

Does Physical Activity Improve Quality of Life in Cancer Patients Undergoing Chemotherapy?

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Keywords

Quality of life · Physical activity · Sports · Chemotherapy

Summary

Background: Improved cancer treatments have resulted in prolonged survival. Nevertheless, tumor symptoms and side effects still compromise physical activity and quality of life (QoL). **Patients and Methods:** We conducted an anonymous survey among cancer patients undergoing chemotherapy using standardized questionnaires: the 'Freiburger Fragebogen zur körperlichen Aktivität' (Freiburg Questionnaire on Physical Activity) and European Organisation for Research and Treatment of Cancer (EORTC) QLQ-C30. Two main questions were addressed: were there differences (1) in physical activity and QoL between patients who do not believe that sport could improve their QoL and those who believe it could (group A vs. B); and (2) in QoL between patients with a total activity (TA) < 18 metabolic equivalent of task (MET) h/week and those with a TA of ≥ 18 MET h/week (group C vs. D)? **Results:** 276 of 400 questionnaires were completed. Groups A and B were balanced in terms of baseline characteristics. Group A suffered significantly more from fatigue and pain; group B reported higher levels of global health status (GHS) and TA. Groups C and D differed in gender distribution, age, and educational background. Group D had significantly higher levels of GHS, group C suffered more from fatigue, pain, and appetite loss. **Conclusion:** Physical activity correlates with a better QoL of cancer patients undergoing chemotherapy.

Introduction

Improved cancer treatments have resulted in prolonged survival, better control of disease and treatment-related complications. An increasing number of patients receive chemotherapy as neoadjuvant, concomitant, adjuvant, or palliative treatment in outpatient clinics. Nevertheless, tumor symptoms and side effects such as nausea, vomiting, pain, insomnia, appetite loss, and fatigue still compromise physical activity and quality of life (QoL). Fatigue is among the most frequent and burdensome side effects of chemotherapy and results in impaired or diminished physical activity [1]. Whereas most side effects are drug specific, fatigue is associated not only with most antineoplastic drugs but also with the disease itself [2]. Prevention and treatment of fatigue are complicated; treatment with drugs alone is rarely adequate. In addition, psychosocial problems often follow the diagnosis of cancer and subsequent chemotherapy [3]. For some patients, diagnosis and treatment are synonymous with an inactive daily life [4], resulting in loss of muscle mass and strength [5, 6]. While physical activity is associated with a lower risk of developing certain site-specific cancers, in particular colon and breast cancers [7], and is associated with survival outcome and reduced colorectal cancer-specific mortality and all-cause mortality [8, 9], few intervention studies have investigated exercise training to improve physical capacity and QoL and to reduce fatigue in patients undergoing chemotherapy [10–12]. Exercise studies have included predominantly women with breast cancer after cytostatic treatment, and the interventions provided improved physical fitness and psychological benefits [10–12]. Generally, studies investigated the effects of a single activity of moderate intensity, such as cardiovascular training on stationary bicycles, rather than resistance training. Results are inconsistent, and many studies exhibited a range of methodological limitations. Even now, it is not evident whether patients with different types of

cancer, disease stages, and symptoms can benefit from combined resistance and cardiovascular training when undergoing chemotherapy. If there is a benefit, it is unclear how intense exercises should be to improve patients' physical capacity. Meyerhardt et al. [13] demonstrated that colon cancer patients with high physical activity defined as ≥ 18 metabolic equivalent of task (MET) h/week have a reduced cancer-specific and all-cause mortality compared with those with < 18 MET h/week. Moreover, it could be shown that ≥ 18 MET h/week compared to < 3 MET h/week increased disease-free survival in colorectal cancer patients [14]. But how much exercise is necessary to improve QoL? A randomized controlled trial in male and female patients with cancer, irrespective of diagnosis and stage of disease, investigated the effect of a 6-week supervised structured group intervention, comprising high intensity physical training and low intensity training, compared to a control group [15]. Participants assigned to the control group received conventional medical care, and completed outcome measures in parallel with the intervention group. The control group was allowed to freely increase physical activity. The hypothesis was that the intervention, as an adjunct to conventional care, could reduce fatigue (primary outcome), and improve other side effects, general physical and emotional wellbeing, global health status (GHS) or QoL, physical capacity, and physical activity in patients who were undergoing adjuvant chemotherapy or treatment for advanced disease. The intervention reduced fatigue and improved vitality, aerobic capacity, muscular strength, and physical and functional activity, and emotional wellbeing, but not QoL [15]. One shortcoming of that study was that, while they were able to report the immediate effects of the intervention, it was not possible to perform valid comparisons of the effect between the control and the intervention groups 3 months after intervention. The reason is that 59.7% of the control group patients subsequently elected to participate in the intervention following their 6-week participation in the study. Study allocation was not concealed, neither to the patient nor to the healthcare professionals, and the control group was allowed to freely increase physical activity. Self selection of participants in the study resulted in a sample of cancer patients who were overtly motivated to engage in group-based physical activity. Furthermore, all patients in the study had a good performance status and no brain or bone metastases [15]. However, the study did not answer the question of what intensity of exercises is necessary to have a good QoL at all.

