 6.1 per month (progression criteria 1).

Further, we were uncertain if participants would be engaged in the intervention and complete the whole programme (retention) (progression criteria 2, 3, 4) or motivated and able to complete the online survey (progression criteria 5, 6).

Participant and clinician satisfaction

Participants rated each session separately on 'relevance' and 'benefit', scored 0–5 on a Likert scale with 0 = no relevance/benefit and 5 = very relevant/beneficial. Clinicians stated their agreement with five statements covering purpose, content, duration, location and adequacy of training, scored 1–5 on a Likert scale with 1 = strongly disagree to 5 = strongly agree (Table S6, supplementary).

Intervention outcomes

To identify a potential primary outcome for a future effect study and provide limited efficacy testing, data was collected on change in self-reported and physical capacity outcomes. Fatigue, as the primary focus of the intervention, was measured by two self-reported questionnaires, MFIS[44,45] measuring impact of fatigue on function and the Multidimensional Fatigue Inventory (MFI-20) measuring fatigue severity.[46] Given the multidimensional nature of fatigue[47] and interconnected secondary consequences of CA[48,49] four further self-reported questionnaires were selected covering health-related quality of life: EQ 5D 5L,[50] anxiety and depression: Hospital Anxiety and Depression Scale[51] (HADS), function and disability: World Health Organisation disability assessment schedule 2.0[52,53] (WHODAS 2.0), and physical activity: International physical activity questionnaire Short Form[54] (IPAQ-SF) (Table S7, supplementary). Physical capacity was measured via the 30-second chair-stand test,[55] 6-minute walk test,[56,57] and hand grip strength[58,59] (Table S8, supplementary).

Data collection

Baseline characteristics came from an initial application form completed by the survivor and their doctor (Fig. 1). Cognitive status was determined by objective cognitive tests administered by a neu-

Table 1 – Progression criteria categories and results.

	Progression Criteria	Categories			Result	Category Result
		Green: progress to effect study	Amber: Amend when progressing to effect study	Red: Must be resolved before progression to effect study		
Recruitment and retention:						
1	Initial application recruitment rate (participants per month)	>6.1	4.5–6.1	<4.5	2.9	Red
2	Conversion of applicants to study participants (%)	>75	50–75	<50	93	Green
3	Participation in mid-intervention telephone call (%)	>80	70–80	<70	100	Green
4	Participation in 2-day follow-up (%)	>80	70–80	<70	87.5	Green
Completion of self-report outcomes at:						
5	Baseline (%)	>90	80–90	<80	97.5	Green
6	Final follow-up (26 weeks) (%)	>75	65–75	<65	65	Amber

ropsychologist during the 5-day programme (Tables S2, S9, supplementary). Progression criteria data on recruitment, retention and completion of outcomes were collected from application forms, attendance lists and a telephone call checklist. Participant satisfaction was collected by paper survey on the last day of the 5-and 2-day programmes and clinician satisfaction by email survey after the 2-day programme.

Self-reported outcomes were collected at baseline, at intermediate time point, and at final follow-up online using REDCap (Research Electronic Data Capture). A physiotherapist conducted the physical tests on day two of the 5-and 2-day programmes.

Data analysis

Descriptive statistics were used to summarize demographic and clinical characteristics. Data for progression criteria were calculated as proportions and presented as numbers and/or percentages.

Participant satisfaction mean scores for 'relevance' and 'benefit' were calculated for the whole SCARF intervention. Clinician satisfaction mean scores were calculated overall for the intervention and for each statement.

For self-reported outcome scores and physical capacity tests, continuous data was checked for normality and described as mean and SD. Mean difference was determined to investigate change in outcomes from baseline to follow-up time points. Effect size was estimated with Cohen's d[60] for normally distributed data. Non-normally distributed data, where differences were tested with Wilcoxon matched-pairs signed-rank test, effect size (r) was calculated by dividing the test statistic z by the square root of the number of observations. Values of 0.3, 0.5 and 0.8 were interpreted as small, medium and large effect sizes respectively for Cohen's d.[60] while associated values for r were 0.15, 0.24 and 0.37.[61] All analyses were conducted using STATA V.16 (StataCorp) statistical software.

