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**THE EFFECTS OF EXERCISE ON QUALITY OF LIFE IMPROVEMENTS IN CANCER
SURVIVORS: THE RESULTS OF A NATIONAL SURVEY**

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ABSTRACT

ERIC P. DURAK, JAIME HARRIS, SUSAN M. CERIALE. **The Effects Of Exercise On Quality Of Life Improvements In Cancer Survivors: The Results Of A National Survey** JEPonline. 2001;4(4):21-28. Recent research has pointed to the benefits of exercise in enhancing physical fitness, quality of life (QOL), and physiological outcomes in cancer survivors. Our goal was to assess the health status of cancer patients who currently exercise in the health club setting. Our hypothesis was that exercise is safe and efficacious for cancer patients independent of location and instructional methods. We mailed modified Rotterdam surveys to fitness trainers nationally as part of their continuing education exam process. Over two years we received 50 surveys from 16 states. We compared this data to the same survey given to 50 participants in a regional Southern California cancer wellness program. Questions included information on cancer treatment, exercise habits, and QOL responses to exercise. QOL questions were ranked from a low score of one (1) to a high-end score of nine (9). Both groups of cancer survivors exercised in a variety of programs (85% trainer supervised), including walking (59% regional, 71% national), stretching (100% regional, 60% national) and strength training (100% regional, 81% national). Strength programs averaged 3 sets of 12 reps. Exercise was performed 3-4 days per week at an average target heart rate of 122 b/min during aerobic training. 65% of combined patients trained at home, 35% practiced Yoga, and 46% meditated. Survivors exercised during bouts of nausea (22% regional, 46% national), 60% used vitamins in addition to exercise, and 36% felt exercise was part of their cancer support system. 87% of physicians were supportive of exercise. 15% of regional and 4% of national groups sustained injuries during exercise – mostly overuse strains. Rotterdam survey results indicate an overall 17% improvement in QOL for the national survey versus 14% in the regional group during their exercise program, with improvements in areas of coping with stress (27%), nausea (7.5%), aspects of pain management (14%) and perception of fitness improvement (20%). All QOL changes were statistically significant analyzed using Student's t-test, with a Bonferoni adjustment of the p-value due to multiple comparisons. Exercise programming performed by cancer survivors is compatible with established guidelines, and outside of infrequent training-related injuries, is safe to perform. These results suggest that community-based exercise programs improve QOL measures independent of the instructor and lend support to the use of exercise as part of the cancer recovery process.

Key words: exercise, cancer, fitness, quality of life, rehabilitation, therapy

INTRODUCTION

When a person is diagnosed with cancer, oncologists will use treatments to enhance their survival. During and after their medical treatment, they also seek therapies to enhance their quality of life (QOL). Current American Cancer Society statistics state that 90% of stage I and II cancer survivors will still be alive at five years post-diagnosis (1). Behavioral research from Spiegel (2) has shown improvements in survival time in metastatic cancer patients who attended cancer support groups. This research was the first to suggest that QOL and survival time are affected by behavioral intervention, and it was followed by similar reports in the oncology and nursing literature (3-5).

Cancer survivorship has been viewed differently recently because of the growing list of professional athletes who have been publicly diagnosed with and treated for cancer. In the 1990's competitors in track and field, figure skating, and baseball were treated for and recovered from cancer. Perhaps the most startling of these stories is Tour de France champion Lance Armstrong, who was diagnosed with metastatic testicular cancer in 1996. After two years out of the racing circuit, he returned in 1998 and trained for the upcoming season. Armstrong's efforts have culminated with victories in the past three Tour de France races - one of sports toughest athletic events. Although his prognosis and training regime is not typical, he has become a spokesperson for using exercise as part of the cancer recovery process.

There is also an increased interest in sports medicine research on this topic (6-13). Recent epidemiological reports state that exercise may be one of the most important lifestyle interventions for cancer prevention (14,15). This along with current information on nutritional intervention for the prevention and therapy of cancer suggest dietary habits account for more than 30% of cancer etiology, and that many survivors use specific nutritional regimes as part of their recovery process (8). Clinical reports have focused on improvements in quality of life and physiological response to exercise, and improvements in cancer-related side effects (9-12,20,21,22,23). In his recent review on exercise and cancer, Courneya (8) stated that exercise consistently demonstrates beneficial effects on a wide variety of quality of life outcomes regardless of the specific intensity, duration, and method of exercise prescription, cancer site, cancer treatment, or intervention timing. Although the studies have some limitations, Courneya believes that; *"additional research is not likely to overturn the fundamental conclusion that exercise is a safe, feasible, and beneficial quality of life intervention for the majority of cancer patients and survivors"*.

