Exercise Testing to Enhance Wives’ Confidence in Their Husbands’ Cardiac Capability Soon After Clinically Uncomplicated Acute Myocardial Infarction

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The effects of wives’ involvement in their husbands’ performance of treadmill exercise testing 3 weeks after clinically uncomplicated acute myocardial infarction was compared in 10 wives who did not observe the test, 10 who observed the test, and 10 who observed and participated in the test themselves. In a counseling session after the treadmill test, couples were fully informed about the patient’s capacity to perform various physical activities. Wives’ final ratings of confidence (perceived efficacy) in their husbands’ physical and cardiac capability were significantly (p <0.05) higher in those who also performed the test than in the other 2 groups. Only wives who walked on the treadmill increased their ratings of their husbands’ physical and cardiac efficacy to a level equivalent to those of their husbands. Spouses’ and patients’ perceptions of patients’ cardiac capability after treadmill testing and counseling at 3 weeks were significantly correlated with peak treadmill heart rate and workload at 11 and 26 weeks. Efficacy ratings at 3 weeks were slightly better than peak 3-week treadmill heart rate and workload as predictors of treadmill performance at 11 and 26 weeks. Participation in treadmill testing early after acute myocardial infarction is an effective means for reassuring spouses about the capacity of their partners to resume their customary physical activities with safety.

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Patients’ perceptions of their cardiovascular status influence their recovery from acute myocardial infarction (AMI). In a prior study,1 patients’ perceptions of their physical capacity were highly correlated with their functional capacity, as measured by peak treadmill heart rate and workload measured 3 weeks after clinically uncomplicated AMI and with their level of physical activity within the following week. The potential of exercise testing early after AMI as an intervention to increase patients’ and spouses’ confidence in the patients’ capabilities has received little attention. The present study tested ways in which the exercise test could be used to raise and strengthen spousal perceptions of patients’ physical and cardiac capability. Having the spouses personally experience the treadmill test was expected to have the strongest impact on their perceptions of their husbands’ physical and cardiac capabilities.2 We hypothesized that both wives’ and patients’ perceptions of patients’ capabilities would predict the patients’ level of cardiovascular functioning on follow-up treadmill testing.

Methods

The degree of spousal involvement in the husband’s treadmill testing was varied by random assignment of couples to 1 of 3 groups. In group I the wife sat in the waiting room during her husband’s treadmill test. In group II the wife observed the husband’s stamina as he performed the treadmill test. In group III the wife not only observed her husband’s performance on the exercise test, but she herself also walked on the treadmill for 3 minutes at the same peak treadmill workload that had been achieved by her husband.

Patients: Thirty consecutive married men, mean age 52 ± 9 years, and their spouses participated in this study. As in previous studies from this laboratory, those eligible to undergo treadmill exercise testing 3 weeks after clinically uncomplicated AMI represent 60% of the entire population of men aged 70 years or younger who are alive 21 days after infarction.3,4 Only patients free of clinically evident heart failure and unstable angina pectoris and other noncardiac limitations to physical effort such as orthopedic and pulmonary disease were considered eligible for participation. These patients were mainly of middle or upper middle socioeconomic status.

Evaluation of confidence (perceived efficacy): On their first visit to the laboratory 3 weeks after AMI, patients and spouses completed 12 scales, each of which described different
levels of capability to engage in common activities or conditions that impose a stress on the heart. These included perceived capacity to tolerate physical stressors, i.e., walking, running, climbing stairs, lifting weights and engaging in sexual activity, and emotional stressors, i.e., anger arousal, bodily tension, social stress and family discord. An additional scale asked patients to rate their overall cardiac capability, i.e., their capacity to tolerate increases in heart rate to 90 to 110, 111 to 120, 121 to 130 and above 131 beats/min for durations ranging from 5 to 20 minutes. Patients were told what ranges of heart rate correspond to low, moderate and strenuous levels of physical activity, but they were not informed about the peak heart rate that they achieved during treadmill testing.

For each activity patients rated the strength of their confidence or efficacy on a 100-point scale divided into 10-unit intervals from very uncertain to completely certain. Perceived efficacy was quantified by averaging the summed confidence score for each of the tasks. The method used to calculate strength of perceived efficacy for walking is given in the Appendix. Both the husband and the wife completed the same self-efficacy scales 3 times during the clinic visit: before exercise testing, immediately after the completion of exercise testing and after a counseling session with the physician and nurse in which the results of the exercise test and their implications for physical activity were discussed in detail with the patient and spouse.

