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Evaluating the effectiveness of an interactive multimedia computer-based patient education programme in cardiac rehabilitation

Key Messages

1. The present study demonstrated that both computer-assisted instruction and tutorial education had immediate positive effects on knowledge acquisition and self-efficacy about application of the knowledge.
2. The long-term effect is still questionable.

Introduction

Cardiac rehabilitation is a multifactorial process that includes exercise training, education, counselling regarding risk reduction and lifestyle changes, and the use of behavioural interventions. Exercise can increase the rate of functional capacity recovery, improve the psychological status and enhance patients' confidence in their ability to perform physical activities. Exercise can also lead to easier weight control, lower cholesterol levels, in addition to reducing the symptoms of angina pectoris, exercise-related dyspnoea, fatigue, and claudication resulting in an overall reduction in the risk of future cardiac events. Cardiac rehabilitation exercise education can minimise the depressive symptoms experienced by patients and their families, and dispel the common myths surrounding coronary heart disease, such as mild exercise and sexual intercourse are dangerous.[1]

Although tutorial sessions are effective in improving knowledge, they are not suited to people of different learning ability and thus may limit participation. As the instructor has to repeat the tutorial many times to different groups of patients, they may become bored and their motivation to teach may decline. Recent studies have demonstrated that computer-assisted instruction (CAI) is more effective than lectures.[2] Recognising the limitation of lecture- and text-based curricula, we developed a CAI programme to educate patients on the role of exercise in a cardiac rehabilitation programme. To evaluate the programme's effectiveness we compared the learning outcome (knowledge and self-efficacy) of the patients undertaking the CAI programme with that in a conventional tutorial-based patient education programme.

Methods

Sample

This study was conducted from July 1997 to July 1998. Forty-eight cardiac patients (30 male, 18 female; mean age, 58.8 years; SD, 12.49 years), participated in the tutorial-based education. Another 48 patients (38 male, 10 female; mean age, 56.12 years; SD, 13.71 years) participated in the computer-assisted education programme. The patients were part of the cardiac rehabilitation programme of Grantham Hospital and had various heart diseases.

Instrumentation

Interactive multimedia CAI package on exercise principles

The CAI programme content was similar to the tutorial education programme and consisted of five separate chapters including: (i) the benefits of exercise for patients with heart diseases, (ii) exercise principles, (iii) points to remember when performing exercises, (iv) adopting a daily exercise routine, and (v) a quiz. The chapters were arranged non-linearly to allow the participants to make their own choice of display sequence.

A strategic behavioural approach with interactive presentation and cognitive

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Table 1. Changes in exercise knowledge and exercise self-efficacy

	CAI group (n=48)				Tutorial group (n=48)				Within subjects F-value (Time)	Between subjects F-value (Time X Group)
	Pre-training		Post-training		Pre-training		Post-training			
	Mean	SD	Mean	SD	Mean	SD	Mean	SD		
Exercise knowledge	7.25	1.66	9.10	1.08	6.96	1.35	7.54	1.38	70.68*	19.21*
Exercise self-efficacy	71.79	15.35	81.54	16.40	69.90	18.74	76.73	16.25	54.33*	1.68†

* P<0.001
† Not significant

tools, such as attractive graphics and animations was adopted for the CAI design. Structured drills helped the participants monitor their progress. Participants were encouraged to repeat the chapter content and quiz until they answered all the questions correctly. Touch screens were used to assist those with limited computer skills. Patients took on average 30 min (SD, 8 min) to complete the CAI programme.

Tutorial-based education programme on exercise principles

The small group tutorial sessions (30 min in length) comprised 8-10 participants and used similar content as the CAI programme. Tutorials were conducted by a tutor using transparencies of key words and pictures projected on a screen.

Outcome measures

A pre/post questionnaire consisting of 10 multiple-choice questions (score range: 0-10) was used to assess the knowledge and skills of the patients before and after the CAI and tutorial programmes.

A self-efficacy questionnaire (10 items, score range: 0-100) was used to assess the extent to which the subjects felt capable of executing each of the listed cognitive-behavioural strategies in physical exertion and exercise when performing daily tasks.

Implementation

This study adopted a pre/post test design. The subjects (n=96) were randomly assigned to two groups, matched by diagnosis and demography. There were no significant differences between the two groups in pre-training self-efficacy and knowledge basis. One group received CAIs and the other conventional therapist-conducted tutorials. All participants were requested to attend the rehabilitation centre for a follow-up assessment 2 months after the education programme. Only 16/48 (33.33%) of the tutorial group and 27/48 (56.3%) of the CAI group attended the follow-up study.

