Exercise as a supportive therapy in incurable cancer: exploring patient preferences

Matthew Maddocks1, Sarah Armstrong2 and Andrew Wilcock1

1Department of Palliative Medicine, Nottingham University Hospitals NHS Trust, Nottingham NG5 1PB, UK
2National Institute of Health Research East Midlands Research Design Service, University of Nottingham NG9 2RD, UK

Abstract

Objective: Therapeutic exercise may benefit patients with incurable cancer, but there is little data on its practicality. We have explored the acceptability of six exercise programmes based on different types of exercise, the preferred delivery method, location and time relative to anticancer treatments and whether various patient characteristics influence choice of exercise.

Methods: A questionnaire determined patients’ perceived capability and preparedness to undertake six exercise programmes, each illustrated by looping video clips and accompanying text, most preferred programme and preferences for its delivery. Frequency counts and percentages were calculated and multiple logistic regression used to examine associations between patient characteristics and preparedness to undertake each of the programmes.

Results: Two hundred patients (103 female; mean (SD) age 64 (9); ECOG 02) with common incurable cancers mostly receiving palliative chemotherapy took part. All considered themselves physically capable of undertaking one or more of the exercise programmes and two-thirds were prepared to undertake a programme at that moment in time. The three most preferred exercise programmes were those based on neuromuscular electrical stimulation, walking and resistance training. The majority of patients preferred to undertake exercise at home, alone and unsupervised. One-third were not prepared to undertake any exercise, with a tendency for the least prepared to be older males and those with a lower performance status.

Conclusions: Our findings suggest that it is realistic to develop exercise as a supportive therapy for patients with incurable cancer, including those receiving chemotherapy, and can be used to inform further research in this area.

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Keywords: acceptability; cancer; exercise; oncology; preferences; supportive care

Introduction

Therapeutic exercise programmes improve physical fitness, psychological well-being and quality of life in patients receiving curative treatment for cancer [1–3]. Patients with incurable cancer may also benefit from exercise, but the evidence is limited and further study is required [4–6]. Which types of exercise to explore in this group requires careful consideration as the rates of uptake and completion for programmes based on ‘traditional’ exercises are only about two-thirds and one-half, respectively [7]. For an exercise to be a practical therapy for patients with incurable cancer, the majority should be capable of undertaking it and find it acceptable. One approach is to develop exercise programmes based on patients’ preferences. Although some work on exercise preferences has been carried out, this is limited to patients with less common cancers, e.g. brain, non-Hodgkin lymphoma, ovarian and the exercise was not presented with details of the intensity, duration and frequency required to provide a therapeutic effect [8–11]. Further, little is known about preferences for more novel approaches, such as neuromuscular electrical stimulation and whole body vibration, which may be more practical in this setting [12,13]. Although passive, i.e. they are initiated and assisted by an external stimulus, both fulfil the American College of Sports Medicine’s definition of exercise [14]. Thus, our study has explored the acceptability of six programmes based on different types of exercise to patients with incurable common cancers. This included identifying the most acceptable delivery method, location and time relative to anticancer treatments, and exploring whether the choice for a particular exercise programme was influenced by various patient characteristics, e.g. habitual exercise behaviour, performance status or the presence of co-morbidities.

Methods

Subjects

Over a one-year period commencing January 2008, patients with histologically proven incurable cancer...
and an Eastern Cooperative Oncology Group (ECOG) Performance Status \[15\] of 0–2 attending oncology outpatient clinics or a daycase chemotherapy suite at Nottingham University Hospitals NHS Trust were identified by their medical records. Patients were approached and invited to take part unless nursing staff considered it inappropriate to do so, e.g. because of high levels of psychological distress or confusion. All gave written informed consent and the study was approved by Nottingham Research Ethics Committee 1 (ref. 07/H0403/116).

Questionnaire

A 19-item questionnaire was developed with the help of the Nottingham Cancer Patients’ Support Group. The University of Nottingham Survey Unit used KeyPoint version 5.5 (Speedwell, Cambridgeshire, UK) to provide a self-contained questionnaire with standardised instructions, which could be presented on a laptop computer \[16\]. The questionnaire covered three broad themes.

