Promoting physical activity in patients with rheumatoid arthritis

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Chapter 5

Engagement and satisfaction with an Internet-based physical activity intervention in patients with rheumatoid arthritis

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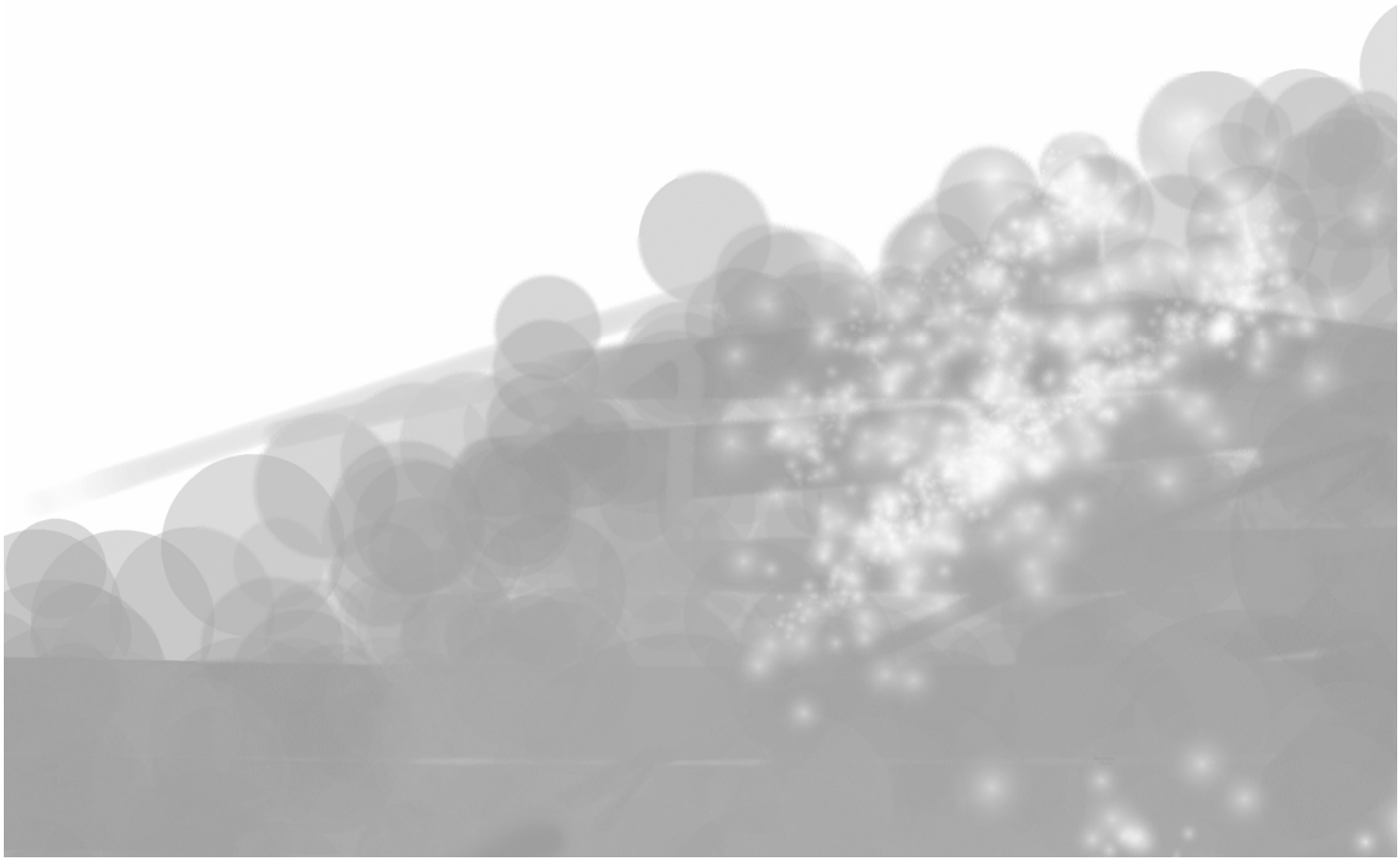

Abstract

Objective. To assess the engagement in and satisfaction with an Internet-mediated physical activity intervention with individual supervision in patients with rheumatoid arthritis (RA).

Methods. The intervention studied was one of the two strategies aimed at enhancing physical activity in RA patients that were being compared in a randomised controlled trial. 82 patients, all experienced in using Internet and e-mail and registered at three different rheumatology outpatient clinics, were randomly allocated to the Internet-mediated individualized intervention (52 weeks). They had access to personal physical activity schedules and received individual supervision by a physical therapist by means of weekly e-mail feedback. In addition, telephone contacts, an online discussion forum, six face-to-face group meetings and electronic newsletters were offered. Besides registration of returned physical activity schedules, engagement and satisfaction were measured through questionnaires.

