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Research paper

Evaluation of a lifestyle intervention program in primary care on physical and mental health and quality of life of cancer survivors: A pilot study

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ABSTRACT

Introduction: Cancer survivors often suffer from fatigue and (mental) health impairments. Despite evidence for effectiveness, lifestyle interventions are seldom applied in their aftercare. The aim of this study was to assess feasibility of a lifestyle intervention program on physical and mental wellbeing and quality of life (QoL) of cancer survivors, and to get a first impression of effectiveness, by means of a pilot study.

Methods: Nine subjects were enrolled in a 12-month lifestyle intervention pilot study without a control group, conducted in a Dutch primary care centre. The intervention consisted of individual and group lifestyle training focusing on diet, exercise and mind-body interaction. The main outcomes were physical and mental health and QoL.

Results: All 9 subjects completed the 12-month lifestyle intervention program. We found a large positive effect on fatigue ($r = -0.9$), stress ($r = -0.8$) and anxiety ($r = -0.9$). With respect to quality of life, large improvements in vitality ($r = 0.7$), role limitations due to physical health ($r = -0.7$), role limitations due to emotional problems ($r = -0.8$) and personal health experience ($r = 0.8$) were found. Subjects' arm strength increased ($r = 0.9$), but there were no significant changes in other physical parameters, depressive symptoms, social optimism and autonomy. Contradictory results were found for pain.

Conclusion: Implementation of this lifestyle intervention program seems feasible in this small uncontrolled pilot study. The reduced QoL that is typical for cancer survivors was positively influenced by this program. Most prominent results were retrieved for fatigue and mental functioning, whereas little effects were found for physical health.

1. Introduction

The number of cancer cases was estimated at 14 million worldwide in 2012 and this number is expected to increase to 24 million by 2035 [1]. This increase in cancer cases is accompanied by an increase in cancer survivors, mainly due to improved treatment methods [2]. Unfortunately, being cured from cancer does not necessarily mean being vital and healthy. Survival from cancer is associated with reduced quality of life and impairments in mental and physical functioning. In The Netherlands, more than 50% of cancer survivors reported increased fatigue, 30–50% suffered from mild to moderate anxiety and/or depression and 15% developed long term physical health problems [3]. Moreover, cancer survivors are characterised by poorer lifestyle behaviour compared to before diagnosis. Badr et al. [4] suggested female survivors, young adult survivors and survivors of cancers of the central

nervous system or lymphoma are most at risk for poor dietary practices, sedentary behaviours, and decreased quality of life. Unfortunately, aftercare for cancer survivors is generally insufficient [5]. Therefore, a tailored lifestyle intervention program might be beneficial to improve the quality of life of cancer survivors. Lifestyle interventions are seldom applied in aftercare for cancer survivors. However, a web-based program for cancer survivors focussing on moderate physical activity and vegetable consumption found sustainable increases of moderate exercise but not in vegetable intake [6]. Secondly, Kenzik et al. [7] found increased weight loss and physical activity to be associated with higher physical functioning in older cancer survivors. Moreover, a review of eight studies containing 413 patients by Smits et al. [8] suggested lifestyle interventions might improve quality of life and reduce fatigue in gynaecological cancer survivors. Regarding other patient groups, García-Toro et al. [9] suggested dietary recommendations might

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improve outcomes in depressed patients. Similar beneficial effects were found in patients with coronary atherosclerosis after a one year diet and activity program [10]. Likewise, a lifestyle intervention program focussed on weight loss and increasing physical exercise in people with risk of type 2 diabetes found higher effectiveness compared to pharmacological treatment [11]. Based on this, we hypothesize that a change in lifestyle may improve quality of life of cancer survivors. To this end, we designed a lifestyle intervention program for cancer survivors, based on the existing infrastructure of a primary care facility in Assen, the Netherlands. The 12-month intervention program consisted of a combination of dietary recommendations, changes in physical activity and mind-body therapy. In this paper, we describe the lifestyle program, assess feasibility, and present preliminary results from a pilot study, examining the program's effects on physical and mental health and quality of life.