Exercise behaviour

Current and pre-diagnosis exercise behaviours were estimated using items from the Godin Leisure Time Exercise Questionnaire \[17,18\]. Patients were asked to report the number of times they did strenuous, moderate and mild intensity exercise for at least 15 min during a typical week, on a five-point scale (0, 1–2, 3–4, 5–6 or \(\geq 7\) times per week). An activity score was calculated by multiplying the lower value of the patient’s response by nine, five and three for strenuous, moderate and mild intensity exercise, respectively, and summing these together. A higher score indicates greater levels of physical activity with a score of 15 equivalent to three sessions of moderate exercise a week.

Preference for type of therapeutic exercise programme

To introduce the purpose of therapeutic exercise, participants were informed that ‘Exercise has been used as a therapy to improve people’s physical condition, mood and quality of life. We are going to show you a selection of exercise therapies that may provide benefit.’ Six different therapeutic exercise programmes were then illustrated in turn by a looping short video clip with accompanying text describing the content, intensity and frequency of sessions and duration of the exercise programme (Table 1). For example, for the exercise programme based on walking, patients were informed that ‘each session would consist of three 10 min walks with rest periods in between and this would be for three days a week for 6 weeks’. Programmes based on walking, treadmill walking, cycling or resistance training were selected because of reported benefit in patients with or cured of cancer \[1,2\] and those utilizing neuromuscular electrical stimulation of the quadriceps muscles or whole-body vibration because of reported benefit in other patient groups, e.g. chronic heart failure, chronic obstructive pulmonary disease \[12,13\].

Patients were asked to indicate whether, at that moment in time, they were physically capable of undertaking such an exercise programme and, if so, whether they would be prepared to undertake the programme. If they were not prepared, they were asked to give the reasons for this using free-text. After providing responses for all six exercise programmes, patients were asked to indicate which, if any, of the programmes they would be most prepared to undertake, providing reasons using free-text.

Programme delivery preferences

For the programme they would be most prepared to undertake, patients were asked to indicate their preferences for the delivery method (alone or in a group, supervised or unsupervised), location (home, hospital, community centre, gym) and timing relative to any anticancer treatments received (during or immediately after chemotherapy or radiation therapy).

Protocol

A member of the research team obtained demographic data verbally or from the medical records and introduced the questionnaire. The patient was asked to complete the questionnaire unaided, in a
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setting of their choice, e.g. consulting room, treatment bay, with the member of the research team providing assistance only if requested. Data were captured in real-time using an Apache Webservice, version 2.2 (Apache Software Foundation) and uploaded to a central database [19].

The sample size was based on the precision to which patients’ preferences for each type of exercise programme could be estimated and assumes the estimated preference for each type of exercise lies within the range 10–60%. With a sample size of 200, two-sided 95% confidence intervals for preferences for each type of exercise can be estimated to within ±7% when a large sample normal approximation is used (nQuery Advisor® version 6.0) [20].

Statistical analysis

Normally distributed continuous data and skewed data were summarised by mean (standard deviation, SD) and median (inter-quartile range, IQR), respectively. Change from pre-diagnosis to current physical activity level was calculated using a Wilcoxon signed-rank test. Frequency counts and percentages with 95% confidence intervals were calculated for responses to questionnaire items: perceived physical capability and preparedness to undertake each type of exercise programme, most preferred exercise therapy programme, delivery method, location and time. Responses to open-ended questions were grouped into themes using content analysis.

Multiple logistic regression was used to examine the associations between gender, age, performance status, current activity score and presence of co-morbidities with being capable and prepared to undertake each of the exercise programmes. Age, performance status and activity score were categorised arbitrarily using cutoff points of 65 years, 1 and 15, respectively; the latter equivalent to three sessions of moderate exercise a week. For each exercise programme, a single logistic regression model containing all independent variables was used to estimate odds ratios, 95% confidence intervals and P values.

