# Tai Chi Chuan improves functional capacity after myocardial infarction: A randomized clinical trial

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**Background** Patients with a recent myocardial infarction (MI) present a reduction in functional capacity expressed as a decrease in peak oxygen consumption ($V_{O_2}$ peak). The impact of a Tai Chi Chuan (TCC) cardiac rehabilitation program for patients recovering from recent MI has yet to be assessed. Our goal is to evaluate functional capacity after a TCC-based cardiac rehabilitation program in patients with recent MI.

**Methods** A single-blind randomized clinical trial was conducted. The researchers who performed the tests were blinded to group allocation. Between the 14th and 21st days after hospital discharge, all patients performed a cardiopulmonary exercise testing and a laboratory blood workup. Mean age was similar (56 ± 9 years in the TCC group and 60 ± 9 years in the control group). Patients allocated to the intervention group performed 3 weekly sessions of TCC Beijin style for 12 weeks (n = 31). The control group participated in 3 weekly sessions of full-body stretching exercises (n = 30).

**Results** After the 12-week study period, participants in the TCC group experienced a significant 14% increase in $V_{O_2}$ peak from baseline (21.6 ± 5.2 to 24.6 ± 5.2 mL/kg per minute), whereas control participants had a nonsignificant 5% decline in $V_{O_2}$ peak (20.4 ± 5.1 to 19.4 ± 4.4 mL/kg per minute). There was a significant difference between the 2 groups ($P < .0001$).

**Conclusions** Tai Chi Chuan practice was associated with an increase in $V_{O_2}$ peak in patients with a recent MI and may constitute an effective form of cardiac rehabilitation in this patient population. (Am Heart J 2015;0:1-7.)

Most patients with a recent history of myocardial infarction (MI) experience a reduction in functional capacity, as expressed by a reduction in peak oxygen consumption ($V_{O_2}$ peak).[1] The aim of physical exercise–based cardiac rehabilitation in patients with coronary artery disease is to increase functional capacity and therefore $V_{O_2}$ peak.[2,3] Tai Chi Chuan (TCC) is a mind-body intervention that is similar to aerobic exercise in several aspects.[4,5] Tai Chi Chuan has origins in ancient Chinese martial arts and combines low- to moderate-intensity physical activity with elements of meditation, body awareness, and breathing.[4] Classical TCC consists of a variety of complex stances, and a typical session lasts 20 to 30 minutes.[6] Some review articles have described TCC as a therapy with potential to exert positive impacts on cardiorespiratory fitness in different scenarios.[7-10] However, previous studies presented limitations such as inconsistency in design and heterogeneity in interventions and outcomes of interest.[10] Only 1 published study, conducted in 1996, assessed the effects of TCC as compared with aerobic exercise in patients recovering from a recent MI. In this experiment, the authors found that TCC was associated with improvements in blood pressure (BP) and heart rate (HR) levels.[11]

After an MI, different strategies including exercise-based cardiac rehabilitation are recommended. In this setting, a gain in functional capacity is a beneficial prognostic marker, and there is a solid evidence for its effects also on disease outcomes.[12,13] However, it is not known if TCC could be a feasible cardiac rehabilitation approach for post-MI individuals because the scientific basis for this intervention is limited.[14,15]

To address a research gap, the goal of the present study was to assess functional capacity in patients with an uncomplicated recent MI after a 12-week period of TCC-based cardiac rehabilitation.

