The Effect of Exercise Training on Heart Rate during Coitus in the Post Myocardial Infarction Patient

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SUMMARY The effect of interval exercise training on the peak coital heart rate in post myocardial infarction patients was studied. Sixteen men (ages 46-54) underwent a 16-week bicycle ergometer training program 12 to 15 weeks following their first myocardial infarction. Portable ECG tape recorders were used to record the ECG during coitus twice before and twice after the training program. The maximum minute oxygen consumption (VO2max) was measured in each subject during bicycle ergometer ECG examinations before and after the training program. A control group of six post myocardial infarction patients who were not trained was evaluated in the same manner.

The exercise-trained group had an average increase in VO2max of 11.5% (2.7 to 3.9 L/min) and an average decrease in peak coital heart rate of 5.5% (127/min to 120/min). The control group demonstrated a 2% increase in VO2max and no significant change in peak coital heart rate.

The increase in aerobic capacity (VO2max) and the consequent reduction in peak coital heart rate in our trained group suggests the potential value of exercise training in improving sexual function in the patient with angina during coitus.

SEXUAL DYSFUNCTION following a myocardial infarction is a commonly noted phenomenon.\(^1\) The basis of this dysfunction is frequently the patient’s fear that the stress of coitus will precipitate a myocardial infarction.\(^2\)

For the majority of patients whose exercise capacity safely exceeds the demands of coitus, these concerns are not physiologically sound. Hellerstein and Friedman have found that the peak coital heart rate among middle-aged married men ranged from 101 to 121 beats per minute. The mean peak coital heart rate was 117 beats per minute. In fact, their subjects’ maximal occupational heart rate frequently exceeded the peak coital heart rate.\(^3\)

For those patients whose exercise capacity safely exceeds the demands of coitus, explicit sexual counseling has been shown to be effective in encouraging the resumption of preinfarction sexual patterns. This author has reported the value of having the spouse observe the patient’s multistage exercise ECG examination and thus receive a tangible demonstration of the patient’s exercise capacity.\(^4\)

For a segment of the population of post myocardial infarction men, sexual dysfunction is not solely psychogenic, but is based on a limited tolerance which is exceeded during coitus. Such individuals may suffer coital or post-coital angina, arrhythmias, or exceptional fatigue. Pre-coital nitrates frequently allow asymptomatic coitus in these patients and are the treatment of choice at present.

Exercise training has become a commonly employed component in the treatment of the post myocardial infarction patient. The rationale for this therapy is the improvement in cardiac efficiency and the ability to perform specific work tasks at reduced heart rate–blood pressure products and cardiac oxygen requirements. In the Hellerstein and Friedman study, two-thirds of the trained subjects reported fewer symptoms during sexual activity after training as compared to before training.\(^5\) The subject of this study is the physiological basis of exercise training as a specific form of therapy for sexual dysfunction in the post myocardial infarction patient.

Method

Patient Selection

Twenty-two men ages 46 to 54 were evaluated 12 to 15 weeks following an initial myocardial infarction. The subjects had no complaints of post infarction angina, were on no drug therapy, and were all sexually active with the same marital partners for more than seven years. None of the subjects had clinical manifestations of congestive heart failure. Each of the subjects had resumed sexual relations six to ten weeks prior to beginning the study protocol.

Coital ECG Recording

Each subject and his spouse received a comprehensive
Explanation of the Holter ECG recording device that the male was to wear during intercourse. A sample tape of an ECG recorded during coitus was played on the Avionic Cardioscanner (utilized in the study) for each couple. The leads were positioned on the lateral aspect of the thorax at the Medical Center, and the subject was asked to plug the lead wire into the recorder at least 30 min prior to coitus. Couples were instructed not to alter their usual positions or patterns of sexual intercourse.

Two pre-training recordings were obtained 5 to 12 days apart. An initial recording was not included in the experimental measurements, as it may have reflected, in part, acclimation to the recording device.

The tapes provided two channels of ECG record and were analyzed on an Avionic Dynamic Electrocardioscanner. A trend recording of heart rate versus time was provided by the Cardioscanner and this was used to identify the moment of peak coital heart rate. An example of such a recording is seen in figure 1. Peak coital heart rates were measured from a real time playback of the ECG during coitus, and were determined from the ten shortest R-R intervals.

