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Contribution of Relaxation Technique Training to the Rehabilitation of Myocardial Infarction Patients[1]

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Abstract. The usefulness of relaxation training (RT) in cardiac rehabilitation is assessed by comparing the changes before and after rehabilitation in two randomly divided groups, one with and the other without relaxation. The psychological effects of RT, in addition to the effects of exercise training, were studied. There is a substantial and positive result on well-being and on feelings of invalidity. Psychological improvement, as a result of exercise only, is not found. The benefits of RT occur more in persons with coronary-prone behavior pattern (type A). In some persons anxiety increases during rehabilitation (about 28%), regardless of RT. There is an indication that relaxation may lead to an increase of functional complaints in a small number of persons, possibly due to sensitization to bodily experiences.

Introduction

The outcome of rehabilitation after myocardial infarction (MI) depends to a large degree on psychological factors [6, 16–20]. There is evidence that short psychological intervention in the early phases of hospitalization and rehabilitation might significantly influence the patients' physical and emotional condition, and subsequent recovery [14, 23]. However, psychological help is usually reserved for a small minority [12].

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A cardiac rehabilitation program usually centers around a physical conditioning training. This is assumed to have a positive psychological effect. In our outpatient department for cardiac rehabilitation we introduced a relaxation technique as a mode of therapeutic intervention. The rationale for choosing these techniques was (a) relaxation is a technique, effective at a psychophysiological level, meant to induce the experience of well-being; (b) it provides the person with direct, 'internal' feedback to adequately estimate his emotional and physical condition, and to accept it as it is; (c) it can be taught and practiced in every rehabilitation unit, after some training.

We feel that relaxation is a treatment in its own right, next to exercise training and/or psychotherapy. We think that it is valuable for the majority of cardiac patients [8, 22]. The technique should be simple, direct and concrete in order to elicit a pleasurable 'relaxation response' in the first few sessions [5, 24]. If this effect does not occur soon, cardiac patients are inclined to feel more uncertain and restless and stop cooperating. There are only a few studies reporting the effects of relaxation in cardiac patients [10, 24, 26]. The usefulness of various techniques in diverse treatment settings is insufficiently demonstrated. The criteria for patient selection are unclear.

The purpose of this study is to answer the following questions: (1) Does the use of the relaxation technique (RT) effect patients' (a) well-being, (b) anxiety, (c) sleep quality, (d) functional complaints? (2) Is the effect of RT predictable by the following psychological determinants of MI: (a) coronary behavior pattern, (b) vital exhaustion and depression? (3) Does the use of RT induce for some patients an increase of (a) anxiety and/or (b) functional complaints?

Materials and Methods

Patients

After leaving the hospital the MI patients are referred by the cardiologist to attend the rehabilitation program in the regional center at St. Joannes de Deo Hospital, Haarlem, The Netherlands. From January until June 1982 a total number of 125 patients applied for the program, 69 of whom participated in the study. Criteria for selection were that the time elapsed after discharge from the hospital was less than 3 weeks, and that the patient was physically able to join the exercise program. Patients with diagnoses other than MI (e.g. coronary bypass operation) were excluded. The mean age of the patients (5 women and 64 men) was 55.5 years; 10 had a recurrent MI.

Questionnaires (Outcome Variables)

(1) Medical Psychological Questionnaire Cardiac Patients (MPVH) [11] constructed to measure the well-being of cardiac patients, consists of four scales: (a) *Well-being:* 12 items (score range: 12–36) including e.g.: 'I feel at ease lately', 'I feel healthy lately'; (b) *Subjective invalidity:* 12 items (score range: 10–30) including e.g.: 'I could do a lot more work before', 'I think my condition is poor'; (c) *Displeasure:* 10 items (score range: 10–30) including e.g.: 'I am often in a bad mood without knowing why'; (d) *Social inhibition:* 6 items (score range: 6–18), e.g.: 'I don't like to have many people around me'. All answers have to be given on a three-point scale: true/?/untrue.