## Methods

### Study design

We conducted a single-blind randomized clinical trial (RCT) in patients with recent history of MI. The patients'

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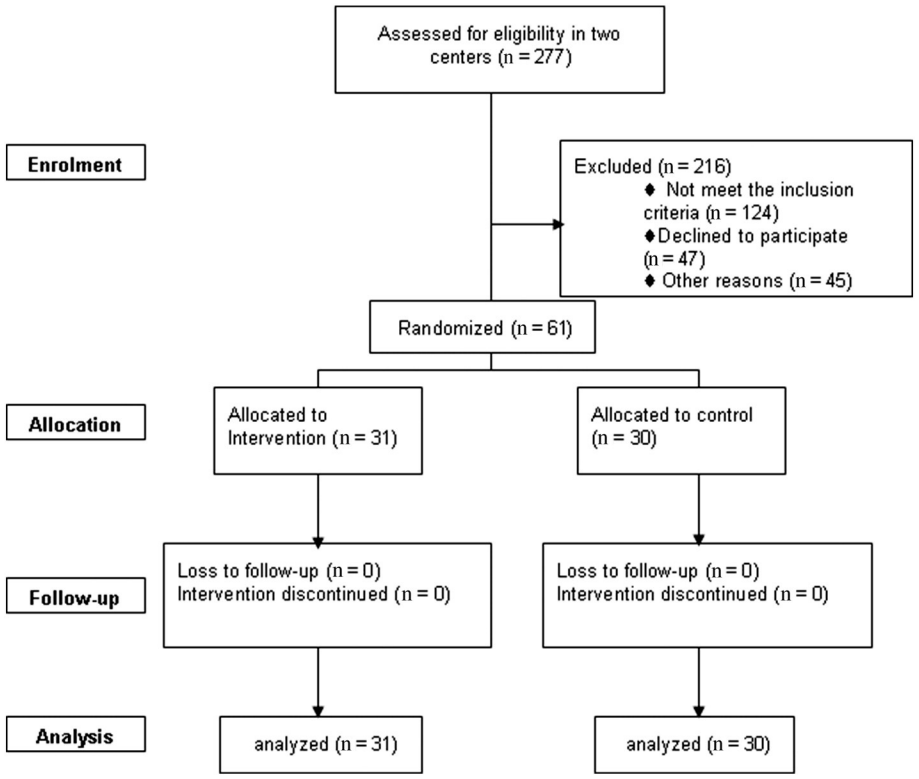
**Figure**




Study flow diagram.

flow diagram describing inclusion, allocation, and follow-up is in accordance to CONSORT (Consolidated Standards for Reporting of Trials) flow diagram and is provided in Figure.

## Study sample and settings

Patients were recruited during their hospitalization at 2 university-affiliated teaching hospitals in southern Brazil. Selected participants were randomly allocated to one of the study groups (intervention or control) and followed up over a 3-month period.

The study sample comprised subjects between the ages of 40 and 80 years with a recent MI, which was defined as a rise in cardiac biomarker values (troponin above the 99th percentile) with at least 1 of the following: new-onset symptoms or electrocardiographic changes indicative of ischemia, new-onset ST-segment T wave changes, new left bundle branch block, development of pathologic Q waves, imaging evidence of loss of viable myocardium or regional wall motion abnormalities, or identification of an intracoronary thrombus on angiography.[14]

Ninety percent of the patients were treated with intracoronary stenting before entry in this RCT. All procedures as well as drugs prescription were under responsibility of patient's physicians. All subjects were assessed 14 to 21 days after hospital discharge. The additional inclusion criteria were availability to attend sessions at the Hospital de Clinicas de Porto Alegre at least 3 times a week over a 12-week period and physical aptitude to take part in a TCC-based cardiac rehabilitation program.

The exclusion criteria were presence of unstable angina, detectable myocardial ischemia (at rest or on exertion), inadequate BP response during exercise, severe symptomatic congestive heart failure, severe pulmonary disease, difficulty or inability to walk, other incapacitating disabilities precluding physical activity, participation in other clinical trials, and unwillingness to take part in the study.

## Study groups and procedures

Participants were randomly allocated to the TCC group or the control group. Over 12 consecutive weeks, the intervention group took part in 3 weekly 60-minute sessions of TCC exercise. We use a standard protocol (Table I), under the guidance of a master TCC and the collaboration of physical education teachers trained in the technique by the Chinese Cultural Center–Martial Arts School of Porto Alegre. Exercises were gentle to moderate in intensity and consisted of a series of slow, combined, sustained movements, weight shifting, and upper-body and lower-

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