Ethical considerations

The study was conducted in accordance with the Declaration of Helsinki with informed written consent obtained from all participants. The Region of Southern Denmark ethics committee assessed that according to Danish legislation the study was not subject to ethical notification (journal number 20192000–19). The study was registered with The Danish Data Protection Agency (journal number 19/15603) and in the database Clinical Trials (www.clinicaltrials.gov, NCT04114773) before inclusion of participants.

Results

Participant demographics and CA-related clinical characteristics

The majority of participants were male (62.5%) with a wide age range from 33-79 years (Table 2). Median time since CA was 13 months (IQR 10.5) (Table 2). In total, 43 CA survivors applied for the course of these 40 were included in the study (Fig. 3).

Progression criteria

Progression criteria results were red for initial application recruitment rate, amber for completion of final follow-up self-reported outcomes and green for the other four criteria (Table 1).

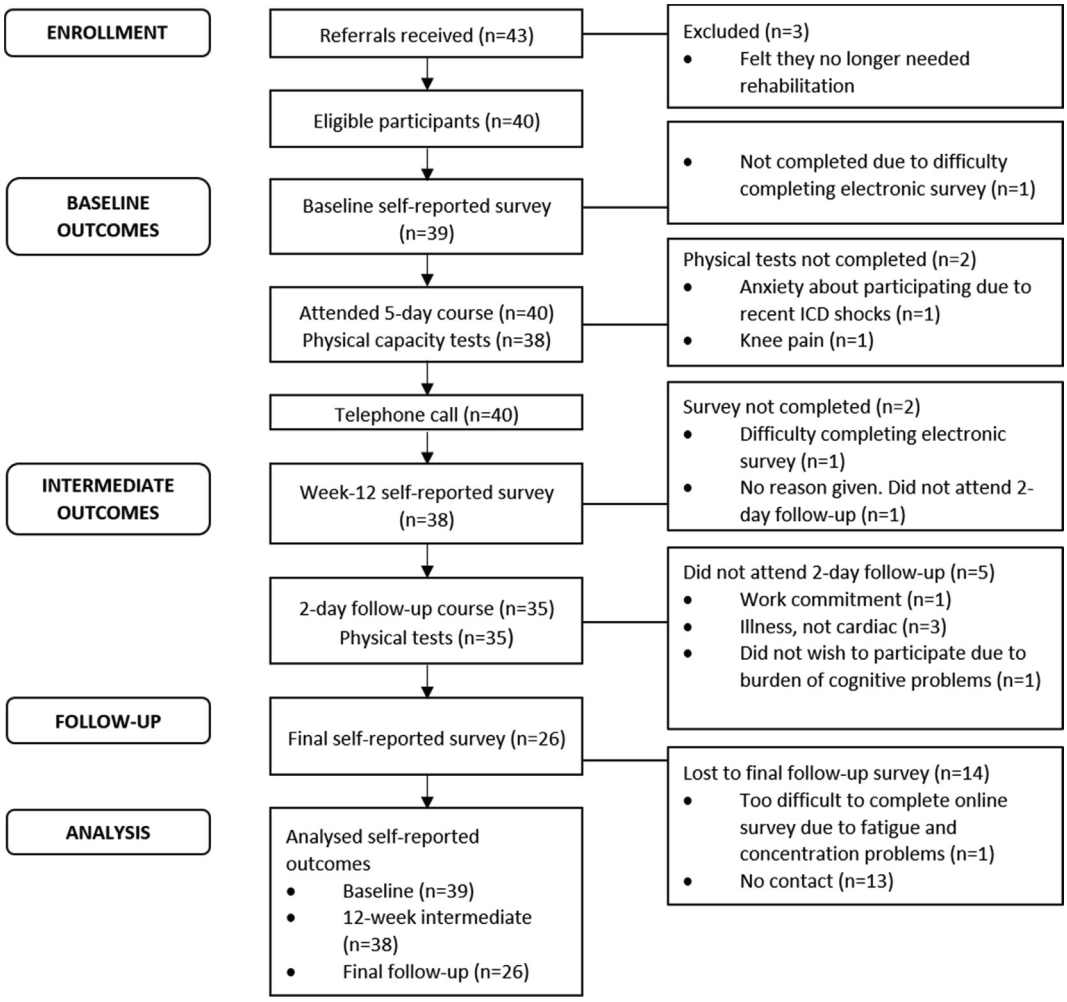

Fig. 3 – Flow of participants through study.

Participant and clinician satisfaction

Overall, participant satisfaction with the SCARF intervention was high with mean scores of 4.5 (SD 0.5) and 4.2 (SD 0.7) out of 5 for relevance and benefit respectively. Clinician overall satisfaction was also high (4.0, SD 0.8) with the statements 'appropriate for participants' (3.6, SD 0.7) and 'enough time' (3.7, SD 0.9) scoring slightly lower than the other three statements.

Intervention outcomes

Neither the total score nor subscales of the MFIS showed an effect size ($r \geq 0.15$) (Table 3). The MFI-20 dimension general fatigue showed a small effect baseline to intermediate follow-up ($r = 0.15$), maintained at final follow-up ($r = 0.18$) with a small effect also found for the MFI-20 dimension physical activity, baseline to final follow-up ($r = 