2. Methods

2.1. Participants

Primary care facility Kloosterveen serves a young, urban population in Assen, the Netherlands covering 7600 patients. The facility consists of several general practitioners, dieticians, physical therapists and other health care professionals. Potential subjects were selected from the patient database using the International Classification of Primary Care (ICPC) code for oncology. Twenty-five subjects who were diagnosed with and treated for cancer during the last two years were contacted. Inclusion criteria were: the subject (1) had been diagnosed with cancer at least 6 months ago and/or has been long-term stable, (2) had a decreased level of physical and/or mental functioning and QoL (as assessed by a general practitioner overseeing the project) and wanted to improve it, (3) age ≥ 18 and < 80 years old. Exclusion occurred when the subject: (1) had severe physical risks due to cancer treatment and/or comorbidities, (2) was currently undergoing intensive chemotherapy or other treatment, (3) had cognitive or psychosomatic complaints that interfere with successful participation.

Thirteen subjects did not meet criteria according to their personal patient file or did not meet age requirements (≥ 18 and < 80 years old). Twelve subjects were interested in participating and 3 declined due to logistic difficulties. Therefore, 9 subjects started in October 2015 (See Fig. 1). The group consisted of 5 males and 4 females, aged 34–74. Subjects were all treated for cancer, respectively lung-, breast- and colon cancer and Non-Hodgkin lymphoma. Subjects received no financial reward for their participation.

2.2. Intervention

This study took place from October 2015 till October 2016 in primary care centre Kloosterveen, Assen, the Netherlands. Anamnesis was taken by a general practitioner, a dietician and a physical therapist. Current health status and exercise - and eating habits were monitored and personal goals were processed in a personal plan for each subject (See Fig. 2). To aid participants in achieving their personal goals, tailored advice in form of special modules was available when desired. The first 12 week subjects trained twice a week for one hour followed by one hour of mind-body therapy, both guided by physical therapists with mind-body therapy expertise. During week 13–26 subjects trained once a week for one hour and were urged to train at least once a week in their own time. During week 27–52 subjects were supposed to continue exercising in their own time. This process was monitored by the general practitioner and the physical therapists. Throughout the year, subjects had 1–4 appointments, depending on personal need, with a dietician and a once-only group meeting about diet and cancer. Lastly, the subjects met with the general practitioner at least 4 times a year to evaluate open questionnaires of distress, problem lists, their progress and to adjust personal goals. After the intervention, all subjects filled in

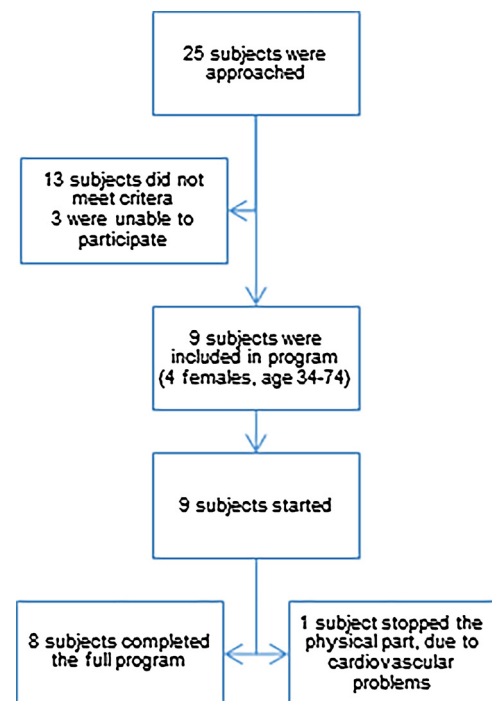


Fig. 1. Flowchart of a 12-month lifestyle intervention program for cancer survivors.

an extensive evaluation form about personal progress and overall satisfaction with the program.