All calculations were performed using Statistical Software for the Social Sciences (SPSS) version 15.0 with the exception of confidence intervals, which were calculated using Wilson’s method and Confidence Interval Analysis (CIA) version 2.1.2 (Trevor Bryant, University of Southampton) [21–23]. A P value of <0.05 was regarded as statistically significant.

Results

Participants

Of 225 eligible patients approached, 200 (89%) enrolled and completed the study (Table 2).

Twenty-five patients declined citing that they lacked interest (n = 19), felt active enough (n = 3), were too tired (n = 2) or in discomfort (n = 1). Compared with pre-diagnosis, participant’s current physical activity scores were significantly lower (median [IQR] fall 10 [4–16], P < 0.01).

Physical capability to undertake an exercise programme

All 200 patients considered themselves physically capable of undertaking one or more of the exercise programmes. More than 80% felt physically capable of undertaking exercise programmes utilizing resistance training, whole body vibration or neuromuscular electrical stimulation, whereas only about half felt capable of undertaking programmes using walking, treadmill walking or cycling (Table 3). Specific reasons given for not feeling capable included the presence of breathlessness (n = 89), tiredness/fatigue (n = 62), pain (n = 49), leg weakness (n = 43), poor balance (n = 18), joint stiffness (n = 13), concern regarding the exercise equipment (n = 12) and both breathlessness and leg weakness (n = 9). Non-specific comments were also
common, e.g. ‘I would not be able to do that’ \((n = 66)\).

### Preparedness to undertake an exercise programme

Two-thirds \((n = 133)\) of patients reported being prepared to undertake one or more exercise programmes at that moment in time. Individually, this was highest for neuromuscular stimulation \((60\%)\) and lowest for treadmill walking \((33\%)\) (Table 3). Reasons given for being capable but not prepared to undertake an exercise programme included a lack of interest \((n = 47)\), being content with current levels of activity/not perceiving a need for exercise \((n = 33)\), completing an activity without purpose \((n = 19)\), time commitment/scheduling difficulties \((n = 15)\), the programme being insufficiently challenging \((n = 13)\), wanting to avoid exercise-induced symptoms \((n = 6)\) or having other priorities, e.g. family or work \((n = 4)\). For patients prepared to undertake exercise, the decision did not appear to be influenced by the timing of the programme in relation to anticancer treatments (Table 3).

One-third \((n = 67)\) were not prepared to undertake any of the exercise programmes. Reasons given by this group across the six exercise programmes included a lack of interest \((n = 109)\), being content with current levels of activity/not perceiving a need for exercise \((n = 63)\), time commitment/scheduling difficulties \((n = 20)\), other priorities, e.g. family or work \((n = 16)\), completing an activity without purpose \((n = 7)\), the programme being insufficiently challenging \((n = 6)\) or wanting to avoid exercise-induced symptoms \((n = 4)\).

Although numbers are smaller, again the decision did not appear to be particularly influenced by the timing of the programme in relation to anticancer treatments (Table 3).

#### Table 3. Current physical capability and preparedness to undertake an exercise programme

<table>
<thead>
<tr>
<th>Frequency</th>
<th>% yes</th>
<th>[95% CI]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you think you are physically capable of undertaking this type of exercise therapy programme?</td>
<td>Walking 107/93 54 [47–60]</td>
<td>Treadmill walking 97/103 49 [42–55]</td>
</tr>
<tr>
<td>Would you be prepared to undertake an exercise therapy programme similar to this?</td>
<td>Walking 57/50 53 [44–62]</td>
<td>Treadmill walking 32/65 33 [24–43]</td>
</tr>
</tbody>
</table>

For each of the treatments you have received, would you be prepared to undertake an exercise therapy programme at these times?