Results. The median physical activity schedule return rate of the 82 participants was 55%. The mean number of patients logging into the website at least once a week was 53 (70%) over 12 months. 69 patients returned the questionnaires (response 84%). Telephone contacts were used by 38/67 patients (57%), the mean (SD) number of attended group meetings was 3.1 (1.5) and the discussion forum comprised 15 posted messages. Overall, the proportions of patients being (very) satisfied with the amount of e-mail contacts, telephone contacts, usefulness of website information, physical activity schedules, group meetings, and website layout were $\geq$85%. A smaller proportion of patients was satisfied with the links to other websites (68%), the newsletters (55%) and the online discussion forum (32%).

Conclusion. Physical activity schedules with weekly feedback by e-mail, telephone contacts and a limited number of group meetings were frequently used website tools and modes of communication of an Internet-based physical activity intervention, with high satisfaction rates from RA patients. Discussion forum and newsletters were less used and appreciated. Caution should be taken when extrapolating the results found to groups of patients who are not experienced Internet and e-mail users or patients with more severe physical disabilities.

Introduction

Physical activity and exercise are found to be beneficial for patients with rheumatoid arthritis (RA), even if performed intensively and long term (1;2). However, the proportion of patients with arthritis that are physically inactive is larger than in the general population (3-5). To promote physical activity among patients with arthritis, various strategies and recommendations have been developed (6;7). Recently, the use of the Internet as a mode of delivery was evaluated, indicating that this intervention, when offered with individualized supervision, is a promising intervention strategy to promote physical activity in patients with RA (8).

Although Internet-based physical activity interventions have been employed and evaluated in other populations as well (9-13), little is known about the participants' actual usage and appreciation of the various website tools, modes of communication and supervision. With respect to usage, the limited number of studies focusing on process evaluations of websites used to deliver physical activity interventions shows that maintaining high levels of participant engagement is challenging, as the login frequency of the websites appears to decline over the intervention period (14), even when personalized websites are involved (11;15;16). Moreover, a large variation has been reported with respect to the proportions of participants actually reading the different information sections (16), reinforcement e-mails (9) or using the online support groups (11).

Concerning satisfaction, three studies described users' satisfaction with several tools or sections on physical activity websites. McKay and his colleagues (11) reported that the majority of the diabetic patients participating in an Internet-based personalized physical activity programme found the tailored online messages from the personal coach to be helpful, whereas the online peer-to-peer support group was less appreciated. Sciamanna *et al.* (16) found that the self-monitoring physical activity diary, safety tips and walking fitness test were rated as the most helpful website sections by the participating healthy adults. Furthermore, Leslie *et al.* (15) found that half of the participants allocated to a physical activity website containing personalized information, interactive quizzes, goal setting, and activity planning found the website and personalized e-mails to be moderately to extremely useful.

As the use of Internet-based interventions regarding physical activity or other self-management activities will grow with time, the need for a thorough evaluation of physical activity websites and website tools increases. Therefore, the aim of this study is to assess RA patients' engagement in

and satisfaction with an Internet-mediated physical activity intervention with respect to usage of the website, website tools and different modes of communication.

Patients and methods

Design

This study was part of a randomized, controlled, multi-centre trial in which the effectiveness of two Internet-based physical activity interventions for patients with RA were compared: an individually supervised programme [Individualized Training (IT)] and a programme consisting of general instructions for home exercises and physical activity [General Training (GT)] (8). The trial was carried out in the rheumatology out-patient clinics of 3 hospitals in the Netherlands (Haga Teaching Hospital, The Hague; Reinier de Graaf Gasthuis, Delft and University Medical Centre, Leiden) from March 2003 until August 2004. The medical ethics committees of all participating hospitals approved this trial and all patients gave written informed consent. The amount of physical activity was the primary outcome measure. The results of this trial, indicating that the IT intervention is more effective with respect to the self-reported amount of physical activity than the GT intervention, were described in another paper (8). For the purpose of this article we only used the data of patients from the IT intervention group.

Patients

To identify potential participants for the trial, a random sample of 1308 patients with RA registered in the aforementioned outpatient clinics were sent questionnaires containing the initial inclusion criteria. Subsequently, eligible patients were invited for a final screening visit. The following inclusion criteria were used: (i) RA according to the 1987 American College of Rheumatology criteria (17); (ii) not being physically active for 30 minutes in succession on a moderate intensity level on at least 5 days a week (a criterion related to the Dutch public health recommendations for public health (18)); (iii) availability of a computer with Internet facilities and being experienced in the use of these facilities; (iv) being able to cycle on a bicycle ergometer; (v) not having cardiopulmonary conditions which would not allow moderately intensive physical activity. This last-mentioned criterion was verified by the rheumatologist, or a cardiologist/ pulmonologist if needed. In total, 832 patients returned the questionnaires. Of these, 160 patients fulfilled the initial inclusion criteria. These patients were subsequently invited for a

screening visit, where the final inclusion criterion of not having contra-indications for moderate physical activity, was checked. All the 160 patients were found to be eligible for the study, gave written consent and were randomized into one of the two study groups.

