太极拳追加注意焦点干预 FAI 患者的效果研究

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摘要：目的：探究太极拳追加注意焦点干预功能性踝关节不稳(Functional Ankle Instability, FAI)的干预效果，为其锻炼预防和运动康复提供理论依据。**方法：**以 46 名 FAI 患者为研究对象，随机分为追加注意焦点太极拳练习组、无注意焦点要求太极拳练习组和不练习太极拳组，以下分别简称追加焦点组、非追加焦点组和不练组。使用等速测力仪（CON-TREX®, Physiomed）测量其踝关节跖屈、背屈、内翻和外翻等速向心肌力（60°/s 和 180°/s 两种角速度）和本体位置觉；使用使用三维测力台测量其单脚站立静立平衡的压力中心(Center of Pressure,COP)控制能力（睁眼和闭眼）；使用 Y 平衡(Y-balance test,YBT)测量其 Y 平衡控制能力。干预前后组内指标的数据对比用配对样本 T 检验，组间指标的数据对比用单因素方差分析，显著性水平为 P<0.05。**结果：**(1)静立 COP 控制能力：追加焦点组睁眼 COPx 值干预前后分别为 0.0289±0.00694、0.0242±0.00414，干预效果非常显著(p<0.01)；睁眼 COPy 值干预前后分为 0.0509±0.01672、0.0345±0.00686，干预效果非常显著(p<0.01);睁眼包络面积值干预前后分别为 0.0017±0.0012、0.0009±0.0003，干预效果显著(p<0.05)；追加焦点组闭眼 COPx 值干预前后分别为 0.0564±0.04293、0.031±0.00527，干预效果显著(p<0.05)；闭眼 COPy 值干预前后分为 0.0848±0.04134、0.0427±0.01007，干预效果非常显著(p<0.01)，干预效果非常显著(p<0.01);闭眼包络面积值干预前后分别为 0.0061±0.00921、0.0014±0.00051，干预效果趋于显著(p=0.06)。非追加焦点组睁眼 COPx 值干预前后分别为 0.0318±0.01268、0.0247±0.00663，干预效果显著(p<0.05)；睁眼 COPy 值干预前后分为 0.0508±0.03629、0.0348±0.00976，干预效果趋于显著(p=0.072);睁眼包络面积值干预前后没有显著差异(p>0.05)；非追加焦点组闭眼 COPx 值干预前后分别为 0.053±0.02585、0.0353±0.01048，干预效果显著(p<0.05)；闭眼 COPy 值干预前后分为 0.0927±0.05434、0.0526±0.01094，干预效果非常显著(p<0.01);闭眼包络面积值干预前后没有显著差异(p>0.05)。不练组前测与后测睁眼、闭眼 COP 控制能力没有显著差异(p>0.05)。(2)YBT 控制能力：追加焦点组前侧值干预前后分别为 53.8542±6.73297、55.9583±5.1926，干预效果非常显著(p<0.01)；后内侧值干预前后分为 83.625±13.52522、87.7292±12.55814，干预效果非常显著(p<0.01);后外侧值干预前后分别为 84.9375±12.1687、89.2817±11.31166，干预效果非常显著(p<0.01)；综合值干预前后分别为 79.2904±8.62674、83.1302±7.46674，干预效果非常显著(p<0.01)。非追加焦点组前

