

# 太极拳“虚灵顶劲”前、中、后 HRV 的变化特征

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**摘要:** “虚灵顶劲”是太极拳练习中十分重要的动作要领; 其注重外在头部、躯干的姿势, 内在意识、神经的集中, 以呼吸运气连接内外形成一个整体, 从而达到“清气上升、浊气下沉、中气十足、天人合一”的修炼状态。太极拳练习讲究形、气、意三个层次, 但是如何用意、练意始终无法得到科学客观的阐释, “意”从生理学的角度来讲就是大脑皮质的兴奋状态, 以及与整个机体的协调统一。“虚灵顶劲”通过刺激大脑皮质, 能够很好的激活神经系统功能, 从而改善人体机能, 但是如何客观论证太极拳“虚灵顶劲”对神经系统具有良好的刺激效果是本研究的核心问题。**目的:** 探究太极拳“虚灵顶劲”前、中、后 HRV 的变化特征, 确定青年练习者在静息、虚灵顶劲及恢复状态下的心率和自主神经变化, 并探讨太极拳对人体机能的锻炼价值。**方法:** 选取 25 名在校大学生作为被试, 测试、分析其在太极拳“虚灵顶劲”前、中、后心率、HRV 的时域、频域和非线性指标。**结果:** 1) 受试者在做“虚灵顶劲”时心率显著升高, 运动后又显著降低。受试者在“虚灵顶劲”前、中、后其 HRV 时域指标 NN50、pNN50 在运动中显著减小, 运动后又显著增加; RMSSD 在运动中降低, 运动后升高; SDNN 的变化相反, 在运动中升高, 运动后降低。2) 频域指标 VLF 在运动中升高, 运动后降低; LF、TP 在运动中显著增加, 运动后显著降低; LF/HF 在运动中升高, 运动后降低; HF 的变化相反, 在运动中显著降低, 运动后显著上升。3) 非线性指标 SD1 在运动中降低, 运动后升高; SD2 在运动中升高, 运动后降低; SD2/SD1 在运动中升高, 运动后降低; 但非线性指标 SD1、SD2、SD2/SD1 都无显著性变化。**结论:** 一次急性 5 分钟的太极拳“虚灵顶劲”练习可以有效刺激自主神经, 提高受试者神经系统的自主调节能力, 从而改善人体机能。在练习过程中, 受试者 HRV 减小, 运动后又逐渐恢复, 其中心交感神经活动在运动中加强, 副交感神经活动在运动中减弱, 运动后两者均有所恢复, 趋于平衡。

**关键词:** 太极拳; 虚灵顶劲; HRV; 自主神经;

The Change of HRV before, during and after Tai Chi-XuLingDingJin

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**Abstract:** XuLingDingJin (XLDJ) is a very important movement key in Tai Chi practice; It pays attention to the posture of the external head and trunk, the concentration of internal consciousness and nerves, and connects the inside and outside with breathing luck to form a whole, so as to achieve the cultivation state of "rising clear Qi, sinking turbid Qi, full middle Qi and unity of heaven and man". Tai Chi practice pays attention to the three levels of Xin, Qi and Yi, but how to use Yi and practice Yi can not be scientifically and objectively explained. From a physiological point of view, Yi is the excited state of the cerebral cortex and the coordination and unity with the whole body. XLDJ can well activate the function of the nervous system by stimulating the cerebral cortex, so as to improve human function. However, how to objectively demonstrate that XLDJ of Tai Chi has a good stimulating effect on the nervous system is the core problem of this study. **Objective:** To explore the changes of HRV before, during and after Tai Chi-XLDJ, determine the changes of heart rate and autonomic nerve of young practitioners in the state of rest, XLDJ and recovery, and explore the exercise value of Tai Chi on human function. **Methods:** 25 college students were selected as subjects to test and analyze the time domain, frequency domain and nonlinear indexes of heart rate and HRV before, during and after Tai Chi-XLDJ. **Results:** 1) the heart rate of the subjects increased significantly during XLDJ and decreased significantly after exercise. The HRV time domain indexes nn50 and pNN50 decreased significantly during exercise and increased significantly after exercise; RMSSD decreased during exercise and increased after exercise; On the contrary, SDNN increased during exercise and decreased after exercise. 2) The frequency domain index VLF increased during exercise and decreased after exercise; LF and TP increased significantly during exercise and decreased significantly after exercise; LF/HF increased during exercise and decreased after exercise; On the contrary, HF decreased significantly during exercise and increased significantly after exercise. 3) The nonlinear index SD1 decreased during exercise and increased after exercise; SD2 increased during exercise and decreased after exercise; SD2/SD1 increased during exercise and decreased after exercise; But the nonlinear indexes SD1, SD2 and SD2/SD1 had no significant change. **Conclusion:** An acute 5-minute Tai Chi-XLDJ exercise can effectively stimulate the autonomic nerve and improve the autonomic regulation ability of the subject's nervous system, so as to improve human function. During the exercise, the HRV of the subjects decreased and gradually recovered after exercise. The central sympathetic nerve activity strengthened during exercise and the parasympathetic nerve activity weakened during exercise. Both recovered and tended to balance after exercise.

**Key words:** Tai Chi, Tai Chi-XuLingDingJin, HRV, Autonomic nerve