2.3. Assessment

Baseline measurements of current physical and mental status were obtained from all subjects and the necessary information about health history was obtained from individual medical files. Bimonthly assessment was conducted of physical fitness (body mass index (BMI), waist circumference, blood pressure, muscular strength (grip, biceps curl, functional squat), endurance (steep ramp test)), self-efficacy (self-efficacy scale (SES)), social optimism and autonomy (positive outcome list (PUL)), pain (numeric pain rating scale (NPRS)) and fatigue (visual analogue scale – fatigue (VAS-F)) and 3-monthly questionnaires were filled in regarding personal distress (distress thermometer & problem list), mental wellbeing (21-item depression anxiety and stress scale (DASS-21) and QoL (rand-36) (See Fig. 2). Other questionnaires regarding personal complaints (patient specific complaints list (PSK) and 4-dimensional complaint list (4-DKL)) were also administered, but not used in this article because they have not been validated. The VAS-F is a subjective 0–10 scale to evaluate fatigue, which is measured from 0 to 100 mm. It has a high validity and internal consistency reliability in both healthy individuals and those with sleep disturbances [12]. The DASS-21 is a short version of the original 42-item scale, which consists of three subsets of questions to measure depression, anxiety and stress. It has a high internal consistency for several patient groups. Cronbach alpha for anxiety, stress and depression were respectively 0.94–0.97, 0.87–0.92 and 0.91–0.96. Test-retest reliability is also adequate, with 0.71 for depression, 0.79 for anxiety and 0.81 for stress [13]. The Rand-36 item Health Survey, or Rand-36, is used to measure perceived health and quality of life in 10 separate scales. This instrument has been used extensively in several healthy – and patient groups. Cronbach's alpha of the separate scales varies from 0.71 to 0.92 in healthy individuals with moderate test-retest reliability [14]. An extensive evaluation form was administered to assess subject's overall satisfaction with the program (see Supplementary file 1). Data were collected by the participating parties (1 general practitioner, 1 dietician and several physical

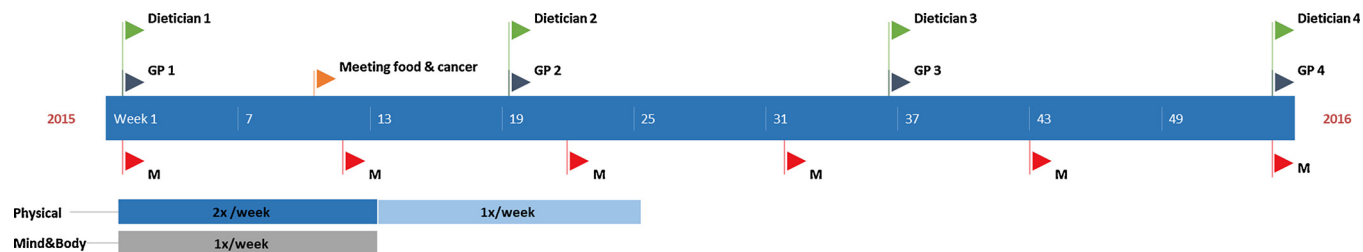


Fig. 2. Time scheme of the program with physical (week 1–26) and mind-body therapy (week 1–13) intervention, an informational meeting about food & cancer, the individual meetings with general practitioner (GP) and dietician (optional) and the measuring points (M).

therapists) and processed by a student of the University of Groningen. Written informed consent was provided and signed by all 9 participating subjects. The Medical Ethical Committee of the University Medical Centre Groningen judged the protocol (M17.218911) to be exempted from review by the Medical Research Involving Human Subjects Act (in Dutch: WMO).