Individually supervised physical activity intervention

The contents of our intervention were substantiated by recent literature on physical activity interventions. In previous trials, physical activity interventions with a similar duration of 12 months (19;20) have been investigated. Furthermore, previously developed Internet-based interventions incorporated e-mail contacts (10;11), a website (9;16), an online discussion forum (11) and newsletters (13). To ensure continuity of communication in case of technical or complex problems, complementary telephone contacts and home visits contacts were offered in the present study. Furthermore, based on the results of previous studies regarding home-based unsupervised physical activity, it was hypothesized that giving the participants the opportunity to meet the supervisor face-to-face and to exchange experiences with other fellow participants during a limited number of group meetings, would positively influence the participants' adherence (21;22).

All participants started the 12-month programme with a face-to-face personal meeting with one of the supervising physical therapist. Subsequently, patients had access to weekly refreshed personal physical activity schedules through a password secured website. The exercise schedule contained descriptions of exercises that had to be performed five times a week on five separate days. Every week the patients had to send back a filled-in schedule to the supervising physical therapist by e-mail. During the intervention period the supervising therapist provided individual supervision by putting a new personal physical activity schedule on the website and providing additional feedback on the previous schedule by e-mail once a week. The exercises described in the physical activity schedules were retrieved from a large online database to which only the supervisors had access. The physical activity schedules were posted on the patients' individual websites, which, in contrast with sending them by e-mail, stimulated usage of all website tools by the participants. Moreover, the posting on the website appeared to be the quickest and most user-friendly way for the supervisors to disseminate the individual physical activity schedules. The physical activity schedules were tailor-made, implying that, depending on the progression the patients made, the programme was adjusted in terms of duration and/or intensity.

The physical activity schedules consisted of muscle strengthening and range-of-motion (ROM) exercises, cycling on a bicycle ergometer and recommendations for daily activities demanding physical activity, such as walking, cycling and gardening. The goal was to perform the activities and exercises five times a week on five separate days. The muscle strengthening and ROM exercises were performed in a sitting, standing or lying position. A bicycle ergometer (Tunturi E3, Tunturi Oy Ltd, Turku, Finland) and a heart rate monitor (Polar T41, Almere, the Netherlands), which is an easy to don and doff device to be worn around the chest, were given on loan to 80 patients during the study period (two patients were already in possession of an appropriate bicycle ergometer). The patients' endurance progression was evaluated according to the average heart rate during cycling and the rating of perceived exertion (RPE or Borg scale, range 0-10) (23). Patients were informed about the possibility of contacting the physical therapists by telephone on working days and to receive home visits in case problems could not be solved by means of e-mail or telephone contacts. In addition, patients were invited to face-to-face group meetings (approximately 8-10 patients per group). In total, 6 group meetings were organized, 3 in the first three months of the trial, and another 3 meetings at 6, 9 and 12 months. These group meetings, which were led by one of the two supervising physical therapists, took place in Leiden, The Hague or Delft, depending on the patients' residence. During the meetings new exercises were demonstrated, extra information about exercise and arthritis was given and patients' experiences were exchanged.

Contacts among group members were facilitated by a discussion forum on the website, an area where patients could communicate with each other by means of questions, answers and discussions on several topics. The forum was not intended for the supervisors. Furthermore, the website contained general information about physical activity and exercise for RA patients, links to other relevant websites and newsletters.

With respect to the organization of the intervention, the personnel comprised two supervisors, a website coordinator and a company hosting the website. The main activities of the supervisors were: performing the initial assessments of the participants (approximately 30 minutes per participant), supervising the six group meetings (approximately 150 minutes), composing the weekly physical activity schedules, posting them on the patients' websites and sending e-mails with additional feedback if needed. On average, composing and posting the physical activity schedules and e-mails took 12 minutes per participant per week. In total, the maximum time spent on one individual by the supervisor over 12 months was estimated to be approximately 10

hours. A website coordinator, who was not involved in the supervision of individual patients (MvdB), up-dated the information on the web pages with new activities and exercises, newsletters and online leaflets, for example a leaflet about walking and one about physical activity at the workplace. In addition, the contents of the online discussion forum were checked regarding appropriate and decent usage every week. Hosting of the website was done by an external company (E-wise, Utrecht, the Netherlands). At the end of the study, all 80 patients who had a bicycle ergometer on loan were offered to take over the ergometer at a price of € 275,- (£190,-) [new price € 730,- (£500,-)].

Measurements

All posted and returned physical activity schedules, e-mails and messages posted on the forum were stored in a database throughout the duration of the intervention.