(2) Anxiety measured by STAI in two aspects: state and trait anxiety. For each of them there are 20 items which have to be answered on a four-point scale (score range: 20–80).

(3) Sleep quality, a 10-item questionnaire designed to measure subjective sleep quality [27]; answers are given as yes/no (score range: 0–10), e.g.: 'I often wake up during the night'.

(4) Functional complaints, a 25-item questionnaire summing up negative bodily and emotional experiences, the frequency of which is indicated on a three-point scale: often/sometimes/never (score range: 25–75). Examples are: 'Inability to breathe in fully', 'Becoming upset about small things', 'Pain in the chest, especially when I sit quietly'.

Predictor variables: (1) Coronary behavior pattern (CBP), as measured by JAS, is a 36-item questionnaire (score range: -6 to 6) in the Dutch adaptation [2]. (2) Vital exhaustion and depression, a 59-item questionnaire, measures psychological prodromata of MI. Answers have to be given on a three-point scale: yes/?/no (score range: 59–168) (Maastricht Questionnaire, MQ [3].

Relaxation Training

RT is a widely used and a 'basic tool' in psychosomatic treatment [1]. There is a variety of methods, all aiming to elicit a 'relaxation response' [5]. However, the choice of a proper technique for the target group is important.

In this study EMG feedback of frontalis muscle [25] is combined with instructions and guidance for diaphragmatic breathing [4, 9]. The feedback instrument enables the cardiac patient to cooperate and to concentrate attention (i.e. to lie down for about 20 min). For breathing instruction, one hand is placed on the lower abdomen. Attention on this hand facilitates the abdominal breathing movement and consequently diaphragmatic activity. Attention is alternately directed to the feedback signals and to the breathing movement. Undue effort would result in predominant thoracic breathing and in increase of feedback signals from frontal and facial muscle activity. The session consists of both the above described passive relaxation (i.e. lying down, no movement at all) and of active relaxation (i.e. sitting, standing, moving). Those who are too restless to lie down, start the session with active relaxation.

The purpose is that the change of breathing to lower abdominal movement becomes voluntary. The patient is asked to practice it outside therapy sessions. Moreover it is our purpose that this breathing method becomes habitual, and that the change will occur spontaneously while lying down, sitting or standing quietly. The patient is asked to notice and report these changes; also, to practice voluntary relaxation of the abdominal wall for 1 or 2 min on as many occasions as possible.

Table I. Questionnaires administered

	Coronary behavior pattern (CBP:JAS)	Vital exhaustion and depression (MQ)	Sleep quality	Functional complaints	Anxiety state and trait (STAI)	Psychological well-being (MPVH)
Intake (retrospectively administered)	×	×	×	×		
Pretest (before rehabilitation)			×	×	×	×
Posttest (after rehabilitation)			×	×	×	×

Protocol for Passive Relaxation

(1) Introductory talk, e.g. about experiences at home with relaxation, lying down and attaching electrodes to forehead. (2) Registration of baseline values for 2 min, displayed in 30-s integration periods (on Myotron 220, Enting). (3) Auditory feedback, 2 min. (4) Discussing experience and continuing relaxation with feedback. (5) Hand on lower abdomen and attention to the breathing movement. (6) Breathing through slightly pursed lips. (7) Pacing breathing rhythm: short pause after breathing in, very slow, audible breathing out, short audible breathing in. (8) Normal nose breathing, attention on change in breathing movement and in general feeling. Repeat (6)–(8) twice. (9) Discussion of experience and body sensation, disconnecting electrodes.