0.15$). Small effect sizes were found, baseline to intermediate follow-up, for the EuroQoL index score ($r = 0.26$), EuroQoL 5D 5L visual analogue scale ($r = 0.27$), HADS-Anxiety ($r = 0.16$) and WHO-DAS 2.0 total ($r = 0.15$) with effect sizes maintained at final follow-up for the EuroQoL index ($r = 0.18$), HADS-Anxiety ($r = 0.17$), and WHODAS 2.0 total ($r = 0.26$). HADS-Depression showed a small effect size baseline to final-follow-up ($r = 0.26$). A moderate effect size was found for WHODAS 2.0 domain 'Life activities' between baseline and intermediate time point ($r = 0.25$) maintained at final follow-up ($r = 0.46$).

A moderate effect size was found for the 30-second chair-stand test ($d = 0.52$) and small effect size for the 6-minute walk test ($d = 0.46$) between baseline and intermediate time points (Table S10, supplementary).

Participants who did not complete the final follow-up self-report outcomes (n = 26) were younger and had a higher burden of self-reported fatigue, depression, and disability (self-care and participation domains) at baseline compared to completers (n = 13) (Table S11, supplementary).

Discussion

This study investigated the feasibility of a residential rehabilitation intervention for CA survivors. We found the intervention was feasible with an 88% completion rate, high participant/clinician satisfaction and showing potential for positive effects bearing in mind the small sample size and one-armed study design. However, two aspects of the study design, recruitment and completion of final outcomes, did not meet the progression criteria and may need to be modified before the intervention is tested in a fully powered RCT.

Recruitment to the SCARF study was primarily via websites connected to CA, relying on clinicians with a special interest[36] or CA survivors/their relatives finding the information. The recruitment rate of

Table 2 – Participant demographics and CA-related clinical characteristics (n = 40).