2.4. Data analysis

Feasibility of the intervention was assessed on the following points: attendance rate, completion of the program, and self-reported satisfaction with the program. To get an initial impression of effectiveness of the program, data from physical tests and questionnaires were used for analysis using IBM Statistical Package for Social Sciences (SPSS) version 24 [15]. The first and last measurements were analysed on normality. None of the data were normally distributed. However, differences between the measurements were normally distributed. Therefore, Wilcoxon signed rank test was used. This statistical method was chosen because the main aim was to establish if any progress on physical and mental wellbeing and QoL was established after the 12-month intervention. For ease of comparison, standardized effect sizes were calculated by dividing the standardized test statistic retained from the Wilcoxon signed rank test by the square-root of the total number of subjects [16].

3. Results

3.1. Feasibility

All 9 subjects completed the lifestyle program, but one stopped the physical component because of cardiovascular problems. One subject reported neuropathy due to the previously followed cancer treatment, but did not drop out. The attendance rates were 77% for group physical therapy, 78% for the mind/body intervention, 100% for individual appointments with the family doctor and with the dietician and 89% for the meetings about food and cancer. According to the evaluation form, subjects scored 8 out of 10 on satisfaction with the program and seven out of nine participants reported that it resulted in an increased quality of life. A total of 8 physical tests were taken 6 times and 2 questionnaires were filled in 3 times during the year. All DASS-21 and Rand-36 questionnaires were handed in, but three questions in total were not filled in properly on the Rand-36. The subscale results of these subjects were not used in analysis.

3.2. Physical wellbeing

Baseline median BMI of 8 subjects was categorized as mild to moderately overweight (see Table 1A). Two subjects had a healthy BMI at this point. Post-intervention BMI did not change. Also, waist circumference, blood pressure, grip strength and endurance did not change significantly. Biceps curl showed an increase with a large effect ($r = 0.9$).

3.3. Fatigue

Individual fatigue scores per subject and changes between baseline and post-intervention were visualised in Table 2. Baseline scores varied from 0 to 75 mm. Post-intervention scores varied from 0 to 81. Seven of 9 subjects reported a decrease in fatigue. One participant started out with no fatigue complaints and had no change in results. Only one subject reported an increase in fatigue. The medians of baseline measurement and post-intervention measurement were 63.0 and 18.0, respectively. A Wilcoxon Signed-rank test shows that there is a large decrease in post-intervention fatigue levels compared to baseline ($N = 8$, $W = 2.0$, $p = .043$, $r = -0.7$).

3.4. Mental wellbeing

Median baseline scores were all categorized as lower than the cut-off for mild depression, according to the scoring guidelines. Two subjects scored 'mild' (total score $\times 2 < 7$) on anxiety (see Table 1B). Significant decreases were found compared to post-intervention scores in anxiety and stress scores. A decrease in depression scores with a moderate effect ($r = -0.3$) was found, but this effect was not significant. Also, a decrease in anxiety with a large effect ($r = -0.9$) and a decrease in stress scores with a large effect was found ($r = -0.8$). These effects were statistically significant.

3.5. Quality of life

Significant decreases were found in scores on the subscales 'role limitations due to physical health problems' and 'role limitations due to emotional problems' (see Table 1C). Both showed a decrease with a large effect ($r = -0.8$). Significant increases were found on the subscales 'energy/fatigue', 'general health perceptions' and 'bodily pain'. Large effects were found on these subscales (resp. 0.7, 0.8 & 0.7). Relative in- or decrease per subscale was calculated by subtracting the mean post-intervention value from the mean baseline value, dividing it by the total score range per subscale and multiplying it by 100%. The outcomes are visualised in Table 1C and Fig. 3 (positive changes in green; negative changes in red; no significant changes in grey).

No significant effects were found on the results of the SES, PUL, NPRS and distress thermometer & problem list.