Thus opens a new era in cancer research. With the daily media attention to the genome project and many clinical trials world-wide, exercise is advancing as one of the primary interventions that may have important implications in enhancing physical function, improving quality of life, becoming an integral part of the support group process, and improving the odds for survival (8,16,18,20).

Courneya's report highlights many descriptive and intervention studies on small numbers of patients – usually from the laboratory setting. Some reports have taken place in health clubs, but for the most part, the research we are now seeing is coming from the clinical and university settings. This does not preclude the potentially large numbers of cancer survivors who exercise regularly at home, community centers, or health clubs as general members. Our contention is that exercise is a safe lifestyle intervention which has its place in community programs within or outside of the hospital setting. Therefore, we set out to ascertain information on the exercise habits of cancer survivors in the community and health club setting and compare their quality of life and exercise information to an established health club wellness program in Southern California. Our hypothesis was that not only is exercise safe, but that it will show substantial improvements in quality of life measures independent of place of exercise or instructional methods implemented.

METHODS

A modified version of the validated Rotterdam quality of life functional survey (9) was mailed to professional trainers who work with cancer survivors in the health club setting. The survey consists of five major components, one of which has five sub-components. They are listed below:

Modified Rotterdam Survey Components

- | | |
|--|-------------------------|
| 1. General Information (demographics) | |
| 2. Cancer/Medical Information (diagnosis/treatments/time frame) | |
| 3. Exercise Information (program, sets, reps, training heart rate, etc.) | |
| 4. Nutritional Information (supplements, meal plans, vitamins) | |
| 5. Psycho-Social Information [nine point scale] | <u>No. of questions</u> |
| 5.a. Functional Living Index (ADLs) | 15 |
| 5.b. Side Effects of Exercise | 4 |
| 5.c. Side Effects of Medication (and exercise) | 3 |
| 5.d. Problems with ADLs (five point scale) | 5 |
| 5.e. Pain Rating Scale | 7 |

Trainers interviewed clients who entered into an exercise program after their diagnosis with cancer. Many of these survivors were undergoing chemo and/or radiation therapy during the start of their exercise program. Surveys were mailed out from 1997 to the beginning of 2000 and at the time of analysis, 50 surveys from 16 states were included in the data analysis set. The surveys were compared with Rotterdam surveys given to 50 cancer survivors who participated in a regional cancer wellness program in Southern California over the past six years. In both groups, patients entered an exercise program after their cancer diagnosis - none was engaged in a regular supervised exercise regime before their diagnosis. Demographic data on both groups is listed in Table 1.

Table 1: Demographic information

	California Program (N=50)				National Program (N=50)			
	Mean	Breast	Prostate	Misc.	Mean	Breast	Prostate	Misc.
Age (yrs)	55.7± 15	52.5±9	70.5±5	55.5±17	55.1±16	52.9±8	73.5±6	56±17
Wt (kg)	66.6±13	83.5±19	64.8±11	67.4±14	75.2±12	67.5±12	79.5±8.8	84.8±14
Diagnosis (yrs)	2.0±2.1	1.4±1.6	2.4±1.7	2.2±2.5	3.8±2.7	2.8±1.6	5.4±3.5	3.2±2.2
Chemo- therapy (number)	25.8±13	26.3±15	31.0±9.8	25.0±13	14.0±10	10.8±9.1	15±11	13.5±10.2

The Rotterdam survey quality of life sections are scored on a 1 to 9 point scale. If there was no change in status of a question, it was marked with a Ø. Specific questions were grouped together and data was analyzed based on specific numbers. Unanswered questions were omitted from the data set. Less than 2% of all questions were not answered. Data was tabulated and analyzed using descriptive and Student's t-test statistics on a Macintosh computer system. Alpha level was set at 0.05 level of significance. Multiple comparisons were corrected for using a Bonferoni adjustment as described by Dunn (21).

RESULTS

Exercise participation

The results of this survey suggest that both locally and nationally, physicians are aware that their patients are engaging in exercise (78% and 71%) and most are highly supportive of the patient's participation (98% and 87%). In both programs, patients performed many types of exercise, including aerobics, strength training, and range of motion/ flexibility. In both surveys, a high percentage of patients engaged in resistance training (over 80%). The

average number of sets performed was higher in the national than the regional group (3 versus 2 sets). Approximately the same percentage of participants also engaged in home exercise outside of the health club facility (43% and 48%). This included primarily walking (59% regionally vs. 75% of national participants). However, regional aspects prevailed as Southern California patients utilized Yoga (58.7%) and meditation classes (61%) much more than patients in other states (12% and 32%). Seven participants in the regional group sustained muscle injuries. The national group had two reported injuries - one back strain and one knee. A summary of the exercise survey results is provided in Table 2.