- Patients prepared to undertake one or more exercise programmes:
  - During chemotherapy 121/7 95 [89–97]
  - After chemotherapy 120/8 94 [88–97]
  - During radiotherapy 40/14 74 [61–84]
  - After radiotherapy 39/15 72 [59–82]
  - During combined chemotherapy and radiotherapy 7/2 78 [45–94]
  - After combined chemotherapy and radiotherapy 7/2 78 [45–94]

- Patients not prepared to undertake any exercise programme:
  - During chemotherapy 0/63 0 [0–1]
  - After chemotherapy 5/58 8 [3–17]
  - During radiotherapy 2/18 10 [3–30]
  - After radiotherapy 1/19 5 [1–24]
  - During combined chemotherapy and radiotherapy 0/3 0 [0–56]
  - After combined chemotherapy and radiotherapy 0/3 0 [0–56]

#### Table 4. Patients preferred type of exercise programme and delivery preferences \((n = 133)\)

<table>
<thead>
<tr>
<th>Frequency</th>
<th>%</th>
<th>[95% CI]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Which type of exercise programme would you be most prepared to undertake at this moment in time?</td>
<td>Walking 29 22 [16–30]</td>
<td>Treadmill walking 5 4 [2–9]</td>
</tr>
<tr>
<td>Neuromuscular electrical stimulation 47 36 [35–44]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

How would you most prefer to undertake the exercise programme?

- Alone, unsupervised 106 80 [72–86]
- Alone, supervised 5 4 [2–9]
- In a group, unsupervised 7 5 [3–11]
- In a group, supervised 15 12 [7–18]

Where would you most prefer to undertake an exercise programme?

- Home 110 83 [75–88]
- Hospital 5 4 [2–9]
- Community centre 11 8 [5–14]
- Gym 7 5 [3–11]
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Table 5. Influence of patient characteristics on preparedness to undertake each type of exercise programme expressed as odds ratios [95% confidence intervals]

<table>
<thead>
<tr>
<th>Characteristic (category of interest vs. baseline category)</th>
<th>Walking</th>
<th>Treadmill walking</th>
<th>Stationary cycling</th>
<th>Resistance training</th>
<th>Whole body vibration</th>
<th>Neuromuscular electrical stimulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender: male vs female</td>
<td>0.74 [0.38, 1.41]</td>
<td>0.84 [0.37, 1.82]</td>
<td>0.93 [0.44, 1.98]</td>
<td>1.17 [0.66, 2.07]</td>
<td>1.22 [0.69, 2.15]</td>
<td>1.27 [0.72, 2.25]</td>
</tr>
<tr>
<td>Age: ≥65 vs &lt;65</td>
<td>0.68 [0.36, 1.31]</td>
<td>0.65 [0.29, 1.43]</td>
<td>0.36 [0.17, 0.79]</td>
<td>0.69 [0.39, 1.23]</td>
<td>1.15 [0.65, 2.04]</td>
<td>1.00 [0.56, 1.78]</td>
</tr>
<tr>
<td>Performance status: 2 vs 0–1</td>
<td>0.37 [0.14, 1.01]</td>
<td>0.19 [0.04, 0.87]</td>
<td>0.21 [0.06, 0.78]</td>
<td>0.67 [0.33, 1.38]</td>
<td>0.64 [0.31, 1.32]</td>
<td>0.79 [0.38, 1.61]</td>
</tr>
<tr>
<td>Current activity score: &lt;15 vs ≥15</td>
<td>0.62 [0.31, 1.25]</td>
<td>0.97 [0.42, 2.20]</td>
<td>0.99 [0.45, 2.19]</td>
<td>1.63 [0.87, 3.13]</td>
<td>0.80 [0.43, 1.48]</td>
<td>1.27 [0.68, 2.38]</td>
</tr>
<tr>
<td>Comorbidities: &gt;1 vs 0</td>
<td>0.77 [0.37, 1.65]</td>
<td>0.67 [0.27, 1.69]</td>
<td>1.75 [0.80, 3.86]</td>
<td>1.06 [0.57, 1.97]</td>
<td>1.03 [0.56, 1.91]</td>
<td>1.23 [0.66, 2.29]</td>
</tr>
</tbody>
</table>

*Statistically significant (P < 0.05).