Design

In order to demonstrate that changes after rehabilitation can be attributed to the RT, a control condition is necessary. After the first interview, patients are randomly assigned to either relaxation condition (RC) or to control condition (CC) (fig. 1). The RC consists of exercise training plus the RT. The latter is done in weekly, individual sessions of about 1 h, totalling 6 sessions. It is parallel to the exercise program. 4 therapists were engaged in this: the first author and 3 others, all trained by him. The CC consists of the usual exercise training, in a 5-week program of daily interval training on a bicycle ergometer; the ECG is continuously monitored. Training is done in groups of 4 patients with 2 physical therapists. Each patient reaching peak loads of 70–80% of maximal heart rate, determined by pretraining exercise testing.

Procedure

Soon after they leave the hospital and applied for rehabilitation, patients are called for a first interview. On that occasion they complete the questionnaires referring to the preinfarction situation. On the second occasion, before the program starts, they complete the questionnaires about the present condition. The second set of questionnaires is repeated after the rehabilitation (table I).

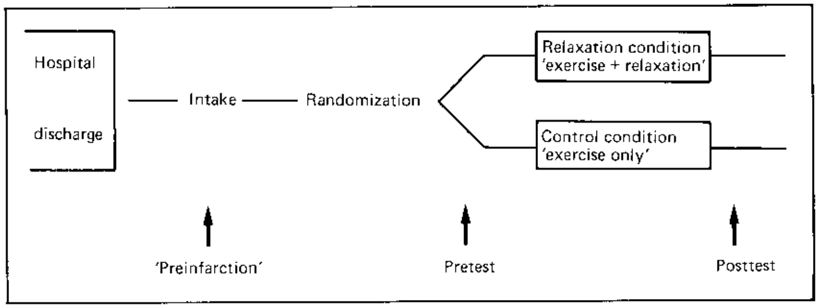

Fig. 1. Design.

Results

Do Patients of the RC Change More Positively on the Following Outcome Variables than Patients of the CC: (a) MPVH Scales: Well-Being (W); Subjective Invalidity (I); Displeasure (D); Social Inhibition (SI); (b) STAI Scales: State (S); Trait (T); (c) Sleep Quality; (d) Functional Complaints

Table II shows the mean changes before and after rehabilitation for the two conditions. For RC all changes turn out to be positive, sleep quality and functional complaints do not show any change. For CC some variables show an unfavorable change: sleep quality, social inhibition. RC improves with regard to MPVH-W and MPVH-I more than CC (Mann-Whitney test $0.001 < p < 0.01$ and $0.02 < p < 0.05$, respectively). A valuable indication of effect size is given by Cohen's discrimination measure (d), which standardizes the differences between means. As a rule of the thumb, $d = 0.20$ means a low effect, $d = 0.50$ indicates a medium effect, whereas a value of $d = 0.80$ is a high effect [7] (table II, fig. 2). Only two variables show a substantial effect of rehabilitation, both in favor of the RC. It is concluded that the RT has a positive and substantial effect on two scales of the MPVH, i.e. well-being (MPVH-W) and subjective invalidity (MPVH-I).

Which Preinfarction Variables Are Able to Predict the Change on the Outcome Variables Mentioned Above?

Preinfarction variables were measured at the intake interview retrospectively: age, JAS, MQ, sleep quality, functional complaints. They were used as predictor variables to estimate the change in each of the outcome variables for RC. As a statistical measure for goodness of fit we calculated a multiple correlation coefficient (R) (table III). High preinfarction functional complaints predict a decrease of functional complaints during rehabilitation, as well as a decrease of well-being. The presence of CBP (high JAS score) predicts an increase of MPVH-W, a decrease of MPVH-I and of MPVH-SI. In other words, among the RC patients, type A persons have more chance of benefitting from RT in the sense that they improve in feelings of well-being, of invalidity and of social inhibition. Age has a moderately predictive value on STAI and MPVH-SI. The anxiety and social inhibition of older people decreases more in the RC than those of younger people.

The conclusion might be justified that the effects of relaxation on the MPVH scales well-being (W) and subjective invalidity (I) is predictable to a moderate degree by preinfarction variables. The presence of CBP as well as few functional complaints is favorable for a positive effect of RT on well-being in the rehabilitation period. Vital exhaustion and depression (MQ) has not any predictive value for *change* in outcome variables.

