

混合式太极心脏康复方案对冠心病患者压力知觉和氧化应激的影响： 一项随机对照试验

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摘要：背景：运动康复对冠心病患者预后起着至关重要的作用。太极拳作为一种基于运动的身心锻炼，可以缓解疼痛症状，提高生活质量，并降低老年人心血管风险。然而，太极拳改善冠心病患者心理压力和细胞应激水平的潜在益处尚缺少随机对照试验研究。因此，本研究采用 12 周的混合式运动康复方案，探讨不同运动干预形式对稳定性冠心病患者(chronic coronary syndrome, CCS)压力知觉(Chinese Perceived Stress Scale, CPSS)和氧化应激(Oxidative Stress)的影响，用以评估太极康复方案对 CCS 患者身心健康促进的有效性。**目的：**本研究评估了混合式太极心脏康复方案对稳定性冠心病患者压力知觉和氧化应激的疗效。**方法：**采用随机对照试验设计。实验组进行太极心脏康复方案(Tai Chi cardiac rehabilitation program, TCCRP)，对照组进行常规有氧运动康复方案(conventional exercise cardiac rehabilitation programs, CECRP)。干预周期为 12 周，包括 4 周线下院内康复和 8 周线上视频康复。主要结局指标为压力知觉评分(Chinese Perceived Stress Scale, CPSS)，完成了前测(T0)、4 周(T1)、12 周(T2)三次测量。次要结局指标为抗氧化酶 CAT、GSH-Px 以及应激产物 ox-LDL 在前测(T0)和 12 周(T2)进行两次测量。**结果：**本研究共纳入 46 名 CCS 患者，最终完成整个试验的患者为 34 例。实验组 14 例，对照组 20 例。两因素重复测量方差分析显示有明显的交互作用($F_{\text{time} \times \text{group}} = 14.435$, $P < 0.001$)。重复测量方差分析进一步显示，T0、T1 时，实验组的 SPSS 得分与对照组之间差异无统计学意义($P > 0.05$)。T3 时实验组的 SPSS 得分比对照组显著降低($MD = -7.71$, $95\%CI [-10.750, -4.678]$, $P < 0.001$)。组内比较，实验组干预前后抗氧化酶系统(GSH-Px、CAT 活性)均有非常显著性提高($P < 0.01$)，ox-LDL 差异无统计学意义($P > 0.05$)。组间比较，

CAT 浓度变化值实验组显著高于对照组，差异有统计学意义 ($P<0.05$)；GSH-Px，ox-LDL 浓度变化值实验组与对照组均无显著性差异 ($P>0.05$)。两组相关性分析显示，实验组 CPSS 得分变化值与 GSH-Px 浓度变化值呈显著性中度负相关 ($r=-0.585$, $p<0.05$)，与 ox-LDL 浓度变化值呈显著性中度正相关 ($r=0.569$, $p<0.05$)。而对照组相关性没有统计学意义 ($r=-0.148$, $P>0.05$)。综上，实验组对患者压力知觉指数的降低效果更好，且与 ox-LDL 的下降、CAT 的上升显著相关。**结论：**12 周的混合式太极心脏康复方案有助于调节冠心病患者的心理压力和情绪，并降低细胞应激水平。该方案可能通过降低脂代谢应激产物损伤和提高抗氧化酶活性来缓解患者的心理压力知觉。建议推广综合性太极拳运动方案，为社区老年冠心病患者提供更多的运动康复形式。

关键词：太极拳；运动康复；稳定性冠心病；压力知觉；氧化应激

Evaluating the Effectiveness of a Hybrid Tai Chi Cardiac Rehabilitation Program for Psychological Stress Reduction and Oxidative Stress in Patients with Chronic Coronary Syndrome: A Randomized Controlled Trial

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Abstract: Background: Preliminary evidence suggests that Tai Chi may effectively relieve pain symptoms, increase quality of life, and reduce cardiovascular risk in patients with chronic coronary syndrome (CCS). However, few randomized controlled trials have specifically investigated the potential benefits of Tai Chi in patients with CCS, particularly regarding its effects on psychological stress and cellular stress levels. **Objective:** To evaluate the effectiveness of a hybrid Tai Chi cardiac rehabilitation program in reducing perceived stress and oxidative stress in diagnosed patients. **Methods:** Forty-six patients with CCS were randomly assigned to 12 weeks of either a Tai Chi cardiac rehabilitation program (TCCRP, $n=23$) or a conventional exercise cardiac rehabilitation program (CECRP, $n=23$) (3 sessions per week). All participants continued their routine drug treatments daily. The main outcome measure was the

Chinese Perceived Stress Scale (CPSS). The secondary outcome measures included the antioxidant enzymes catalase (CAT) and glutathione peroxidase (GSH-Px) and the stress marker oxidized low-density lipoprotein (ox-LDL). The data were analyzed by 2-way mixed analysis of variance with post hoc Bonferroni adjustment and paired t tests. **Results:** The group-by-time interaction effect on CPSS was significantly different (MD=-7.71, 95% CI [-10.750, -4.678], $P<.001$). Within the TCCRP group, the CPSS score significantly decreased ($P<.05$) from baseline to the end of the intervention. Notably, in the CECRP group, the CPSS score increased ($P<.05$) at the end of the intervention. The CAT and GSH-Px levels increased markedly in the TCCRP group after the intervention ($P<.001$). Spearman's correlation analysis revealed that CPSS was positively correlated with ox-LDL ($r=0.569$, $p<0.05$) and negatively correlated with GSH-Px ($r=-0.585$, $p<0.05$). The correlation in the control group was not statistically significant ($r=-0.148$, $P>0.05$). **Conclusions:** A 12-week hybrid Tai Chi cardiac rehabilitation program has been shown to help regulate psychological stress and emotions and reduce cellular stress levels in patients with coronary heart disease. This program may alleviate patients' perception of psychological stress by reducing the damage caused by lipid metabolism stress products and increasing antioxidant enzyme activity. The promotion of comprehensive Tai Chi exercise programs to offer a variety of exercise rehabilitation options for elderly patients with coronary heart disease in the community is recommended.

Keywords: Tai Chi; Exercise Rehabilitation; Chronic Coronary Syndrome; Perceived Stress; Oxidative Stress