Results

The within-subjects analysis showed significant differences in the subjects' self-efficacy (F=54.33, P<0.001) and exercise knowledge (F=70.68, P<0.001) after the teaching sessions. Compared with the pre-training measurement, both the CAI and tutorial groups showed significantly higher exercise self-efficacy and knowledge in the post-training measurement (Table 1).

There was a significant group effect on the exercise knowledge change (F=19.21, P<0.001) but not on the exercise self-efficacy change (F=1.68, P>0.05). The CAI group showed more significant short-term knowledge improvement than the tutorial group (Table 1).

The follow-up and the non–follow-up participants of both the CAI group (27 vs 21) and the tutorial group (16 vs 32) showed similar baseline knowledge and self-efficacy levels (Table 2).

Pair-wise comparisons of the pre- and post-training exercise knowledge and self-efficacy at follow-up demonstrated significant improvement in exercise knowledge and self-efficacy (except knowledge of the tutorial follow-up group, F=0.68, P>0.05). A significant group effect on the two groups' knowledge change was also found (F=16.97, P<0.001). A group effect on the two groups' self-efficacy change was also not significant (F=0.38, P>0.05).

The knowledge scores of the CAI group declined significantly to the pre-training level (F=22.68, P<0.001) at follow-up. The CAI group had less knowledge retention than the tutorial group when compared with post-training levels (F=19.89, P<0.001). When compared with the pre-training baseline the tutorial group showed more deterioration in the knowledge scores than the CAI group (F=4.33, P<0.05). Neither the CAI nor tutorial programmes demonstrated a significant improvement in self-efficacy at follow-up.

Discussion

The CAI group demonstrated a significantly higher short-term improvement in learning outcomes. The patients found the CAI programme interesting, and that it facilitated self-paced learning and in-depth understanding. However, the tutorials allowed better flexibility in the teaching and learning process as the subjects could ask questions and share the tutor's experience. We recommend that the CAI

Table 2. Baseline comparisons between follow-up and non–follow-up participants

	CAI group					Tutorial group				
	Follow-up (n=27)		Non–follow-up (n=21)		ANOVA	Follow-up (n=16)		Non–follow-up (n=32)		ANOVA
	Mean	SD	Mean	SD	F	Mean	SD	Mean	SD	F
Pre-training										
Knowledge	7.74	1.72	6.86	1.98	2.15*	7.00	1.30	6.94	1.39	0.02*
Self-efficacy	71.51	17.40	72.14	12.64	0.02*	67.63	22.29	71.03	16.97	0.35*
Post-training										
Knowledge	9.33	1.66	8.81	1.21	2.91*	7.18	1.27	7.72	1.42	1.59*
Self-efficacy	80.67	18.41	82.67	13.77	0.17*	77.50	19.29	76.34	14.83	0.05*

* Not significant

be run in parallel or as a supplement to the tutorial method. Participants can learn basic concepts from CAI education before joining the tutorial. In this way, the tutorial can be targeted to resolving the individual doubts of participants, and also facilitate active discussion to enhance knowledge integration.

Subjects of both the CAI and tutorial groups showed higher short-term self-efficacy in the application of the learned concepts and skills to their daily living activities after the programme. This could be attributed to the fact that both methods included self-efficacy enhancement components. For example, consistent persuasion was given to individual trainees throughout both programmes, to facilitate appropriate outcome expectancy and goal setting. Moreover, positive feedback on the progress was given explicitly and frequently during the sessions. Trainees were informed if they had achieved the learning task at each level. Both groups also experienced live modelling that was self-efficacy enhancing. In the tutorial group, trainees who had better mastery of exercise would demonstrate their progress or successful performance to the others. Similarly, video clips in the CAI group provided the live modelling. However, self-efficacy level retention needs further investigation.

Both the CAI and tutorial groups showed substantial decline in long-term knowledge and self-efficacy at follow-up. Long-term retention of knowledge and self-efficacy are essential to change health behaviour. Further studies on the long-term effects of patient education programmes, on self-efficacy, knowledge, lifestyle changes and other health-related outcomes are recommended. The cost-effectiveness of the CAI programme also needs further investigation.

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