Quality of Life Information

There were consistent improvements in all quality of life questions from the Rotterdam survey. Table 2 shows that both groups exercised during periods of fatigue (50% to 51%), but the regional exercise group experienced fewer bouts of nausea (22% vs. 46%) and depression (17.4% vs. 45%) during their exercise program. As seen in Table 3, the improvement in enjoyment of life rating (question #4) improved by over 13% on average, $p < 0.002$. Also in Table 3, survey question #2 shows that nausea improved in both groups during the course of their exercise program by 7-8% respectively, $p < 0.03$, while measures of depression (question #1 coping, and question #3 well-being) improved on average 27% and 16%, $p < 0.003$.

Of primary concern for most cancer patients is dealing with pain during their recovery process. Our survey questions on pain that interferes with daily activities (question #5) improved by 11% in the regional group, and 16% in the national group, $p < 0.008$. Pain that interfered with mood improved by 14% in the regional and 18% in the national group, ≤ 0.001 .

Pain that may interfere with normal work situations improved by 11% in the regional group, and 18% in the national group, $p = 0.001$. The last area - how pain interfered with relationships also improved - by 8% in the regional and 9% in the national group, $p = 0.01$. In each of these cases, the regional group started out with a higher beginning score than the national participants, which may have accounted for their lower percentage increase. Nonetheless, all scores were statistically significant, even after correcting for multiple comparisons.

Perception of fitness improvement

Many persons do not have a good indication of how well they change their fitness status unless they are in a competition situation, where they have a time or a score to judge their progress. Even increases in the resistance they add to their resistance machine may not seem significant to participants because they start out their program with small weights. For our cancer groups, we asked them to rate their perception of how well they felt they improved their strength and endurance during their exercise. In each case, the perception of improvement was

Table 2: Exercise information

<i>Question</i>	<i>California</i>	<i>National</i>
<i>Was your Dr. aware of your program?</i>	78%	71%
<i>Did your Dr. advise against exercise?</i>	2%	13%
<i>Consider exercise part of your support?</i>	49%	23%
<i>Participation in aerobics</i>	54%	62%
<i>Participation in Yoga</i>	58.7%	12%
<i>Participation in strength training</i>	80.4%	81%
<i>Participation in meditation?</i>	61%	32%
<i>Participation in swimming?</i>	17%	19.7%
<i>Experience excess fatigue?</i>	50%	51%
<i>Experience nausea?</i>	22%	46%
<i>Experience depression?</i>	17.4%	45%
<i>Injuries during exercise?</i>	15%	4%
<i>Trainer knowledgeable?</i>	83%	49%
<i>Recorded exercise information?</i>	89%	35.5%
<i>Number of sets/reps</i>	2.2 / 11.6	3/12
<i>Days of exercise/week</i>	3.9±2.2	3.6±1.4
<i>Home exercise</i>	43%	48%
<i>Walking program</i>	59%	71%
<i>Jogging program</i>	11%	11%
<i>Target Heart Rate (average)</i>	121±13	124±13

Table 3: Quality of Life (QOL) survey information

QOL areas:	Exercise		Improvement	p value
	Pre	Post		
1. Coping with everyday stress				
California group	5.48	6.89	21	<0.001
National group	5.97	6.95	15	0.003
2. Nausea affecting your ADLs				
California group	7.44	7.93	7	0.03
National group	6.52	7.03	8	0.025
3. How do you feel today?				
California group	5.89	6.89	15	<0.001
National group	5.39	6.47	17	<0.001
4. Enjoyment of life rating				
California group	6.11	6.94	12	0.002
National group	5.89	6.87	15	0.001
5. Pain interferes with gen. activity *				
California group	6.49	7.22	11	0.004
National group	5.73	6.89	16	0.004
6. Pain interferes with mood *				
California group	6.43	7.41	14	0.004
National group	5.49	6.65	18	0.004
7. Pain interferes w/ normal work *				
California group	6.38	7.09	11	0.004
National group	5.26	6.34	18	0.004
8. Pain interferes with relationships *				
California group	6.78	7.36	8	0.004
National group	6.45	7.07	9	0.004
9. Do you have more endurance?				
California group	4.4	5.5	20	0.001
National group	4.4	5.5	20	0.002
10. Do you feel stronger?				
California group	4.7	6.01	22	<0.001
National group				

* Pain data corrected for using Bonferroni adjustment described by Dunn (21).

significant - endurance improved by 20% in each group, and strength improved by 22% in the regional group, and 19% in the national, $p \leq 0.002$.