In the current survey we investigated the correlation between intensity of physical activity calculated by MET and QoL in cancer patients (irrespective of diagnosis and stage of disease) undergoing chemotherapy in our outpatient department.

Material and Methods

Patients

The study was reviewed and approved by Ethics Committee II of the University of Heidelberg, Medical Faculty of Mannheim. Standardized questionnaires were handed out to patients at the oncology outpatient department at the University Hospital Mannheim over a 9-month period between August 2011

and April 2012. Cancer patients suffering from various oncological and hematological diseases at different stages were polled.

All patients undergoing intravenous or subcutaneous chemotherapy were included. No patient was excluded from the survey for any specific reason. Questionnaires were handed to patients who expressed an interest in participating in the study after a short explanation about the purpose and goals of the survey. The participants were instructed to independently and anonymously complete the questionnaires and return it to a box installed at the department.

Questionnaires

A cover letter outlined the intentions of the survey and assured the patient's anonymity. The first and second parts of the standardized questionnaire were specifically created for this survey. In the first part, personal information about the patient's demographic and medical characteristics were gathered: gender, age, size, weight, educational achievement, occupation and professional life, medical records including pre-existing conditions, alcohol consumption and smoking habits. The second part contained 14 questions about patient's attitude towards physical and sportive activities with either single or multiple responses allowed. The third part comprised the Freiburg Questionnaire on Physical Activity (*Freiburger Fragebogen zur körperlichen Aktivität*) and contains 8 questions to evaluate the time patients spent with different physical activities [16]. The fourth part consists of the QLQ-C30 questionnaire (version 3.0), a questionnaire of the European Organisation for Research and Treatment of Cancer (EORTC) to assess QoL [17]. The QLQ-C-30 is a validated, brief, self-reporting, and cancer-specific questionnaire comprising 30 items that generate 9 multi-items scales: 5 function scales, 3 symptom scales as well as the GHS/QoL scale.

Statistical Analyses

Statistical analysis was conducted on the data collected from all returned questionnaires and were performed using the statistical program Graph Pad Prism Version 5.00. For further calculations beyond descriptive analyses, patients were assigned to groups. First, patients who indicated that sports cannot improve their QoL (group A) were compared to patients who indicated that sports can improve their QoL to a high extent (group B). Second, 2 further groups were assigned: group C comprising patients with < 18 overall MET h/week, and group D comprising patients with ≥ 18 overall MET h/week.

QoL

The linear transformation to a 0–100-point scale of the EORTC QLQ-C30 questionnaire was performed according to the EORTC scoring manual [18]. High numerical values in function scales as well as in the GHS correspond to higher levels of functioning. High values in the symptom scales/single items indicate more symptoms [18]. Comparison between groups was evaluated by the Mann-Whitney test.

Physical Activity

Conversion of the time that patients spent on different activities evaluated by the 'Freiburger Fragebogen zur körperlichen Aktivität' into MET were performed according to the 'Compendium of Physical Activities' [19, 20]. 1 MET is defined as the amount of oxygen consumed while sitting at rest, and is equal to 3.5 ml O₂/kg body weight \times min. Comparison between groups was evaluated by the *t*-test.