Engagement with website, website tools and different modes of communication. The actual usage of the personal physical activity schedules was measured by recording the amount of physical activity schedules that were returned by the participants in the previous 3 months. At 3, 6, 9 and 12 months the ratio of the number of returned physical activity schedules and the relative maximum of returned schedules for the previous 3 months was calculated. Taking into account a period for getting used to filling in the schedules, the relative maximum of returned schedules for the first 3 months of the trial was set at 7 schedules. For the remaining three-quarters the relative schedule maximum was set at 11 schedules per quarter (average holiday period of 2 weeks per quarter). The overall schedule return rate was defined as the ratio of the number of returned physical activity schedules during the total follow-up period (12 months) and the relative maximum of 40 returned schedules.

Patients were asked about the frequency of logging into the website after 3, 6, 9 and 12 months by means of a questionnaire. In addition, the use of e-mail contacts, telephone contacts, forum contacts and group meetings attended were measured after 12 months by means of another questionnaire. Frequency of e-mail and telephone contacts were categorized as once a week, once every 2 or 3 weeks, once a month, less than once a month and never.

Satisfaction. Patients' satisfaction was measured once, i.e. directly after the patients had finished the physical activity programme after 12 months. Satisfaction was measured with a questionnaire

designed specifically for the present study comprising statements and questions that covered the following components of satisfaction: satisfaction with the general contents of the physical activity programme (variation, clarity, tailored to individual needs), satisfaction with the website and website tools (layout, usefulness of information, usefulness and user-friendliness of the personal physical activity schedules and usefulness of links to other websites, newsletters and the forum) and satisfaction with the group meetings.

Furthermore, patients' satisfaction with the frequency of contact with supervisors and fellow participants (e-mail, telephone, forum and face-to-face contact) was measured. The satisfaction items were initially measured on a 5-point Likert scale, which was later categorized into three (1-2 = satisfied or very satisfied, 3 = neither satisfied nor unsatisfied, and 4-5 = unsatisfied or very unsatisfied) for the analysis. Questions about the frequency of contact contained the categories too low, optimal and too high. Furthermore, there were two questions in the questionnaire asking the patients whether or not they had experienced any miscommunications between themselves and their supervisors related to the use of e-mail and whether or not they thought they have been able to develop a relation of trust with their supervisor during the training period. In the last part of the questionnaire the patients were asked whether they thought they would continue to be physically active in the future and, if so, by means of which forms of supervised or unsupervised activities they would do this (multiple answers were possible). Moreover, it was registered whether patients made use of the offer to take over the bicycle ergometer at the end of the programme.

Additional assessments. Socio-demographic characteristics recorded at baseline were age, gender, educational level (categorized as low: up to and including lower technical and vocational training; medium: up to and including secondary technical and vocational training; high: up to and including higher technical and vocational training and university) and employment status. In addition, the Body Mass Index (kg/m^2) and the presence of co-morbidity (assessed using a part of the Dutch Arthritis Impact Measurement Scale II (AIMS II) (24)) were registered. Disease duration at baseline and medication usage were recorded from the medical records. Functional ability was assessed with the Health Assessment Questionnaire (HAQ) (25) and the McMaster Toronto Arthritis (MACTAR) Patient Preference Disability Questionnaire (26). In addition, quality of life was measured with Rheumatoid Arthritis Quality of Life (RAQoL) questionnaire (27) and the RAND 36-Item Health Survey (28). All measurements were done every 3 months (HAQ, RAQoL and RAND 36)

or every 6 months (MACTAR), but for the present study, only the baseline and 12-month scores were used.

Physical activity was measured every 3 months by means of a questionnaire containing two questions. First, the participants were asked how many days a week they were physically active on a moderate intensity level for 30 minutes in succession. Second, participants were asked how many days a week they were physically active on a vigorous intensity level for 20 minutes in succession. On the base of the two aforementioned questions the proportions of patients meeting the Dutch public health recommendations for physical activity (29) (i.e. being moderately active 30 minutes in succession on at least 5 days a week or vigorously active for 20 minutes in succession on at least 3 days a week) were calculated.

A detailed description of the aforementioned socio-demographic and outcome measures is given in a separate publication (8).

Statistical analysis

All analyses were performed using the Statistical Package for the Social Sciences (SPSS 12.0 for Windows, Chicago IL, USA]. Descriptive statistics were utilized for data analysis to summarize demographic characteristics and frequencies of selected variables. An independent samples *t*-test, a Pearson Chi-square test or a Fisher's Exact test was used to test whether there were significant differences between patients with a low versus a high login frequency or schedule return rate.

Results

In total 160 patients were randomized, of which 82 were allocated to the IT group. During the one-year trial, five patients from this latter group (6%) were lost to follow-up. The median age at baseline was 49.5 (IQR 12.9) years. 62 (76%) patients were female and the median disease duration was 7.6 (IQR 8.8) years. The median HAQ score was 0.75 (IQR 1.13), which corresponds to mild or moderate difficulty (30). All baseline characteristics are presented in Table 1.