Table II. Changes of outcome variables (pre-post differences) for RC (n = 36) and CC (n = 33)

	RC		CC		Significance[1]	Cohen's discrimination measure (d)	
	$\overline{X}$	SD	$\overline{X}$	SD		RC	CC
Anxiety (STAI)							
State (S)	−2.3	8.6	−1.8	9.1	NS	−0.27	−0.20
Trait (T)	−1.0	6.3	−0.9	5.5	NS	−0.16	−0.16
Sleep quality	0.1	1.7	−0.8	2.1	NS	0.04	−0.38
Functional complaints	−0.1	5.2	−0.9	5.7	NS	−0.02	−0.16
MPVH Scales							
Well-being (W)	4.9	6.7	−0.3	9.6	$0.001 < p < 0.01$	0.73	−0.03
Subjective invalidity (I)	−3.0	5.2	−1.3	6.0	$0.02 < p < 0.05$	−0.58	−0.22
Displeasure (D)	−1.0	3.7	0.1	5.1	NS	−0.27	0.02
Social inhibition (SI)	−0.4	1.9	0.4	2.3	NS	−0.32	0.17

[1] Significance level: Mann-Whitney test (one-tailed).

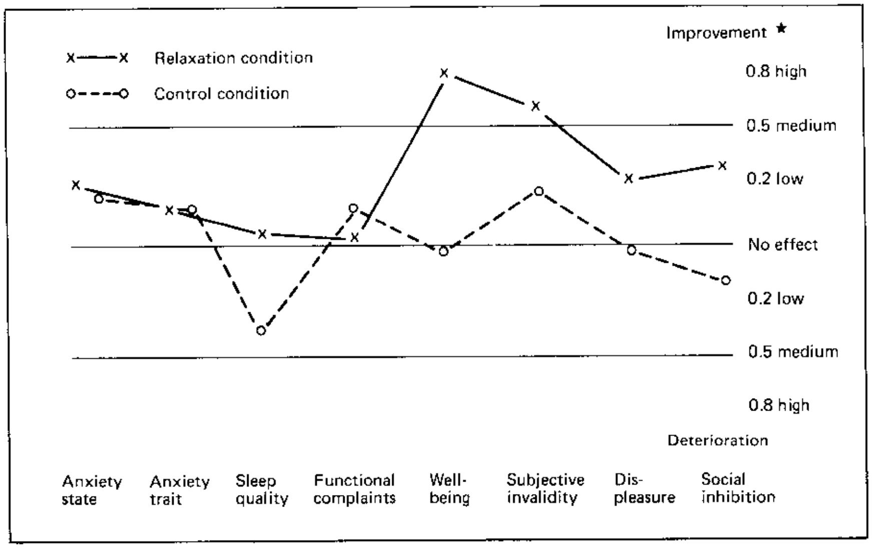

Fig. 2. Improvement in outcome variables, for the two conditions separately, as indicated by effect size (Cohen's d). * Corrected for positive or negative direction of scale: improvement is a decrease on a negative scale and an increase on a positive scale.

Table III. Improvement in outcome variable, predicted by preinfarction variables (RC, n = 36)

Positive change in outcome variable (pre-post difference)	Multiple R	R^2	Beta	Predictor variables
Anxiety (STAI)				
State (S)	0.28	0.08	+0.28	age
Trait (T)	–	–	–	–
Sleep quality	–	–	–	–
Functional complaints	0.34	0.11	+0.34	functional complaints
MPVH Scales				
Well-being (W)	0.41	0.17	−0.41	functional complaints
	0.48	0.22	+0.26	CBP (JAS)
Subjective invalidity (I)	0.25	0.06	+0.25	CBP (JAS)
Displeasure (D)	–	–	–	–
Social inhibition (SI)	0.29	0.09	+0.29	age
	0.39	0.15	+0.25	CBP (JAS)

Does the Use of RT Induce for Any Patients an Increase of (a) STAI and/or (b) Functional Complaints?