Results

Patients' Characteristics

A total of 400 questionnaires were handed out during the 9-month period. 276 questionnaires were completed and returned. This corresponds to a response rate of 69%. 126 out of 276 patients (46%) were male, 148 (54%) were female, 2 patients did not answer the question. Median age was 63 years (1 patient did not indicate age); 64 patients were ≥ 70 years (23%), 211 were < 70 years (77%).

170 out of 276 patients engaged in sporting activity before disease (62%), 99 patients did not engage in sporting activity before diagnosis (36%), 7 patients did not answer the question. 20 out of 170 patients who engaged in sporting activity before disease indicated no change in sporting habits (12%), 4 patients (2%) indicated an increase in sporting activity, and 144 patients a decrease of activity (85%). 4 out of 99 patients (4%) who did not engage in sporting activity before diagnosis indicated engaging in sporting activity since diagnosis.

Patients' Attitude towards Physical Activity and Sports

Of the 276 patients, 85 indicated that they had received information about 'physical activity during cancer treatment' (31%): 50 from a physician (59%), 16 from another cancer patient (19%), 12 from the internet (14%), and 29 from other sources (34%) (it was possible to specify several areas).

Of the 276 patients, 214 indicated that they felt definitely or possibly physically able to participate in sporting activities or physical exercises for cancer patients (78%): 88 for light (41%), 53 for moderate (25%), and 16 for heavy training (7%). 57 patients did not specify the answer. 174 out of 214 patients were evaluable for the analysis of MET. Of these, 81 (47%) received less than 18 overall MET h/week. 133 of the 276 patients indicated that they were generally interested in participating in sporting activities or physical exercises for cancer patients (48%): 68 once a week (51%), 51 twice a week (38%), 8 every second day (6%), and 6 every day (5%). 6 patients were in favor of an immediate start of these exercises after diagnosis (5%), 59 during treatment (44%), 31 immediately after the end of treatment (23%), 19 with distance to the end of treatment (14%). 18 patients did not specify an answer.

Of the 276 patients, 141 indicated that they were not or only potentially interested in participating exercises for cancer patients (51%): 42 due to lack of energy (30%), 43 due to fatigue (30%), 25 due to time investment (18%), 4 due to fear of harming (3%), 15 due to a general disinterest (11%), and 56 for other reasons (40%), e.g. patients already engaged in sports or did not like group sport (it was possible to specify several areas). 2 patients did not answer the question. 83 of these 141 patients (59%) stated a decrease of activity after diagnosis.

Patients were asked about their preferred physical activity (multiple answers possible). 142 out of 276 patients indicated cycling (51%), 64 gymnastics (23%), 103 swimming (37%), 55 strength training (20%), 20 jogging (7%), 58 nordic walking (21%), 154 taking a walk (56%), 12 tennis/badminton/squash (4%), and 21 ball sports (8%). Patients also suggested riding, yoga, bowling, canoeing, rowing, hiking, dancing, workout, combat sport, and diving. 158 out of 276 patients indicated that they would prefer a light (57%), 86 a moderate (31%), and 7 a heavy training intensity (3%). 25 patients did not answer the question.

Of the 276 patients, 71 specified that they would prefer individual training (26%), 92 group training with other cancer patients (33%), and 85 group training independent of the disease (31%). 28 patients did not answer the question. 174 of the 276 indicated that they would prefer instructions from a real trainer (63%), 16

Table 4. Physical activity assessed by the 'Freiburger Fragebogen zur körperlichen Aktivität' of patients who believe that sports cannot improve their quality of life (group A) patients who indicated the opposite (group B)

	To what extent do you think that sports can improve your quality of life? (1 = not at all; 6 = very much)		
	Group A 1-4 (n=111)	Group B 5-6 (n=138)	p value ^a
Basic activity (mean ± SEM)			
h/week	3.26 ± 0.64; n=102	3.834 ± 0.48; n=117	0.47
MET	11.78 ± 2.22; n=102	13.46 ± 1.63; n=117	0.54
Leisure time activity (mean ± SEM)			
h/week	1.455 ± 0.17; n=106	2.484 ± 0.34; n=128	0.01
MET	5.329 ± 0.63; n=106	9.747 ± 1.6; n=128	0.02
Sport activity (mean ± SEM)			
h/week	0.4739 ± 0.21; n=110	1.211 ± 0.23; N=134	0.02
MET	2.770 ± 1.25; n=110	6.131 ± 1.14; N=134	<0.05
Total activity (mean ± SEM)			
h/week	4.822 ± 0.73; n=97	7.777 ± 0.70; n=114	<0.01
MET	18.29 ± 2.64; n=97	30.30 ± 2.86; n=114	<0.01

SEM = standard error of the mean, MET = metabolic equivalent of task.