4. Discussion

This 12-month lifestyle intervention program for a heterogeneous group of cancer survivors seems feasible. Furthermore, subjects improved on a broad range of outcome measures, including arm strength, fatigue, anxiety and stress levels, role limitations due to physical health problems, role limitations due to emotional problems, energy level, and general health perceptions. No significant changes were found on BMI, waist circumference, endurance, blood pressure, grip strength, social optimism and autonomy, self-efficacy, depressive symptoms and distress. Bodily pain moderately increased. Overall results indicate that this lifestyle intervention program was feasible in a primary care

Table 1

Median (baseline and post-intervention) ± standard deviation, total N, smallest sum of ranks (W), p-value and effect size (r) of (A) physical testing, (B) DASS-21 -, and (C) Rand-36 questionnaire subscales. *p < 0.05.

	Baseline	Post-intervention	N	W	p	r
A. Physical wellbeing						
BMI (kg/m ²)	27.7 ± 3.23	27.9 ± 3.52	8	17.0	.889	0.3
Waist circumference (cm)	99.0 ± 13.76	101.3 ± 15.08	8	10.5	.292	0.4
Blood pressure (mm/Hg)						
Systolic	142.0 ± 21.13	142.5 ± 22.07	8	12.0	.400	-0.3
Diastolic	84.5 ± 9.18	85.5 ± 6.21	8	8.5	.182	0.5
Grip left hand (kg)	33.0 ± 8.66	34.5 ± 8.49	8	12.0	.734	0.1
Grip right hand (kg)	36.0 ± 12.34	38.0 ± 7.63	8	7.0	.236	0.4
Biceps curl (kg)	43.0 ± 14.25	62.5 ± 17.57	5	0.0	.043*	0.9
Steep ramp (l/min)	2.6 ± 0.39	2.5 ± 0.66	8	4.5	.416	0.3
B. Depression, Anxiety & Stress (DASS-21 subscales)						
Depression	2 ± 2.55	1 ± 2.11	9	6.5	.395	-0.3
Anxiety	2 ± 2.00	0 ± 1.17	9	0.0	.011*	-0.9
Stress	5 ± 1.83	2 ± 1.56	9	0.0	.017*	-0.8
C. Quality of life (Rand-36 subscales)						
Physical functioning	25 ± 3.35	28 ± 4.27	9	6.0	.345	0.3
Social functioning	8 ± 1.76	8 ± 1.33	9	7.5	.542	0.2
Role limitations due to physical health problems	7 ± 1.79	4 ± 0.74	8	0.0	.034*	-0.7
Role limitations due to emotional problems	5 ± 0.97	4 ± 0.88	9	2.5	.016*	-0.8
Emotional wellbeing	24 ± 1.90	25 ± 2.71	9	10.5	.292	0.4
Energy/fatigue	16 ± 3.77	17 ± 3.72	9	2.5	.028*	0.7
Bodily pain	49 ± 9.58	55 ± 7.86	9	4.0	.049*	0.7
General health perceptions	16 ± 3.89	20 ± 4.06	9	1.5	.020*	0.8
Health changes	3 ± 0.98	3 ± 0.69	7	1.5	.414	-0.3

Table 2

VAS-F-values per subject + change (post-intervention (PI)-baseline) for all measuring points (baseline to PI), in mm.

Subject	Baseline	2	3	4	5	PI	PI-Baseline
1	24	23	0	9	0	2	-22
2	68	28	20	12	21	30	-38
3	63	78	69	NA	73	81	+18
4	63	30	53	1	7	6	-57
5	77	80	34	55	56	51	-26
6	0	0	0	3	1	0	0
7	57	21	51	NA	NA	NA	-6
8	51	39	69	10	10	2	-49
9	75	85	34	16	61	68	-7

Bold values signifies change in fatigue level using the VAS-F scale per subject comparing baseline fatigue level with post intervention fatigue level.