A principal-components analysis was conducted on both the husbands’ and wives’ efficacy scores to avoid redundant overlap of correlated measures. Two main factors were extracted: perceived physical efficacy, which measured the capacity to tolerate physical and emotional strain, and cardiac efficacy, which measured the capacity to withstand increasing levels of heart rate. The reliability of the self-efficacy scales for physical and cardiac self-efficacy was \( r = 0.94 \) and \( r = 0.85 \), respectively.

**Treadmill exercise testing:** Exercise was performed on a motor-driven treadmill using a combination of protocols described by Naughton et al. Exercise commenced at a workload equivalent to 3 multiples of resting energy expenditure (METs), and workloads were added every 3 minutes until the appearance of limiting symptoms: chest pain, dyspnea, fatigue, leg cramps or dizziness; hypotension, i.e., a reduction in systolic pressure of at least 10 mm Hg from the peak value attained earlier during exercise; or ventricular tachycardia, i.e., 3 or more consecutive premature ventricular complexes. Neither attainment of an age-predicted maximal heart rate nor the magnitude of ischemic ST-segment depression were used as endpoints for testing. The test response was defined as “ischemic” when 0.1 mV or more of flat or downsloping ST-segment depression occurred during exercise or 10 minutes of recovery. Exercise testing was repeated 11 and 26 weeks after infarction.

**Counseling of patients and their wives:** After treadmill testing, couples met with a cardiologist for an explanation of the results of the test and a discussion of the patient’s capacity to perform various physical activities such as walking, jogging and stationary cycling. The couple then met with the project nurse who informed patients of the physical regimen to which they had been randomly assigned before the clinic visit as part of another study. Nine patients commenced home exercise training, 13 commenced group exercise training and 8 received no specific instruction regarding exercise training. The proportion of patients assigned to each of these 3 groups was comparable for patients randomized to the 3 conditions of the present study. Patients undergoing group or home training were given an individualized prescription for physical activity consisting of 100 minutes/week of brisk walking, jogging or stationary cycling at a heart rate of 70 to 85% of the peak heart rate achieved during the 3-week exercise test. Patients who were given no formal prescription for physical activity were, like the other 2 groups, advised about the kinds of physical activity that they could safely undertake based on the results of the treadmill exercise test. Neither the cardiologist nor the nurse had access to patients’ or spouses’ efficacy ratings.

**Results**

**Husbands’ treadmill test performance:** The peak treadmill workloads achieved by patients at 3, 11 and 26 weeks after infarction were 6.2 ± 1.7, 7.7 ± 1.6 and 8.0 ± 1.8 METs, respectively. The groups did not differ significantly in this regard. The corresponding peak heart rates were 137 ± 19, 150 ± 20 and 155 ± 20 beats/min, without significant intergroup differences. The increase in peak workload and heart rate between 3 and 11 weeks was significant (t = 2.7, p < 0.008 and t = 4.5, p < 0.0001, respectively); no further significant increase in peak heart rate or workload occurred between 11 and 26 weeks. Overall, one-third of the patients demonstrated treadmill-induced ischemic ST-segment depression or angina pectoris, or both without significant differences among groups in the frequency of these ischemic abnormalities. None of the 30 patients experienced reinfarction or death during the study.

**Changes in perceived physical and cardiac efficacy:** Self-efficacy scores for patients and spouses before treadmill testing did not differ significantly between groups (Fig. 1). Patients exhibited a highly significant increase in the perception of their cardiac capability after treadmill testing and counseling \( (F = 7.5, p < 0.001) \). Their perceived cardiac efficacy increased significantly after the treadmill test experience.
walked on the treadmill than in those who did not (F =
self-efficacy were significantly greater in wives who
respectively) (Fig. 1). The overall congruence between
conception of their husbands' capabilities occurred (Fig.
1). In contrast, wives who not only watched their hus-
bands' treadmill performance, but also performed at the
same level themselves substantially increased their
judgments of their husbands' physical and cardiac ef-
capabilities were highly discrepant—husbands judged themselves moderately
robust, whereas wives judged their husbands' cardiac
capability as severely diminished and incapable of
withstanding physical and emotional strain. Spouses
who were either uninvolved in, or merely observers of,
the treadmill test did not significantly change their
considerable doubts about their husbands' physical and
cardiac capabilities. Wives who merely observed their
husbands' treadmill tests may have focused more on
symptoms and signs than on their spouses' attainment
of relatively high workloads. Selective attention to their
husbands' symptoms would reduce the wives' benefit
about their husbands' capacity for physical
effort.