Demographic/clinical characteristics	Counts (%)
Age (years), mean (range, SD)	57.4 (33–79, 20.72)
Gender, male	25 (62.5)
Body Mass Index, mean (range, SD)	28.2 (18.2–55.0, 7.6)
Marital status	
Single	8 (20.0)
Partner	9 (22.5)
Married	23 (57.5)
Living alone	13 (32.5)
Children < 18 years living at home	13 (32.5)
Time since cardiac arrest (months), median (IQR, range)	13 (10.5, 3–49)
Reason for cardiac arrest[a]	
Ischemic heart disease	20 (50.0)
Arrhythmia	9 (22.5)
Cardiomyopathy	3 (7.5)
Other or unknown	8 (20.0)
Return of spontaneous circulation[b] (minutes) (mean, range)	15 (0.5–87)
Place of cardiac arrest[c]	
Home	15 (37.5)
Public place	14 (35.0)
Hospital	11 (27.5)
Treatment after cardiac arrest[a]	
Percutaneous coronary intervention	20 (50.0)
Implantable cardioverter-defibrillators	28 (70.0)
Coronary artery bypass grafting	3 (7.5)
Rehabilitation need as measured by the	
REHPA scale (points), median (IQR)	5.6 (2.0)
Cognitive status	
Cognitive impairment[d]	11 (28.9)

[a] Information from referring doctor and more than one category may have been recorded.
[b] Return of spontaneous circulation unknown or unrecorded (n = 11).
[c] Public place includes n = 2 in ambulance.
[d] Cognitive impairment was defined as a score less than 1.5 SD of published population norms[6] on two or more cognitive tests (Table S8 supplementary materials) (n = 38).

2.9 per month is half the estimated required rate to show an effect on the MFIS in a full-scale study over a three-year period. Possible modifications to the study design include a more active recruitment process or using a multi-center trial design. Screening CA survivors for fatigue or related secondary problems at outpatient cardiology follow-up may identify those with rehabilitation needs and therefore potential future study participants. A multi-center trial including similar residential facilities in European countries[62,63] may increase pace of recruitment. The residential delivery method used by SCARF meant survivors need only attend twice, improving retention, but possibly reducing recruitment for survivors with work or caring commitments. Recruitment to SCARF could be improved with alternate delivery models, for example, using outpatient centers, as is traditional for cardiac rehabilitation[64] or via tele-rehabilitation whose popularity has accelerated in part due to Covid 19[65] but also due to the potential for reduced resource use[66] and increased participation.[64,66] Telephone-based rehabilitation has successfully been delivered to CA survivors in previous studies[22,67] but this does not allow group-based components. Further, tele-rehabilitation may not suit older CA survivors[68] or provide the social or environmental benefits found with in-person interventions,[69] and the preferences of survivors themselves needs further investigation.

Only 65% of participants completed final outcomes at six months, perhaps due to difficulties with the on-line survey, low motivation, fatigue and/or cognitive problems. Modifications to improve completion could include shortening the self-reported survey,[70,71] providing paper surveys[70] or using additional telephone calls to remind and support participants to complete the final survey.[70,72,73]

Where final outcomes were completed, we found a small effect for MFI-20 general Fatigue score (r = 0.18) but none for the MFIS. Fatigue is the most prevalent symptom after CA but is linked with multiple other secondary problems. Hence, for this feasibility study, we chose a broad recruitment approach based on rehabilitation need. Though we did show a small effect for MFI-20 general fatigue the lack of effect on the MFIS could be due to some participants having low initial fatigue scores. An earlier study testing EC + PST[22] with CA survivors found the MFIS improved significantly, but only included participants with chronic fatigue with a baseline mean MFIS total score of 50.4 (scale 0–84) compared to 29.4 in our study. Further, the MFIS result could have been affected by the poor completion of final outcomes, with the non-completers reporting a significantly higher baseline MFIS score (39.6) than the completers (24.3) (Table S11, supplementary).

Given the multidimensional nature of fatigue and our inclusion based on rehabilitation need,[47] we chose four additional self-reported outcomes. Of these, the WHODAS 2.0 'Life activities' domain showed the largest effect (r = 0.46). SCARF was designed to treat the many interconnected secondary consequences of CA[48,49] with a focus on the causes and consequences of fatigue. Therefore, we included sessions on work and family life as well as

Table 3 – Self-reported outcomes at baseline, intermediate and final follow-up time points.