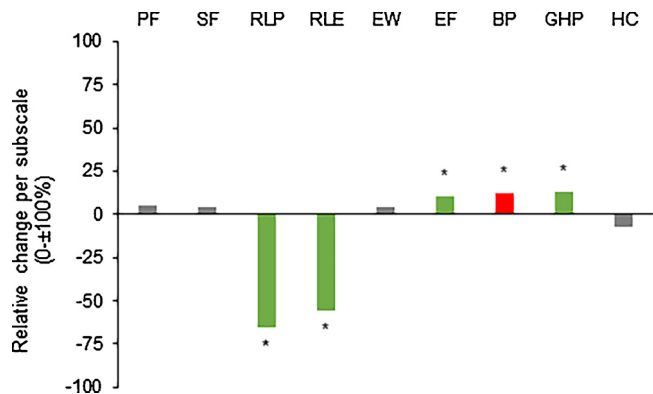


Fig. 3. Relative changes in QoL, shown in all subscales of Rand-36 Health Survey: physical functioning (PF), social functioning (SF), role limitations due to physical health problems (RLP), role limitations due to emotional problems (RLE), emotional wellbeing (EW), energy/fatigue (EF), bodily pain (BP), general health perceptions (GHP) and health changes (HC). *p < 0.05.

facility in Assen, the Netherlands. All parts of the program were successfully conducted with existing infrastructure of this primary care facility. There was a high attendance rate and all participants completed the 12-month lifestyle intervention program. Only one participant did not complete all individual parts due to physical health problems. Moreover, all participants reported to be satisfied with the overall program in the final evaluation form. This indicates it is attainable to implement a lifestyle intervention program in primary care for cancer survivors.

The most important result of the program was a reduction in role limitations, which was supported by qualitative data as well. All subjects reported less limitations in daily practice and an improved personal goal attainment regarding physical and psychosocial activities. Promising results were found on fatigue using the VAS-F, as 7 of 9 subjects reported lowered fatigue. A significant effect was found, but the results must be carefully interpreted, because of the missing values and lack of power. Previous intervention programs also showed decreased fatigue in cancer survivors, therefore the effect of this program on fatigue should be further examined [17–19]. Few changes were found on physical fitness; only the improvement of arm strength was significant (unfortunately with measurements of only 5 subjects). This is partially supported by previous literature none to small effects on physical fitness in cancer survivors following intervention programs [20,21]. Nevertheless, large changes were found in QoL in this small sample, suggesting other factors might be involved in subjects' perception of physical wellbeing. A moderate increase in bodily pain was measured with the Rand-36 Health Survey, although subjects did not report increased pain as an effect of the program in qualitative analysis and some minor injuries were obtained alongside of the program (e.g. on a skiing trip). Moreover, no such effect was found on the NPRS. Whether a lifestyle intervention program increases pain should be further examined in future studies. Although the preliminary results seem promising and the implementation of the program feasible, there are important limitations that must be kept in mind: (1) the study had a very small sample size, (2) there was no randomisation or control group and (3) there were no follow up measurements, except for the physical part of the intervention (i.e. supervised sessions ended after the first six months), (4) there was a huge age range of the participants. Therefore,

there can be no firm conclusions about the effectiveness of this program.

Future research should involve sufficiently powered randomized controlled trials to evaluate the effects of lifestyle programs in primary care on physical and mental symptoms and quality of life that includes a long-term follow-up. Also, cost-effectiveness studies are needed.

5. Conclusions

A lifestyle intervention program seems feasible in primary care and seemed to lower fatigue, anxiety and stress problems and increase QoL in cancer survivors in this small uncontrolled pilot study. Although the increase in pain may be caused by external factors, further examination is needed. These preliminary results are promising in the light of lowering long-term residual health complaints and recurrence rates in cancer survivors and development of a suitable aftercare system. Most importantly, these findings make a plea to further implement and examine lifestyle interventions in the aftercare of cancer survivors.

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Conflict of interests

None. Two of the authors (ECW and HJRH) developed the program and one of them (ECW) was the primary MD responsible for the program.

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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:<https://doi.org/10.1016/j.eujim.2018.08.007>.

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