^aUnpaired t-test.

through a DVD/video (6%), and 41 with no trainer at all (15%). 45 patients did not answer the question. As preferred training location, 94 patients indicated the hospital (34%), 64 a professional gym (23%), 74 home gym (27%), and 57 other locations (21%), e.g. outdoor locations like the forest, community grounds, sports fields, and public swimming pool.

Of the 276 patients, 170 engaged in regular sporting activity before diagnosis (62%): 64 once a week (38%), 50 twice a week (29%), and 56 more than twice a week (33%). 182 patients indicated that they had been physically more active before diagnosis (66%), 63 indicated no change (23%), and 8 patients indicated that they had been more active since diagnosis (3%). 23 patients did not answer the question.

Attitude towards Sports and QoL

Patients were assigned to 1 of 2 groups. Patients indicating that sports cannot improve their QoL (group A) were compared to patients who indicated that sports can improve their QoL to a high extent (group B). 27 patients did not answer the question.

Patients' characteristics are depicted in table 1. The 2 groups do not differ in gender, age, body mass index (BMI), educational achievement, alcohol consumption or smoking habits. Patient groups differed significantly in occupation status, time of diagnosis (≥ 1 year <), and treatment approach (curative vs. palliative).

Table 7. Quality of life aspects according to the EORTC QLQ-C30 questionnaire of patients with a total activity (TA) < 18 MET h/week compared to those with a TA ≥ 18 MET h/week

	Group C Overall MET h/week < 18 (n = 127)	Group D Overall MET h/week ≥ 18 (n = 102)	p value ^a
Global health status and functioning scales (Mean ± SEM)			
Global health status	49.86 ± 1.97; n = 122	59.36 ± 1.86; n = 97	<0.01
Physical functioning	59.47 ± 2.21; n = 123	76.02 ± 2.12; n = 100	<0.01
Role functioning	51.39 ± 3.14; n = 120	62.12 ± 2.72; n = 99	0.02
Emotional functioning	62.25 ± 2.27; n = 122	66.84 ± 2.50; n = 97	0.15
Cognitive functioning	71.31 ± 2.62; n = 122	77.15 ± 2.60; n = 97	0.16
Social functioning	50.96 ± 3.05; n = 121	64.60 ± 3.03; n = 97	<0.01
Symptom scales (Mean ± SEM)			
Fatigue	56.93 ± 2.70; n = 121	44.10 ± 2.65; n = 96	<0.01
Nausea	19.35 ± 2.36; n = 124	10.17 ± 1.74; n = 100	<0.01
Pain	35.81 ± 2.98; n = 121	26.22 ± 3.18; n = 96	0.02
Dyspnea	34.95 ± 3.19; n = 124	31.31 ± 3.20; n = 99	0.56
Insomnia	40.65 ± 3.32; n = 123	37.00 ± 3.38; n = 100	0.54
Appetite loss	34.15 ± 3.32; n = 123	24.33 ± 3.28; n = 100	0.04
Constipation	26.93 ± 3.25; n = 125	13.19 ± 2.59; n = 96	<0.01
Diarrhea	21.77 ± 2.96; n = 124	22.57 ± 3.10; n = 96	0.55
Financial difficulties	27.82 ± 3.06; n = 121	30.24 ± 3.69; n = 97	0.75

^aMann-Whitney test.

Table 2 shows patients' attitude towards sports. Significant differences were seen between the 2 groups concerning the importance of sports, information level, physical capability, interest in sports and physical activity before diagnosis.

Groups were also compared with regards to their symptoms and functional scale evaluated by the EORTC QLQ C30. Results are listed in table 3. Significant differences in GHS, physical and emotional functioning, fatigue, pain, and appetite loss were found in favor of group B. Finally, physical activity was calculated for both groups. Table 4 shows that group B was significantly more active than group A.