Time point	Baseline	Intermediate follow-up (11 weeks after baseline)			Final follow-up (6 months after baseline)		
Outcome measure Self-reported	Mean (SD) n = 39	Mean (SD) n = 38	Mean difference baseline to intermediate follow-up (95% CI)[a]	Effect size	Mean (SD) n = 26	Mean difference baseline to final follow-up (95% CI)[b]	Effect size
MFIS total	29.4 (18.9)	29.2 (17.1)	−0.5 (-5.6, 4.6)	0.01	25.1 (16.1)	0.8 (-5.2, 6.8)	0.10
Physical	13.2 (9.0)	13.0 (8.2)	−0.2 (-2.8, 2.3)	0.00	12.2 (8.6)	1.2 (-2.1, 4.5)	0.13
Cognitive	13.6 (10.1)	13.3 (9.4)	−0.5 (-2.8, 1.8)	0.03	10.7 (8.4)	−0.5 (-3.0, 2.1)	0.04
Psychosocial	2.7 (2.4)	2.9 (2.0)	0.2 (-0.6, 1.0)	0.04	2.2 (2.0)	0.0 (-0.9, 0.9)	0.05
MFI-20 General fatigue	13.5 (4.1)	13.1 (3.6)	−0.5 (-1.6, 0.7)	0.15*	12.7 (3.8)	−0.7 (-2.0, 0.5)	0.18*
Physical activity	12.4 (4.9)	12.8 (5.1)	−0.2 (-4.1, 3.7)	0.09	12.2 (5.2)	−1.2 (-2.1, 4.5)	0.15*
Reduced activity	12.2 (4.4)	12.5 (4.1)	−0.2 (-1.3, 0.8)	0.06	11.6 (4.4)	0.1 (-1.4, 1.2)	0.02
Reduced motivation	8.5 (3.4)	8.8 (4.0)	−0.4 (-1.4, 0.7)	0.10	8.0 (2.8)	0.2 (-0.7, 1.2)	0.13
Mental fatigue	11.6 (4.6)	11.7 (4.5)	−0.8 (-0.9, 0.8)	0.01	11.1 (4.7)	0.2 (-1.0, 1.3)	0.07
EuroQoL index	0.72 (0.16)	0.76 (0.11)	0.04 (0.01–0.08)	0.26*	0.79 (0.11)	0.03 (0.15, 0.07)	0.18*
EuroQol 5D 5L VAS	60.2 (21.9)	65.0 (18.7)	5.6 (-0.3, 11.4)	0.27*	65.6 (23.5)	2.1 (-8.4, 12.6)	0.12
HADS Anxiety	7.7 (4.6)	7.4 (4.5)	−0.5 (-1.4, 0.4)	0.16*	6.4 (4.4)	−0.7 (-1.7, 0.3)	0.17*
HADS Depression	5.6 (4.0)	5.4 (4.1)	−0.3 (-1.2, 0.5)	0.11	3.8 (2.8)	−0.8 (-1.7, 0.1)	0.26*
WHODAS 2.0 total	22.1 (14.3)	20.5 (15.3)	−2.0 (-5.1, 1.0)	0.15*	16.8 (12.3)	−2.5 (-6.3, 1.3)	0.26*
Understanding and communication	21.1 (20.1)	20.6 (20.8)	−1.0 (-5.7, 3.8)	0.06	19.4 (20.3)	−0.3 (-8.2, 7.5)	0.04
Getting around	11.6 (14.8)	11.5 (16.7)	0.3 (-4.8, 5.3)	0.08	7.7 (12.3)	−0.8 (-6.1, 4.5)	0.12
Self-care	6.6 (13.7)	4.4 (12.0)	−2.3 (-7.6, 3.0)	0.21*	3.6 (7.3)	0.5 (-0.9, 1.9)	0.07
Getting along with people	20.4 (20.6)	23.6 (21.4)	2.6 (-1.2, 6.5)	0.19*	17.3 (14.2)	−0.2 (-4.21, 4.6)	0.03
Life activities	38.9 (27.9)	29.9 (24.1)	−9.9 (-17.9, −1.8)	0.25*	21.9 (21.3)	−15.4 (-24.1, −6.7)	0.46*
Participation in society	34.4 (18.8)	33.0 (21.9)	−2.0 (-7.5, 3.6)	0.09	30.7 (21.3)	0.7 (-6.3, 7.7)	0.10
IPAQ Short (MET per week)	4237 (3362)	3807 (3181)	−541 (-1840, 757)	0.09	4100 (3362)	107 (-923, 1136)	0.01