Table 1. Baseline demographic and clinical characteristics of RA patients receiving an Internet-based individualized physical activity programme (n = 82)*

Female	62 (76)
Age, years; median (IQR)	49.5 (12.9)
Duration of RA, years; median (IQR)	7.6 (8.8)
Current treatment	
Nonsteroidal anti-inflammatory drugs (NSAIDs)	58 (71)
Disease-modifying anti-rheumatic drugs (DMARDs)	74 (90)
Presence of co-morbidity	38 (46)
Body Mass Index, kg/m^2; median (IQR)	
Female	24.5 (5.5)
Male	27.5 (3.0)
Education level	
Low	15 (18)
Medium	50 (61)
High	17 (21)
Gainfully employed	47 (57)
Physical activity	
Moderate intensity 30 minutes accumulated, days/wk; median (IQR)	2.0 (3.0)
Vigorous intensity 20 minutes in succession, days/wk; median (IQR)	0 (1.0)
Health Assessment Questionnaire score (HAQ); median (IQR)	0.75 (1.13)
28-joint Disease Activity Score (DAS28); median (IQR)	3.5 (2.3)

* Values are the number (%) of patients, unless indicated otherwise. Interquartile ranges (IQRs) are expressed as the net result of 75th - 25th percentile.

Engagement with website, website tools and different modes of communication

Table 2 presents the reported frequency of logging into the website, the physical activity schedule return rates, the use of telephone and e-mail contacts with the supervising physical therapist and the amount of attended group meetings. Overall, a decline in the website login frequency over the total follow-up period was seen. The median physical activity schedule return rate over the total period of 12 months was 55% (IQR 74.4), with the return rate declining with time. Over the total follow-up period there were 15 patients (19%) who returned less than four physical activity schedules, of whom six patients did not send back any schedule nor ever logged into the website. The median number of group meetings that was attended was 3.0 (IQR 2.0). Five patients attended none of the group meetings whereas four patients attended only one session. Half of the participants (n = 33/65, 51%) reported they had had personal contact with other participants in the trial once or more during group meetings.

Table 2. Number of patients (%) engaged in the website, personal physical activity schedules, telephone contacts, e-mail contacts and group meetings

	0-3 months	3-6 months	6-9 months	9-12 months	Average over total follow-up period (1 yr)
Login frequency					
≥ Once a week	63 (86)	60 (75)	46 (62)	42 (55)	53 (70)
One to three times a month	6 (8)	9 (11)	14 (19)	15 (20)	11 (15)
Never	4 (6)	11 (14)	14 (19)	20 (26)	12 (16)
Schedule return rate					
High (rate 75-100%)	51 (62)	23 (28)	30 (37)	26 (32)	33 (40)
Sufficient (rate 50-75%)	6 (7)	17 (21)	9 (11)	7 (9)	10 (12)
Low (rate < 50%)	25 (31)	42 (51)	43 (52)	49 (60)	40 (49)
Reported telephone contacts					
≥ Once a month					3 (5)
< Once a month	--	--	--	--	34 (51)
Never					30 (45)
Reported e-mail contacts					
≥ Once a week					20 (30)
Once every 2 or 3 weeks					12 (18)
Once a month	--	--	--	--	11 (16)
< Once a month					22 (33)
Never					2 (3)
Reported attended group meetings					
5-6 meetings					13 (20)
3-4 meetings	--	--	--	--	24 (37)
1-2 meetings					26 (40)
Never					2 (3)

More than half of the patients reported to have used telephone contacts, the majority of them at a frequency of once a month or lower. E-mail contacts, including the returning of physical activity schedules, were used more often: almost one third of the patients reported to have used this mode of communication once a week or more, another one third used it once every 2 or 3 weeks or once a month.

With respect to the use of the online discussion forum, 12 different patients posted 15 messages to other participants over the total period of 12 months. During the intervention period, one patient had to be visited at home by the supervisor, because of problems with the bicycle ergometer that could not be solved by e-mail or telephone.

To explore whether the level of engagement with the website and website tools was related to the reported total amount of moderate or vigorous physical activity, the proportions of patients meeting the physical activity recommendations were compared among groups of patients with different login frequencies (low *vs.* high) or schedule return rates (low *vs.* high) (Table 3). A high

login frequency was defined as logging into the website once a week or more on at least three out of the four follow-up measurements, whereas a high schedule return rate was defined as 50% or more over the total period of 12 months. Table 3 shows that the proportions of patients meeting either the moderate or the vigorous physical activity recommendations were larger within the group of patients logging in frequently than among the patients logging in less frequently, with the differences reaching statistical significance for moderate activity at 6 and 12 months and for vigorous activity at 9 and 12 months. Similar results were obtained with respect to the schedule return rates, with significantly more patients meeting the physical activity recommendations at 12 months for moderate activity and at 6, 9 and 12 months for vigorous activity. The aforementioned results indicate there is a dose-effect relation between the login frequency and the schedule return rate on the one side and the total amount of physical activity on the other side.

With respect to the relationship with login frequency and schedule return rate and functional ability and quality of life measures, the improvements within the group of patients with a high login frequency or schedule return rate were in general larger than in the group of patients with a low login frequency or schedule return rate (except for the HAQ scores) (Table 4). Apart from a significantly greater improvement of the RAQoL in patients with a high schedule return rate, none of the differences between the two groups did however reach statistical significance.