侧值干预前后分别为 55.5778±4.25845、56.8222±4.10549，干预效果显著($p<0.05$)；后内侧值干预前后分为 84.9111±6.91268、86.6222±600766，干预效果显著($p<0.05$);后外侧值干预前后分别为 86.7333±9.28063、88.4444±8.26608，干预效果显著($p<0.05$);综合值干预前后分别为 78.8915±5.20258、80.6277±6.37523，干预效果非常显著($p<0.01$)。不练组前测与后测前侧、后内侧、后外侧和综合值成绩均没有显著差异($p>0.05$)。(3)本体位置觉：追加焦点组跖屈 10°误差值干预前后分别为 2.5969±1.28634、1.6213±0.62905，干预效果显著($p<0.05$);内翻 15°误差值干预前后分别为 4.5981±2.52645、1.3963±0.91464，干预效果非常显著($p<0.01$);外翻 15°误差值干预前后分别为 4.4531±1.38165、1.9244±0.93923，干预效果非常显著($p<0.01$)。非追加焦点组跖屈 10°误差值干预前后分别为 2.4727±1.36237、1.584±0.80121，干预效果显著($p<0.05$);内翻 15°误差值干预前后分别为 3.8067±2.23284、1.4527±0.67719，干预效果非常显著($p<0.01$);外翻 15°误差值干预前后分别为 4.3107±1.56601、2.6567±1.80796，干预效果非常显著($p<0.01$)。追加焦点组和非追加焦点组干预前后背屈 5°误差值不具有显著差异($p>0.05$)。不练组前测与后测跖屈 5°、背屈 10°、内翻 15°和外翻 15°位置觉成绩均没有显著差异($p>0.05$)。干预后组间结果具有一定差异性，具体表现为：追加焦点组与不练组闭眼 COPx 晃动距离具有非常显著差异($p<0.01$)，非追加焦点组与不练组闭眼 COPx 晃动距离具有非常显著差异($p<0.01$)，追加焦点组与非追加焦点组不具有显著差异($p>0.05$)；追加焦点组与不练组闭眼 COPy 晃动距离具有非常显著差异($p<0.01$)，非追加焦点组与不练组闭眼 COPy 晃动距离具有非常显著差异($p<0.01$)，追加焦点组与非追加焦点组不具有显著差异($p>0.05$)；追加焦点组与不练组闭眼面积具有显著差异($p<0.05$)，非追加焦点组与不练组闭眼面积不具有非常显著差异($p>0.05$)，追加焦点组与非追加焦点组不具有显著差异($p>0.05$)；追加焦点组与不练组睁眼 COPx 晃动距离具有显著差异($p<0.05$)，非追加焦点组与不练组睁眼 COPx 晃动距离具有显著差异($p<0.05$)，追加焦点组与非追加焦点组不具有显著差异($p>0.05$)；追加焦点组与不练组睁眼 COPy 晃动距离具有非常显著差异($p<0.01$)，非追加焦点组与不练组睁眼 COPy 晃动距离具有显著差异($p<0.05$)，追加焦点组与非追加焦点组不具有显著差异($p>0.05$)；追加焦点组与不练组睁眼面积具有显著差异($p<0.05$)，非追加焦点组与不练组睁眼面积不具有显著差异($p>0.05$)；追加焦点组与非追加焦点组具有显著差异($p>0.05$)。追加焦点组与不练组 YBT-前侧成绩具有显著差异($p<0.05$)，非追加焦点组与不练组 YBT-前侧成绩具有显著差异($p<0.05$)，追加焦点组与非追加焦点组 YBT-前侧成绩不具有显著差异($p>0.05$)；追加焦点组与不练组 YBT-后内侧成绩具有非常显著差异($p<0.01$)，非追加焦点组与不练组 YBT-后内侧成绩具有显著差异($p<0.05$)，追加焦点组与非追加焦点组 YBT-后内侧成绩不具有显著差异

(p>0.05))；追加焦点组与不练组 YBT-后内侧成绩具有非常显著差异(p<0.01)，非追加焦点组与不练组 YBT-后内侧成绩具有显著差异(p<0.05)，追加焦点组与非追加焦点组不具有显著差异(p>0.05)。追加焦点组与不练组背屈 5°差值具有具有显著差异(p<0.05)，非追加焦点组与不练组不具有显著差异，追加焦点组与非追加焦点组不具有显著差异(p>0.05)；追加焦点组与不练组跖屈 10°差值具有具有显著差异(p<0.05)，非追加焦点组与不练组具有显著差异(p<0.05)，追加焦点组与非追加焦点组具有显著差异(p<0.05)；追加焦点组与不练组内翻 15°差值具有具有非常显著差异(p<0.01)，非追加焦点组与不练组具有非常显著差异(p<0.01)，追加焦点组与非追加焦点组具有显著差异(p<0.05)；追加焦点组与不练组外翻 15°差值具有具有非常显著差异(p<0.01)，非追加焦点组与不练组具有非常显著差异(p<0.01)，追加焦点组与非追加焦点组具有显著差异(p<0.05)。**结论**：追加注意焦点与非追加注意焦点太极拳练习对 FAI 患者平衡能力和位置觉提升都较为显著；追加注意焦点太极拳练习改善位置觉效果优于非追加注意焦点组；不练组平衡能力和位置觉提升不显著。

关键词：注意焦点；太极拳；FAI

Effect of Taijiquan With Additional Focus Of Attention On Patients With FAI

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Abstract: Objective: To explore the intervention effect of Taijiquan with additional focus of attention on Functional Ankle Instability (FAI), and to provide theoretical basis for exercise prevention and rehabilitation.**Methods:** 46 FAI patients were randomly divided into Tai chi practice group with additional attention focus, Tai chi practice group with no attention focus requirement and no Tai chi practice group, respectively referred to as the supplementary focus group, non-supplementary focus group and no practice group. The isokinetic muscle force (60°/s and 180°/s) and body position perception of the ankle joints were measured with CON-TREX®, Physiomed. The ability to control the Center of Pressure (COP) (open and closed eyes) using a three-dimensional force measuring table to measure its standing static balance on one foot; Y-balance control was measured using the Y-balance test (YBT). Before and after intervention, the data of intra-group indicators were compared by paired sample T test, and the data of inter-group indicators were compared by one-way analysis of variance, and the significance level