MFIS: Modified Fatigue Impact Scale; Multidimensional fatigue inventory; VAS: Visual analogue scale; HADS: Hospital anxiety and depression scale; WHODAS-2.0: World Health Organisation disability assessment schedule 2.0; IPAQ: International Physical Activity Questionnaire; MET: Metabolic equivalent.

capacity measure (n = 33).

* Effect size $\geq$ 0.15.

[a] Change from baseline to intermediate outcome calculated from mean and SD from participants who completed both baseline and intermediate self-report (n = 38) and physical.

[b] Change from baseline to 6 month follow-up calculated from mean and SD from participants who completed both baseline and 6 month follow-up self-report measures (n = 26).

a process for problem solving that could have been used by participants in situations other than for energy conservation. This comprehensive programme might account for the improvement in WHODAS 2.0 'life activities' and suggests a global or composite measure[74] might have been a more appropriate outcome in our study than using a single specific measure such as fatigue. Small effect sizes were found for quality of life (r = 0.18), anxiety (r = 0.17) and depression (r = 0.26) and the 6 minute walk test (d = 0.46) with a moderate effect size for the 30-second chair-stand test (d = 52) again indicating the effect of SCARF may be multi-factorial.

This study successfully identified several modifications required before progression to a SCARF effect study, however, the study had some limitations. We chose not to include a control group with randomization due to the exploratory nature of the study and uncertainty about recruitment. A recent RCT in the same setting[75] successfully demonstrated how SCARF could be tested using a RCT waiting list design.

Participants were included if they had a self-identified rehabilitation need, referred by a medical doctor and were independent with/without a relative, thereby excluding survivors with severe physical/cognitive problems or lacking insight into their rehabilitation needs. However, considering SCARF centers on group education and problem-solving, alternative, one-to-one interventions may be needed to meet the needs of these survivors.

The participant and clinician satisfaction data were limited to the survey questions provided. A parallel qualitative interview study, with both groups, would have increased the depth of information and potentially identified problems and solutions not considered by the research team.[76,77] In a change from the protocol, we were unable to collect information on number of problems solved through the EC + PST due to the complexity of the information needed and the timeframe for the individual conversation. A future study could collect this data via qualitative means.

Except for the recruitment strategy, this study found the SCARF intervention is feasible, but a fully powered RCT is needed to determine the effect. For this to be successful, research is needed to establish the content/face validity and reliability of fatigue measures in CA survivors. Further, developing methods for screening CA sur-

vivors for long term secondary problems would identify those with rehabilitation needs that could benefit from interventions like SCARF. Any future RCT should include a process evaluation to determine if SCARF's mechanism of action is consistent with the presented theory of change and logic models.[76,78]

Conclusions

The SCARF intervention was found to be feasible with high participant/clinician satisfaction, high participant retention and the potential to improve fatigue, quality of life, anxiety, depression, function and physical capacity bearing in mind the small sample size and one-armed study design. Procedures for study recruitment and collection of final outcomes should be modified before a fully powered RCT is conducted.

CRediT authorship contribution statement

Vicky L. Joshi: Conceptualization, Methodology, Investigation. **Lars Hermann Tang:** Conceptualization, Methodology, Investigation. **Young Joo Kim:** Methodology. **Mette Kirstine Wagner:** . **Jørgen Feldbæk Nielsen:** Conceptualization, Methodology. **Morten Tjoernlund:** Methodology, Investigation. **Ann-Dorthe Zwisler:** Conceptualization, Methodology.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.resuscitation.2022.02.002.

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