Satisfaction

Satisfaction with contents physical activity programme, website (tools) and group meetings. Table 5 presents the proportions of patients that were (very) satisfied, neither satisfied nor unsatisfied or (very) unsatisfied with the general contents of the physical activity programme, the website and website tools and the group meetings. It was found that in general the majority of the participants were satisfied or very satisfied with the general contents of the programme. The website and the different website tools were also well appreciated, except for the usefulness of the newsletters, links to other websites and the online discussion forum. Satisfaction with the usefulness and organization of the group meetings was high.

Table 3. Numbers (%) of participants meeting the moderate and vigorous physical activity recommendation divided into three groups: all patients; patients with a low vs. high login frequency and patients with a low vs. high schedule return rate

	All patients (n = 82)	Login frequency #		P-value login frequency	Schedule return rate #		P-value schedule return rate
		Low (n = 27)	High (n = 49)		Low (n = 39)	Sufficient to high (n = 43)	
Numbers (%) of participants being physically active on a moderate intensity level for 30 minutes in succession on at least 5 days a week							
Baseline	0 (0)	0 (0)	0 (0)		0 (0)	0 (0)	
3 months †	no data	--	--	--	--	--	--
6 months	29 (38)	6 (23)	22 (47)	0.046*	10 (28)	19 (46)	0.093
9 months	26 (35)	5 (20)	21 (43)	0.051	7 (23)	19 (44)	0.055
12 months	19 (26)	3 (12)	16 (34)	0.036*	4 (12)	15 (37)	0.017*
Numbers (%) of participants being physically active on a vigorous intensity level for 20 minutes in succession on at least 3 days a week							
Baseline	5 (6)	2 (7)	3 (6)	0.59	4 (10)	1 (2)	0.13
3 months	27 (39)	8 (36)	19 (40)	0.80	8 (30)	19 (44)	0.22
6 months	27 (35)	8 (32)	19 (39)	0.57	8 (23)	19 (44)	0.049*
9 months	29 (40)	4 (16)	25 (52)	0.003*	5 (16)	24 (57)	<0.001*
12 months	26 (34)	3 (11)	23 (48)	0.001*	3 (9)	23 (55)	<0.001*

A high login frequency was defined as logging into the website once a week or more on at least three out of the four follow-up measurements, whereas a sufficient to high schedule return rate was defined as 50% or more over the total period of 12 months.

† Due to a logistic failure during the original randomized controlled trial, no data were available for the moderate physical activity recommendation at 3 months.

* $P < 0.05$ (low vs. high login frequency or low vs. sufficient to high schedule return rate).

Table 4. Baseline and change scores regarding functional ability and quality of life within three patient groups: 1. all patients; 2. patients with a low vs. high login frequency; 3. patients with a low vs. high schedule return rate

	All patients (n = 82)	Login frequency		P-value login frequency	Schedule return rate		P-value schedule return rate
		Low (n = 27)	High (n = 49)		Low (n = 39)	Sufficient to high (n = 43)	
Functional ability by HAQ score							
Baseline	0.75 (1.13)	0.63 (1.41)	0.63 (0.89)	0.89	0.75 (1.28)	0.63 (0.88)	0.39
Δ 0–12 months	−0.09 (−0.16, −0.01)*	−0.12 (−0.28, 0.04)	−0.06 (−0.15, 0.02)	0.49	−0.11 (−0.24, 0.03)	−0.07 (−0.16, 0.02)	0.67
Functional ability by MACTAR score							
Baseline (mean)	51.0 (4.0)	51.0 (4.0)	51.0 (4.0)	0.97	51.0 (5.0)	51.0 (4.0)	0.68
Δ 0–12 months	4.2 (2.5, 6.0)*	3.0 (−0.5, 6.6)	5.0 (3.1, 7.0)*	0.28	2.4 (−0.5, 5.4)	5.6 (3.5, 7.7)*	0.07
Quality of life by RAQoL score							
Baseline	10.0 (10.2)	10.7 (13.8)	10.0 (9.4)	0.78	11.1 (11.4)	9.3 (10.0)	0.45
Δ 0–12 months	−1.3 (−2.35, −0.34)*	−0.08 (−1.8, 1.7)	−2.1 (−3.3, −0.8)*	0.06	0.2 (−1.3, 1.7)	−2.6 (−3.8, −1.3)*	0.01*
Quality of Life by RAND-36 score *Physical summary scale*							
Baseline	52.8 (40.1)	42.5 (42.4)	56.8 (36.9)	0.28	41.8 (34.9)	55.6 (38.2)	0.07
Δ 0–12 months	4.9 (1.1, 8.7)*	4.6 (−1.3, 10.5)	4.7 (−0.4, 9.9)	0.98	4.2 (−1.2, 9.6)	5.4 (−0.1, 10.9)	0.76
Quality of Life by RAND-36 score *Mental summary scale*							
Baseline	75.1 (26.2)	72.0 (35.6)	79.0 (24.8)	0.46	72.0 (27.5)	79.0 (25.8)	0.32
Δ 0–12 months	−0.2 (−4.8, 4.3)	−0.5 (−8.0, 6.9)	−0.2 (−6.2, 5.8)	0.94	−2.0 (−8.7, 4.9)	1.1 (−5.2, 7.4)	0.50

Baseline values are given as the median (IQR). Follow-up values are given as the mean (95% CI) change from baseline values.