Physical Activity and QoL

In addition, patients were assigned to group C or D. Group C included patients with a < 18 overall MET h/week; group D included patients with ≥ 18 overall MET h/week. Patients' characteristics are depicted in table 5. Patients differed significantly regarding gender, age, educational achievement, and alcohol consumption. In group C, 46 out of 127 patients (36%) suffered from hypertension, 17 (13%) from diabetes, 5 (4%) from peripheral arterial disease, 16 (13%) from knee or hip problems, and 21 (17%) from heart diseases (group C). Distribution in group D and comparison to group C were as follows: of 102 patients, 39 suffered from hypertension (38%) (n.s.), 12 from diabetes (12%) (n.s.), 0 from peripheral arterial disease (0%) (n.s.), 12 from knee or hip problems (12%) (n.s.), and 7 from heart diseases (7%) (p = 0.04).

Table 6 shows the difference of both groups concerning the attitude towards sports and table 7 the difference in symptoms and functional scales. Significantly more patients in group D engaged in regular sporting activity before diagnosis of cancer (75% vs.

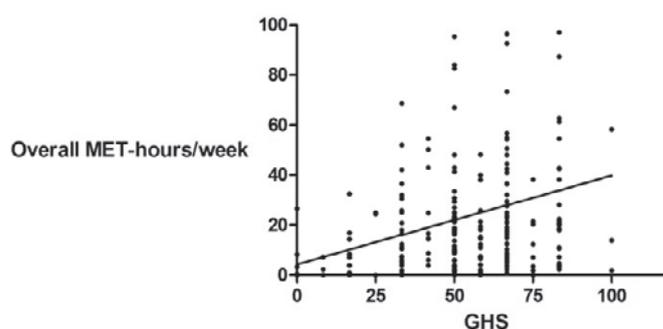


Fig. 1. Correlation between overall metabolic equivalent of task (MET) h/week and global health status (GHS); n = 219; slope is significant (p < 0.01).

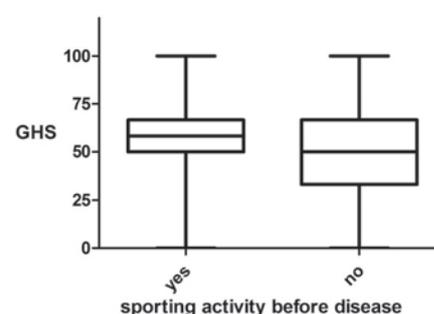


Fig. 2. GHS depending on sporting activity before disease; n = 257; p < 0.01 (Mann-Whitney test).

53%, p < 0.01). 72% of each group indicated that they had been physically more active before diagnosis than at the time of the poll (n.s.).

Group D reported significantly higher levels of GHS, and physical, role, and social functioning; group C suffered more from fatigue, nausea, pain, appetite loss, and constipation.

Fig. 1 illustrates a significant correlation between overall MET h/week and GHS ($p < 0.01$). Fig. 2 shows that GHS of patients who practiced sports before their cancer diagnosis was significantly higher than the GHS of patients who did no sports before their diagnosis.

Discussion

In this survey we collected self-reported demographic and medical data from 276 cancer patients receiving antineoplastic therapy for different kinds and stages of disease. We investigated their interest, information level, attitude and habits concerning sports. Moreover, the patients completed the 'Freiburger Fragebogen zur körperlichen Aktivität', a standardized questionnaire to evaluate their physical activity calculated by MET, and the QLQ-C30, a standardized questionnaire to assess QoL. The aim of this survey was to determine correlations between physical activity and QoL during cancer treatment.

Patients indicating that they believed that sports cannot improve their QoL (group A) were compared to patients indicating the opposite (group B). Group A contained more patients treated in the palliative setting and those with a history of cancer of at least 1 year. They had a worse GHS, physical and emotional functioning, and more fatigue, pain and appetite loss. More patients of group B considered physical activity important, more were informed about and were interested in a sports program, more engaged in regular sporting activity before diagnosis, and more patients indicated that they had been more active before diagnosis than after. However, they still had a higher total activity (TA) after diagnosis, with 30 MET h/week in contrast to group A with 18 MET h/week (18 MET h/week corresponds to a high physical activity). These results suggest that the attitude and habits towards sports and physical activity before diagnosis correspond to the level of physical activity after diagnosis. Furthermore, there seems to be a positive correlation to GHS, and physical and emotional functioning, as well as a negative correlation to fatigue, pain and appetite loss. The attitude towards sports might be interpreted as an expression of general perspectives towards life, health and disease. Group B seems to consist of a highly motivated and highly active patient group. This is probably due to patient selection as all patients were treated in our outpatient department. Inpatient treatment normally leads to less activity. Moreover, more active patients may fill out a survey about physical activity than less active patients.