Determination of Maximum Aerobic Capacity

Each subject underwent a multistage exercise ECG exam utilizing a calibrated bicycle ergometer (Schwinn). Increments in work load of 300 kilopond meters per minute (KPM) for four minutes duration were utilized, and expired air was collected in a Douglas bag for the last (fourth) minute of each workload. When the subject's heart rate reached 85% of his age predicted maximum, consecutive minute samples were collected and the minute oxygen consumption (VO$_2$) was calculated. The subjects exercised to near exhaustion, and the VO$_2$ obtained during the last minute of exercise was considered the maximum minute oxygen consumption (VO$_2$max).

Training Protocol

Sixteen subjects comprised the study group, which undertook a 16 week bicycle ergometer interval training program. The six remaining subjects comprised the control group, which did not undergo exercise training, but were evaluated in a manner identical to the study group before and after a 16 week control period. The subjects were randomly assigned to the study and control groups. Both groups were of comparable ages.

Training was performed on a calibrated bicycle ergometer and was supervised at the Downstate Medical Center Cardiac Exercise Laboratory. Each subject trained for three sessions a week, each session lasting approximately 40 minutes. Following a two minute warm-up interval at 150 KPM, each subject pedalled for four minutes at a workload sufficient to achieve a heart rate equal to 75% of the age-predicted maximum. Heart rates were obtained by the use of an analog rate meter monitoring a single chest lead. Each work interval was followed by a rest interval of 3 minutes. Each session was composed of four work interval-rest interval sets, and a 2 minute warm-up interval. Pedalling frequency was maintained at 60–70 RPM. The workloads were adjusted at each session so as to assure the desired heart rate response.

![Figure 1. Representative recording of a coital heart rate trend write-out.](image_url)

At the completion of 16 weeks of training (or the 16 week control period) coital heart rate recordings were again obtained in duplicate, and the VO$_2$max was measured during a bicycle ergometer multistage exercise ECG exam, as was performed prior to training. Data were analyzed statistically by paired analysis.

Results

Aerobic Capacity (VO$_2$max)

The trained study group demonstrated an increase in measured VO$_2$max to a mean value of 11.5% (range: 8%–16%). The mean pre-training VO$_2$max was 2.70 L/min and after training a mean value of 3.06 L/min was obtained. (Data was significant at $P < 0.01$.) The control group had an average VO$_2$max of 2.68 L/min and demonstrated a mean increase in VO$_2$max of 2% (range: −1 to 3.5%). This was not significant. These data are graphically represented in figure 2.

Coital Heart Rates

Correlations of the ten beat average peak rate measured from the duplicate recording pre and post training were excellent, with a standard deviation of 2.6 beats/min. In the exercise-trained group the peak coital heart rates declined an average of 5.5%. All 16 trained patients showed a significant decline in the measured peak coital heart rate, ranging from 4–7.5% ($P < 0.01$). The mean peak coital heart rate before training was 127 beats/min (range: 120–130) and after training a mean rate of 120/min (range: 115–122) was obtained. There was no significant change in the average peak coital heart rate in the untrained control group from a

![Figure 2. This graph demonstrates the increase in the mean VO$_2$max consequent to a 16 week interval exercise training in 16 males post infarction. A significant increase ($P < 0.01$) is noted.](image_url)
mean value of 128 beats/min. This data is graphically displayed in figure 3.

Figure 4 is a plot of peak coital heart rate vs aerobic capacity (VO$_{2\text{max}}$). It demonstrates clearly the relationship of improved cardiorespiratory fitness consequent to exercise training, and the reduction in peak heart rate achieved during coitus.

**Discussion**

Numerous studies have demonstrated an increase in maximum oxygen consumption and a decrease in the heart rate-blood pressure product at specific workloads after exercise training. This reduction in the double product at given workloads reflects a decrease in the myocardial oxygen requirement for the specific workload, and is a major rationale for post myocardial infarction exercise training. Clinical studies have shown this to be true for a variety of steady-state isotonic exercise loads. The response of coital heart rate, however, could not be predicted with certainty because coitus requires isotonic and isometric work, and also the heart rate may reflect additional factors.

The data from this study demonstrates that the peak coital heart rate, and by implication, coital myocardial oxygen requirements, will decline as the post myocardial infarction patient attains improved levels of fitness consequent to interval exercise training.

In the patient limited during coitus by anginal pain or other manifestations of ischemia, such a decrease in peak coital heart rate may be associated with a decrease in symptoms and a consequent improvement in sexual function.

**References**

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