On average, differences do not show any negative effect of relaxation (table II). Comparing the measurements individually and taking an increase in STAI-S of more than 5 as cut-off point, a substantial number of persons, having become more anxious during rehabilitation, is found. The group is evenly distributed for the two conditions (RC, 9; CC, 10) and comprises about 28% of the total group. Using the same cut-off point for increase in functional complaints 8 persons meet this criterion. They report to have more complaints after rehabilitation. Of them, 7 are from RC. The difference in distribution does not reach statistical significance ($\chi^2 = 3.09$; d.f. = 1; NS). Hard conclusions are not allowed, but there is an indication that RT has a negative effect on functional complaints for some patients. 5 persons show an increase of both anxiety and functional complaints. This effect is rather isolated, as none of these persons has at the same time a substantial deterioration in MPVH-W and MPVH-I.

Discussion

The results justify the conclusion that the RT does have a positive and substantial contribution to the well-being in the majority of MI patients. There is no serious negative effect, although we do not pretend to have used psychological variables representing the full range of psychic functioning. We could not demonstrate a positive effect as a result of exercise training only. In other words – if it is a purpose of cardiac rehabilitation to enhance the psychological well-being, then the addition of a simple individual technique as RT is recommended.

It is interesting that coronary-prone behavior pattern has some (positive) predictive power as to relaxation effect. It would be expected that type A persons have trouble in relaxing and become easily aroused in situations of understimulation [13]. Possibly because of the post-MI experience, where physical rest and inactivity are necessary, they are more susceptible to learning relaxation. Moreover, the fact that type A persons have more chance to benefit from RT can also be seen as an indication that the techniques used fit the coronary personality.

There are three plausible interpretations for the increase for some persons in anxiety (state) and in functional complaints. First, this may reflect a real increase in fear and negative emotions, and an impairment of psychic functioning. The rehabilitation then would be threatening to these persons, making it more difficult to cope with the recent MI experience. For them, a more supportive type of intervention might be considered, or even no intervention at all. Second, more emotion and (negative) feelings might come up, but the person will function more adequately. He is more realistic and the increase of anxiety does not necessarily imply a negative prognosis (this may be called a 'negative therapeutic reaction' [15]. Some empirical support for this interpretation is given by the other variables: almost all pretraining variables differ negatively from the average, *except* the STAI-S score. In other words, these patients feel in the beginning worse than others, they have more anxiety trait, but less anxiety state. After training, the increased anxiety score corresponds better with the average, and with the other variables. Those do not become worse. Third, the increase of functional complaints may be a typical relaxation effect: the result of sensitization to bodily experiences. One learns to feel (more) and consequently one reports more sensations, both positive and negative. This may be a transitory phenomenon.

The study gives enough evidence to continue research: (1) In order to make sure that the findings are not due to chance, the number of patients studied has to be increased. (2) Follow-up measurements are necessary to discover any long-term effect and to combine these with the short-term effects. In this way, four main categories of relaxation effect can be differentiated (table IV). Group A consists of persons having a stable and positive effect. In group B are persons with a transient positive effect that disappears later on, or even may turn in a negative effect. Group C shows a delayed

Table IV. Distribution of effect in time

		Long-term effect	
		+	–
Short-term effect	+	A + +	B + –
	–	C – +	D – –

+ + = Stable positive; + – = transient; – + = delayed; – – = none or negative.

effect that does not yet become apparent in the short-term analysis. Finally, in group D we find those whose psychological condition persistently deteriorates. The contribution of RT may then be estimated by comparing the number of persons in each category for the RC, with the distribution among the patients who do not learn RT. (3) In order to find indications and contraindications for RT, an attempt should be made to use pretraining variables as predictors for the distribution across the four above-mentioned categories.

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