The majority of patients expressed a preference to undertake the exercise programme at home, alone and unsupervised. A minority (n = 15, 12%) preferred group exercise, with a community centre the preferred meeting place (Table 4).

Influence of patient characteristics on exercise programme preference

Older patients and those with a lower performance status were less likely to be capable of and prepared to undertake the cycling exercise programme (odds ratios 0.36 and 0.21, respectively, P < 0.05) (Table 5). There were non-significant indications that older patients, males and those with lower performance status, activity scores and comorbidities felt less capable of and prepared to undertake exercise programmes utilising walking, treadmill or cycling and generally more likely to undertake programmes utilising resistance training, whole body vibration or neuromuscular electrical stimulation (Table 5). These characteristics were also non-significantly associated with being unprepared to undertake at least one exercise programme (results not presented).

Discussion

This is the most in-depth survey of the exercise preferences of patients living with a range of common cancers to our knowledge. When provided with the full details of six therapeutic exercise programmes utilising various types of exercise, two-thirds of patients reported being capable of and prepared to undertake at least one of them. This proportion is in keeping with the median [IQR] uptake of 63 [33–80]%, reported by a recent systematic review of therapeutic exercise in people mainly treated for cancer with curative intent [7]. Of those prepared to undertake a programme, the most preferred type of exercise was neuromuscular electrical stimulation (36%), followed by walking (22%), resistance training (19%) and whole body vibration (14%) with treadmill walking and stationary cycling selected by less than 10% of patients. This suggests that to engage the majority of patients with common incurable cancers in their most preferred form of exercise, a range of therapeutic exercise programmes may need to be offered, taking into account the clear preference for exercise to be undertaken at home and unsupervised.

The evidence base regarding the exercise programmes we examined is limited in people with incurable cancer, particularly for the more novel forms of exercise, e.g. neuromuscular electrical stimulation. Our results can help inform the selection of appropriate types of exercise in which to examine uptake, adherence and efficacy. On the basis of its popularity, neuromuscular electrical stimulation of the quadriceps muscles appears worthy of further study. Patients cited practicality and convenience as the main reason for selecting this as their preferred choice and, compared to many exercises, neuromuscular electrical stimulation requires less motivation and change in lifestyle, e.g. it can be undertaken whilst sitting watching television, reading etc. Nonetheless, this choice is likely to have been based mainly on the information given rather than actual experience of neuromuscular electrical stimulation and further work is required to explore the acceptability of its use. Except for walking, there will also be varying degrees of experience with the other types of exercise and this knowledge could have further informed our findings. Identifying preferences for other types of exercise not shown could also have been enlightening.

One-third of patients surveyed were not prepared to undertake any of the exercise programmes, which is also in keeping with the findings of the systematic review [5]. We found a tendency for older male patients and those with a lower performance status or activity score to be the least prepared to undertake exercise. The main reason given was a lack of interest and future studies could explore contributory factors in more depth, e.g. motivation, confidence, educational level and social status, along with any willingness or preference to undertake other types of exercise not represented in the six programmes. Perhaps offering exercise as an integrated component of a cancer treatment regimen would improve uptake but this remains to be seen. Nonetheless, there is
always likely to be a proportion of patients for whom any form of exercise is unacceptable, even when able and aware of the potential benefits [6].

Our aim is to develop therapeutic exercise for people with incurable cancer as part of a proactive rehabilitation programme to optimise physical function, independence and psychological wellbeing for as long as possible. Intuitively, success is more likely the sooner the programme commences after diagnosis rather than waiting until significant loss in function has occurred. Thus, we explored the views of patients with a reasonable performance status, many of whom were receiving or had received chemotherapy or radiotherapy. Although all patients had a good performance status (ECOG 0–2), their exercise levels had already fallen from pre-diagnosis levels, supporting our rationale for early intervention. We plan to focus future work on patients with lung and upper gastro-intestinal cancers.

In conclusion, our findings suggest that it is realistic to develop exercise as a supportive therapy for patients with incurable cancer, including those receiving anti-cancer treatments, and can be used to inform further research in this area.

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