Among wives who did not actually participate in
treadmill walking, no significant increase in the per-
ception of their husbands' capabilities occurred (Fig.
1). In contrast, wives who personally experienced the
strenuousness of the effort expended by their husbands
on the treadmill registered a sharp overall increase in
their perceptions of their husbands' cardiac and physical
efficacy (F = 6.99, p < 0.004 and F = 5.49, p < 0.01,
respectively) (Fig. 1). The overall congruence between
husbands' and wives' ratings of physical and cardiac
self-efficacy were significantly greater in wives who
walked on the treadmill than in those who did not (F =
3.91, p < 0.05 and F = 3.08, p < 0.02).

Relation between perceived efficacy and tread-
mill test performance: Patients' perceptions of their
capabilities predicted their treadmill performance: the
higher they perceived their physical efficacy to be before
testing, the higher was their peak treadmill workload
(r = 0.31, p < 0.05) and heart rate (r = 0.40, p < 0.025).
The more robust they judged their hearts to be, the
higher the peak heart rate they achieved on the tread-
mill (r = 0.46, p < 0.01).

Changes in self-efficacy after treadmill testing re-
lected the treadmill test performance: Attainment of high
treadmill workload was accompanied by high
ratings of cardiac and physical efficacy (r = 0.40, p < 0.02
and r = 0.46, p < 0.01, respectively). Similarly, high peak
treadmill heart rates were associated with high per-
ceived cardiac and physical efficacy (r = 0.43, p < 0.02
and r = 0.42, p < 0.02, respectively).

Relation between perceived efficacy and later
treadmill test performance: The measures of per-
ceived efficacy obtained after treadmill testing and
medical counseling at 3 weeks were correlated with peak
treadmill heart rate and workload at 11 and 26 weeks
(Table I). Patients' perceptions of their physical effi-
cacy at 3 weeks bore some relation to their subsequent
treadmill performance. Although peak treadmill heart
rate and workload at 3 weeks were also predictive of
later treadmill performance, the combined perception of
patients and their wives concerning the patients' car-
diac capabilities proved to be the most consistent
predictor of patients' cardiovascular functioning,
whether measured in terms of maximal workload or
heart rate at 11 or 26 weeks.

Discussion

Psychologic recovery from heart attack is a social
rather than a strictly individual matter. Wives' notions
about their husbands' physical capabilities can assist
or impede the recovery process. Medically unwarranted
concerns may impede patients' functional recovery from
AMI even in clinically low risk subsets in whom the
potential for functional recovery is greatest.

The present study underscores the value of treadmill
testing and counseling early after AMI in reassuring
clinically low risk patients and their spouses about
the capacity of patients to resume their customary
activities.

Before exercise testing and counseling the percep-
tions of wives and their husbands concerning the hus-
bands' physical and cardiac capabilities were highly
discrepant—husbands judged themselves moderately
robust, whereas wives judged their husbands' cardiac
capability as severely diminished and incapable of
withstanding physical and emotional strain. Spouses
who were either uninvolved in, or merely observers of,
the treadmill test did not significantly change their
considerable doubts about their husbands' physical and
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husbands' treadmill tests may have focused more on
symptoms and signs than on their spouses' attainment
of relatively high workloads. Selective attention to their
husbands' symptoms would reduce the wives' benefit
of observing the test.