To analyze the correlation between physical activity and QoL, patients were also assigned to groups indicating < 18 overall MET h/week (group C), or ≥ 18 overall MET h/week (group D). The cut-off value was taken from Meyerhardt et al. [13, 14]. Group D comprised more men, younger and better educated patients, and patients with less heart diseases than those in group C. One could assume that the more active group consists of patients with a better general condition. Interestingly, treatment approach and time of diagnosis did not differ significantly between the 2 groups. In

group D, more patients considered physical activity important, more were informed about and interested in a sports program, more felt physically able to participate in a sport program and more believed that physical activity could improve their QoL. Indeed, they had a better GHS, and physical, role and social functioning, as well as less fatigue, nausea, pain, appetite loss and constipation. Moreover, more patients of group D engaged in regular sporting activity before diagnosis than patients of group C. However, both groups indicated that they had been more active before diagnosis than after.

Some inherent limitations of surveys have to be considered when discussing these data. As this is not an interventional study, no statements can be made about the relationship between cause and effect. Moreover, all the information gathered are self-reported. One could speculate that patients with better conditions have a better QoL and are therefore more active. Vice versa, physical activity could improve QoL. We found a significant correlation between sports before diagnosis and GHS during treatment. Changing patterns of behavior is rare after diagnosis. Few patients are more active after diagnosis than before; most patients reduce physical activity after diagnosis. These results are in line with observations made in patients receiving palliative chemotherapy: they are less active than healthy controls [21]. Hence, from these data no statement can be made about an improvement in QoL by increasing physical activity after diagnosis.

In the light of these results, all patients should receive information about the potential effect of physical activity on QoL and on cancer- and treatment-related symptoms. As only about a third of the patients in our survey had received such information, there is a strong need to overcome this knowledge gap. In particular, the attending physician should recommend physical activity in all its forms and draw patients' attention to sports programs. 78% of the patients indicated that they felt physically able to participate in a sport program. However, only about half of the patients showed interest in such a program. 51% of the patients indicated that they were not interested in participating in exercises for cancer patients, and explained this was due to a lack of energy and fatigue. Of these, 59% decreased their activity after diagnosis. Disinterest in sport programs can be due to the fact that a lot of patients already do sports on their own. However, fatigue and lack of energy may be an important reason for decreasing activity. It is important that patients are advised that physical activity can break the vicious circle and improve fatigue and lack of energy. In fact, less than half of the patients who felt physically able to participate in a sport program received the recommended 18 overall MET h/week. This can be explained by a lack of will power as known from healthy people or even depression, but also it can be due to a lack of motivation by the physician and missing information about the positive effects of physical activity even in case of malignant disease. Finally, there is a need for prospective studies investigating the relationship between physical activity and QoL during anti-cancer treatment.

Online Supplemental Material

Table 1. Characteristics of patients who believe that sports cannot improve their quality of life (QoL) (group A) and patients who indicated the opposite (group B)

Table 2. Attitude towards physical activity and sports of patients who believe that sports cannot improve their quality of life (group A) and patients who indicated the opposite (group B)

Table 3. QoL aspects according to the EORTC QLQ-C30 questionnaire of patients who believe that sports cannot improve their quality of life (group A) and patients who indicated the opposite (group B)

Table 5. Characteristics of patients with a total activity (TA) of < 18 MET h/week (group C) compared to those with a TA of ≥ 18 MET h/week (group D)

Table 6. Attitude towards physical activity and sports of patients with a TA of < 18 MET h/week (group C) compared to those with a TA of ≥ 18 MET h/week (group D)

To access the supplemental tables, please refer to www.karger.com/?DOI=381734.

Disclosure Statement

The authors indicate no conflict of interest.

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