Nutrition Information

In the nutrition section of the survey - both groups were evenly matched in their use of specialized diet programs (32.6% and 34%). They were also evenly matched on their use of food supplements (such as meal replacement drinks and protein shakes - 34.8% and 30%), and similar in daily caloric consumption reported (1,784 vs. 1,862 Kcals). The regional group used vitamin supplements to a greater degree than the national group (74% vs. 42%). A summary of the nutritional information is seen in Table 4.

DISCUSSION

In the area of sports medicine, exercise in cancer is one of the least-studied areas in the literature. With 450 studies on exercise / rehabilitation and cancer listed on MEDLINE through 1999, there is still much to learn about the effects of exercise on physiological mechanisms, elements of quality of life, and cancer status. Nonetheless, with the current

studies that have been reported in the past three years, there is much enthusiasm that exercise programming may have as much of an impact on survivorship as any other therapy (3,8,10).

Quality of Life

This report, the first national survey of cancer survivors who engage in supervised exercise in the community health setting, showed significant changes in their quality of life in the areas of coping with stress and nausea (which is remarkable because over 50% in both groups experienced excess fatigue, and an average of 30% in both groups experienced nausea). Their level of vigor and enjoyment of life increased during exercise, and they felt that conditioning helped them combat pain during their normal daily routines. This aspect of our report agrees with the majority of exercise research, and it is of interest to see results that are comparable with such a wide variety of locations, teaching styles, and exercise regimes imposed on the national survey participants.

Exercise Habits

If exercise is to become an integral part of the recovery process, oncologists must understand its benefits, and be willing to refer to qualified programs. On average, three quarters of the physicians were aware that their patients were engaged in exercise, and the vast majority supported their patient's decision to participate. More than 80% of survivors engaged in strength training exercise, which is in agreement with previous reports that resistance training should be the primary component of exercise prescription because it maintains or increases lean tissue that may become cachexic due to cancer and its treatment (12). More than half participated in regular aerobic training consisting mostly of walking, but also including specialty exercises such as jogging (11%), Yoga, and meditation. The intensity and duration of strength exercise (sets, repetitions, target heart rate, and days of exercise per week) coincided with established sports medicine guidelines, and although participants in each group experienced fatigue and nausea, they continued to exercise during their programs.

Survivors in the regional exercise program felt their instructors were well qualified to teach them (83%). This differs from those in the national group, where less than 50% of survivors felt their instructors were qualified and knowledgeable about the exercise and cancer relationship. Clearly this is an area of continuing education that needs to be expanded if survivors are to feel comfortable in participating, and oncologists are willing to refer to these types of clinical health programs.

Nutrition

The nutritional information collected from this survey shows some interest in the use of nutrition in the cancer recovery process. At least one third of the participants used a special diet, diet supplement, or vitamin supplement during their recovery process (at the time of the survey). The regional group had a much higher use of vitamins, perhaps due to the fact that there are over one dozen international vitamin companies in this region of the country. These regimes seem to agree with current reports on the use of nutrition and exercise to enhance breast cancer prognosis (20).

Exercise safety

One of the elements of this report discusses the aspect of safety of exercise. In the national survey, 15% the California exercise groups reported some type of general injury while exercise as opposed to 4% of those in the national survey group. None of the injuries in the regional group were considered serious, and no additional information was given about the knee injury in the national group.

Table 4: Nutrition information

	<i>California</i>	<i>National</i>
<i>Special nutrition program?</i>	32.6%	34%
<i>Use food supplement?</i>	34.8%	30%
<i>Use vitamin supplements?</i>	74%	42%
<i>Kcals/day</i>	1,784±455	1,862±505

Study Limitations

Although this survey lends information on exercise habits of cancer survivors, we are limited by the relatively small numbers of participants. Also - because the surveys were not distributed by and supervised by any of the investigators, some errors in completion may have occurred. Items on the severity of injuries, elaboration of medical or health concerns, or other data which may be been “glanced over” could have altered the results of this survey. Future surveys of this type should use a more standardized approach to completion of surveys so investigators know that instructors who are distributing them may instruct their participants on their contents, and how they should answer all areas of its contents. Other validated questionnaires may be used to verify quality of life changes due to exercise. Future research in the area of exercise and cancer should also utilize a more randomized approach to exercise so other quality of life influences may be accounted for.

In conclusion, exercise is shown to have improvement in general fitness status and quality of life measures in cancer patients, independent of the level of instruction they receive, and the location of the facility in which they exercise. This report may have an impact on the growing number of health and wellness facilities who wish to implement cancer and exercise programs in terms of establishing policies on instructor training, physical assessments, exercise prescription, and outcomes measurements.

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