In contrast, wives who not only watched their hus-
bands' treadmill performance, but also performed at
the same level themselves substantially increased their
judgments of their husbands' physical and cardiac ef-
cicacy. This underscores the power of direct participa-

| TABLE I | Treadmill Test Performance and Perceived Efficacy at Three Weeks as Predictors of Later Treadmill Performance: Pearson Product-Moment Correlations |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Treadmill Test at 3 Weeks | Physical | Cardiac | 11-Week Treadmill | 26-Week Treadmill | 11-Week Treadmill | 26-Week Treadmill |
| Peak METs | Peak HR | Patient | Spouse | Combined | Patient | Spouse | Combined | Patient | Spouse | Combined |
| Max METs | 0.44 | 0.29 | 0.36* | 0.29 | 0.37* | 0.40† | 0.43‡ | 0.48‡ |
| Max HR | 0.31 | 0.35* | 0.15 | 0.13 | 0.17 | 0.35* | 0.42† | 0.45‡ |
| Max METs | 0.48† | 0.40† | 0.29 | 0.23 | 0.30 | 0.24 | 0.46‡ | 0.39‡ |
| Max HR | 0.45‡ | 0.55‡ | 0.45‡ | 0.31 | 0.44‡ | 0.66‡ | 0.49‡ | 0.67‡ |

* p < 0.05; † p < 0.025; ‡ p < 0.01; ‡ p < 0.001.

HR = heart rate.
tion in altering wives' perceptions of their husbands' capabilities.

Direct participation in treadmill walking may also have influenced wives' responses to the counseling that followed treadmill testing, for these wives demonstrated a greater increase in efficacy after counseling than those of the other 2 groups. The counseling session afforded an opportunity to generalize the implications of the treadmill test performance to activities and conditions quite different from treadmill exercise. If the treadmill test is interpreted as an isolated task, its impact on perceived cardiac and physical efficacy may be limited. However, if the test is interpreted in a counseling session as a generic indicator of patients' capacity to resume a broad range of customary activities, patients are likely to resume these activities and spouses are more likely to support this.

The present study extends previous findings that self-efficacy is an important factor in recovery from AMI.1 In the study of Ewart et al., patients' ratings of self-efficacy 3 weeks after infarction were more predictive of directly measured physical activity in the week after the treadmill test than were peak treadmill heart rate and workload at 3 weeks. In the present study, joint perceived cardiac efficacy of patients and their spouses predicted later maximal treadmill heart rate and workload even when treadmill performance at 3 weeks was taken into account. The relative superiority of perceived cardiac efficacy over perceived physical efficacy as a predictor of the level of cardiac functioning on follow-up treadmill tests is of interest.

Acknowledgment: We gratefully acknowledge the assistance of Lynda Fisher in exercise testing, Helena C. Kraemer and David Ahn in statistical analysis and Dorothy Potter in manuscript preparation.

Appendix

Herein is an example of the method used to calculate strength of self-efficacy: A patient's confidence or self-efficacy in his ability to tolerate a given activity or condition is rated on the horizontal 10-point scale from 10% (quite uncertain) to 100% (quite certain) (Table II). The mean strength of self-efficacy for walking before treadmill testing is 79%. This is obtained by dividing the total score of 630 by 8, the number of levels for this activity. In this example, the self-efficacy for walking increased from 79 to 93% after treadmill testing and to 99% after counseling, an overall change of 25%.

The overall strength of physical self-efficacy for this patient was obtained by averaging the mean scores for walking with 8 remaining activities or conditions, i.e., running, stair climbing, weight lifting, sexual activity, anger arousal, body tension, social stress and family discord.

References


<table>
<thead>
<tr>
<th>TABLE II</th>
<th>Rating of Perceived Efficacy</th>
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<tbody>
<tr>
<td>10%</td>
<td>20%</td>
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<tr>
<td>Quite Uncertain</td>
<td>Moderately Certain</td>
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<table>
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<tr>
<th>Walking</th>
<th>1 Block in 5 min.</th>
<th>2 Blocks in 10 min.</th>
<th>3 Blocks in 15 min.</th>
<th>4 Blocks in 20 min.</th>
<th>5 Blocks in 25 min.</th>
<th>1 Mile in 30 min.</th>
<th>2 Miles in 60 min.</th>
<th>3 Miles in 90 min.</th>
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<tbody>
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<td>Pre-TM</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>80</td>
<td>80</td>
<td>70</td>
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<td>50</td>
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<tr>
<td>Post-TM</td>
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<td>90</td>
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<tr>
<td>Post-C</td>
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<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>90</td>
</tr>
</tbody>
</table>

Strength of efficacy—total score: 630
Strength of efficacy—mean score: 79

C = counseling; TM = treadmill.