* $P < 0.05$ (low vs. high login frequency or low vs. sufficient to high schedule return rate).

See Table 3 for other definitions.

Table 5. Number of patients (%) that are (very) satisfied, neutral or (very) unsatisfied with the contents of the physical activity programme, the website, website tools and group meetings*

	(Very) satisfied	Neither satisfied nor unsatisfied	(Very) unsatisfied
General contents programme			
Variation (n = 55#)	48 (87)	6 (11)	1 (2)
Clarity (n = 56)	53 (94)	2 (4)	1 (2)
Tailored to individual needs (n = 56)	44 (79)	7 (12)	5 (9)
Website and website tools			
Layout (n = 69#)	67 (97)	2 (3)	0
Usefulness general information (n = 54)	49 (91)	5 (9)	0
Usefulness physical activity schedules (n = 56)	53 (94)	2 (4)	1 (2)
User-friendliness physical activity schedules (n = 55)	47 (86)	4 (7)	4 (7)
Usefulness links to other websites (n = 66)	45 (68)	18 (27)	3 (5)
Usefulness newsletters (n = 55)	30 (55)	20 (36)	5 (9)
Usefulness forum (n = 50)	16 (32)	22 (44)	12 (24)
Group meetings			
Usefulness (n = 40#)	34 (85)	4 (10)	2 (5)
Organization (n = 40)	37 (93)	3 (8)	0

* Satisfaction only to be judged in case of actual use.
# Variation in the total number of patients (n) was caused by the varying number of patients that returned the questionnaires or that had actually used the items mentioned.

Satisfaction with frequency of contact. The majority of the patients were satisfied with the frequency of contact with their supervisor by means of e-mail (n = 57/60, 95%), telephone (n = 35/40, 88%), face-to-face (n = 35/41, 85%) contact. These positive satisfactions results were supported by other data derived from the questionnaire showing that 55/62 patients (89%) did not experience any miscommunications between themselves and their supervisors because of the use of e-mail. In addition, 53/62 patients (85%) felt that they had been able to develop a relation of trust with their supervisor during the one-year training period. Satisfaction with the frequency of contact with fellow participants was rated as somewhat lower. Proportions of patients rating the frequency of contact as being optimal was 41% (n = 9/22) for the forum contacts and 67% (n = 29/43) for the group meeting contacts. Other data showed that the majority of the participating patients (n = 50/63, 79%) found that they were given sufficient opportunities to contact fellow participants. Furthermore, 54 out of 63 patients (86%) reported they did not think

that their adherence to the physical activity programme would be worse if they were not able to keep contact with fellow participants during the training period.

Planned continuation of physical activity. With respect to the continuation of physical activity in the future, 64 patients (97%) reported they thought they would indeed continue. 11 (17%) of these participants preferred to do this with supervision, 24 (38%) without supervision and 29 (45%) preferred to be physically active both with and without supervision. Of the supervised physical activities hydrotherapy (n = 15, 38%), Internet-mediated home-based training (n = 13, 33%), group exercise therapy (n = 13, 33%), individual exercise therapy (n = 12, 30%) or a combination of these activities were mentioned most often. Of the participants who reported they preferred to be physically active without supervision, 36 (68%) reported they thought they had gained enough experience to continue with their home exercises without the e-mail supervision and 33 (62%) reported they preferred to be physically active by performing activities such as walking, cycling, and swimming. 51 (64%) of the 80 patients that were given a bicycle ergometer on loan during the study period used the possibility to buy this ergometer after the trial.

Discussion

This study on an Internet-based physical activity intervention with individual supervision in patients with RA showed that about half of the participants did actively log into the website, returned physical activity schedules, had e-mail and telephone contacts with their supervisors and attended at least three group meetings over a period of 12 months. The usage of the forum was low. Furthermore, the majority of patients was satisfied with the web-based tools and modes of communication, with the lowest satisfaction scores for the links to other websites, newsletters and the online forum.

So far a limited number of studies have investigated the effectiveness of interventions to influence physical activity behaviour of patients with chronic conditions using the Internet and e-mail (8-11;13). Despite their promising results, little is known about the usage and appreciation of the various website tools and modes of communication employed with these Internet-based interventions. McKay *et al.* (11) reported that diabetic patients participating in an 8-week personalized physical activity programme logged into the website 1.1 times per week on

average. However, there was a steep decline in website usage over time where in the end there were only 0.5 logins per participant per week. Sciamanna *et al.* (16) investigated the usage of a physical activity website based on social cognitive theory in combination with weekly e-mails in healthy persons. In that study it was found that 83% of the participants reported accessing the website at least more than once in the past month after 3 months. In addition, Leslie *et al.* (15) found that 46% of the healthy participants participating in an 8-week Internet-based physical activity programme visited the website at least once. However, website visits declined during the trial period with in the last 2 weeks <20% of the participants entering the site. Although the aforementioned studies each measured website login rates differently, the trend towards decrease over time seems to be a more generic problem. Providing incentives for regular use, adding prompts and providing more interactive website features, such as goal setting and tools to track personal progress are some of the suggested strategies to improve engagement in physical activity websites (11;15;31). Moreover, Doshi *et al.* (32) found that, although proven to be effective (33;34), most physical activity websites provide little to no assessment, feedback and tailored assistance. Future research should further explore the effectiveness of the strategies to improve or maintain participant engagement and determine the optimal combination of these strategies.

The frequency of contact between patients and the supervisor within this home-based intervention was rather high (at least once a week). Future research should investigate whether a lower frequency of contact will lead to the same results regarding patients' adherence to the programme. In addition, future cost-effectiveness analyses should assess to what extent this intervention is more cost-effective compared to regular individual or group exercise therapy.

In our study we identified a relatively large proportion of patients that did not participate in the physical activity programme at all, as measured by the amount of returned physical activity schedules. Recent literature suggested that these 'hard to engage' individuals need a special approach when trying to stimulate them to take part in a physical activity programme: an approach that focuses on personal goals and addresses gaps in their knowledge about physical activity and their perceived barriers (35). In addition, this study did not investigate which determinants have led to a good programme adherence. Future research should further explore the association between factors such as age, gender, education and exercise attitudes on the one side and patients' adherence to the programme on the other side.

In this study, a positive association between the usage of the website and its associated modalities on the one side and the level of physical activity on the other side was found, whereas the relationship with improvement of functional disability or quality of life was absent or weak. Concerning this weak relationship, the fact that overall, the participants had relatively low levels of disease activity and functional impairment could have played a role. Their relatively favourable health status may have left little room for improvement in functional ability or quality of life at all. Moreover, with respect to the statistical analyses regarding the relationship between patients' adherence to the intervention and the outcomes measures, it should be noted that a relatively large number of statistical tests were carried out, so that it cannot be totally ruled out that some of the results were obtained by chance. In addition, for some analyses the sample size may not have been adequate. Despite these shortcomings, the results regarding the association between adherence and outcomes were consistent over the various groups of outcome measures.

The literature on user satisfaction with physical activity websites shows that in general these websites were found to be useful or helpful (11;15). Concerning specific website tools, McKay *et al.* (11) found that 88% of the participants reported finding the personal coach component and 35% the peer-to-peer support group helpful. Sciamanna *et al.* (16) found that the three tools of a physical activity website that were viewed the most helpful were: safety tips (92%), recording daily physical activity (81%) and a walking fitness test (77%).

The lower satisfaction with the forum found in the present study corresponds with the relatively low appreciation of the online peer-to-peer support group found by McKay *et al.* (11). A possible explanation for these lower satisfaction rates could be the fact that the participants in studies regarding Internet interventions form a selected group of individuals, in which the need for mutual interaction and contact with fellow sufferers is probably not as high as compared the total arthritis population.

The relatively low use of telephone contacts in the present study is related to the nature of the intervention, where in order to adequately take part in the physical activity programme, the exchange of e-mails was mandatory, whereas telephone contacts were complementary. In general, the literature shows that both telephone (36) and e-mail (37) consultations can be effective in reducing the amount of face-to-face consultations and that these are acceptable modes of communication for patients attending a rheumatology clinic (38). However, it seems that e-mail communication with patients is more time efficient than telephone communication (39).

A limitation of our study is the fact that our study population comprised people with RA who had access to and were experienced in the use of Internet and e-mail, were able to cycle on a bicycle ergometer and showed interest in an Internet-based physical activity programme. This selection of patients makes it conceivable that the patients participating in the trial had less difficulty in using computer keyboards and utilize the website tools than the general population of RA patients, leading to an overestimation of engagement and satisfaction scores. Moreover, our intervention incorporated a limited number of face-to-face contacts (initial assessments, group meetings, home visits), which may have influenced the participants' judgment on the frequency and quality of supervision by means of e-mail contacts.

In conclusion, our results showed that physical activity schedules with feedback by e-mail, telephone contacts and a limited number of group meetings were frequently used website tools and modes of communication of an Internet-based physical activity intervention, with high satisfaction rates from patients. Discussion forum and newsletters were less used and appreciated. These findings could be taken into account when designing future Internet-based physical activity interventions as they appear promising alternatives for face-to-face individual or group-based interventions.

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