was P<0.05.**Results:** (1) Statically standing COP control ability: the COPx values before and after intervention in the additional focus group were 0.0289±0.00694 and 0.0242±0.00414, respectively, indicating a significant intervention effect (p<0.01). The open COPy values were 0.0509±0.01672 and 0.0345±0.00686 before and after intervention, and the intervention effect was very significant (p<0.01). The open eye envelope area was 0.0017±0.0012 and 0.0009±0.0003 before and after intervention, respectively, and the intervention effect was significant (p<0.05). The COPx values of the supplementary focus group were 0.0564±0.04293 and 0.031±0.00527 before and after intervention, respectively, and the intervention effect was significant (p<0.05). COPy values for closed eyes were 0.0848±0.04134 and 0.0427±0.01007 before and after intervention, and the intervention effect was very significant (p<0.01). The closed eye envelope area values before and after intervention were 0.0061±0.00921 and 0.0014±0.00051, respectively, and the intervention effect tended to be significant (p=0.06).In the non-supplemental focus group, the COPx values before and after intervention were 0.0318±0.01268 and 0.0247±0.00663, respectively, and the intervention effect was significant (p<0.05). The open COPy values were 0.0508±0.03629 and 0.0348±0.00976 before and after intervention, and the intervention effect tended to be significant (p=0.072). There was no significant difference in the open eye envelope area before and after intervention (p>0.05). In the non-supplemental focus group, the COPx values before and after intervention were 0.053±0.02585 and 0.0353±0.01048, respectively, and the intervention effect was significant (p<0.05). The COPy values of closed eyes before and after intervention were 0.0927±0.05434 and 0.0526±0.01094, the intervention effect was very significant (p<0.01). There was no significant difference in the closed eye envelope area before and after intervention (p>0.05). There was no significant difference in COP control ability between pre-test and post-test (p>0.05).(2)YBT control ability: the pre-side values of the additional focus group before and after intervention were 53.8542±6.73297 and 55.9583±5.1926, respectively, indicating a very significant intervention effect (p<0.01). The posterior medial value before and after intervention was 83.625±13.52522, 87.7292±12.55814, and the intervention effect was very significant (p<0.01). The posterolateral values before and after intervention were 84.9375±12.1687 and 89.2817±11.31166, respectively, and the intervention effect was very significant (p<0.01). The comprehensive values before and after intervention were 79.2904±8.62674 and 83.1302±7.46674, respectively, the intervention effect was very significant (p<0.01). The pre-side values of the

non-supplemental focus group were 55.5778±4.25845 and 56.8222±4.10549 before and after intervention, respectively, indicating significant intervention effect ($p<0.05$). The posterior medial values were 84.9111±6.91268 and 86.6222±600766 before and after intervention, and the intervention effect was significant ($p<0.05$). The posterolateral values before and after intervention were 86.7333±9.28063 and 88.4444±8.26608, respectively, and the intervention effect was significant ($p<0.05$). The comprehensive values before and after intervention were 78.8915±5.20258 and 80.6277±6.37523, respectively. The intervention effect was very significant ($p<0.01$). There were no significant differences in the anteromedial, posteromedial, posteromedial and comprehensive scores between the two groups ($p>0.05$). (3) Body position perception: the 10° plantflexion error values of the additional focus group before and after intervention were 2.5969±1.28634 and 1.6213±0.62905, respectively, indicating significant intervention effect ($p<0.05$). The error values of 15° inversion before and after intervention were 4.5981±2.52645 and 1.3963±0.91464, respectively, indicating a significant intervention effect ($p<0.01$). The error values of 15° valvulation before and after intervention were 4.4531±1.38165 and 1.9244±0.93923, respectively. The intervention effect was very significant ($p<0.01$). The 10° error values of plantar flexion in the non-supplemental focus group were 2.4727±1.36237 and 1.584±0.80121 before and after intervention, respectively, indicating significant intervention effect ($p<0.05$). The error values of 15° inversion before and after intervention were 3.8067±2.23284 and 1.4527±0.67719, respectively, indicating a significant intervention effect ($p<0.01$). The error values of 15° valgus before and after intervention were 4.3107±1.56601 and 2.6567±1.80796, respectively, indicating that the intervention effect was very significant ($p<0.01$). There was no significant difference in 5° dorsiflexion error between the supplementary focus group and the non-supplementary focus group before and after intervention ($p>0.05$). There were no significant differences in the position perception scores of plantar flexion (5°), dorsiflexion (10°), varus 15° and varus 15° between pre-test and post-test ($p>0.05$). After intervention, the results among the groups showed certain differences, which were as follows: There was a significant difference in the COPx shaking distance between the supplementary focus group and the non-training group ($p<0.01$), and there was a significant difference in the COPx shaking distance between the non-supplementary focus group and the non-training group ($p<0.01$), but no significant difference between the supplementary focus group and the non-supplementary focus group ($p>0.05$). There was a

significant difference in COPy shake distance between the added focus group and the no-practice group ($p<0.01$), a significant difference in COPy shake distance between the non-added focus group and the no-practice group ($p<0.01$), and no significant difference between the added focus group and the non-added focus group ($p>0.05$). There was significant difference in the closed eye area between the supplemental focus group and the no-practice group ($p<0.05$), no significant difference in the closed eye area between the non-supplemental focus group and the no-practice group ($p>0.05$), and no significant difference in the closed eye area between the supplemental focus group and the non-supplemental focus group ($p>0.05$). There were significant differences in the open eyes COPx slosh distance between the supplemental focus group and the no-exercise group ($p<0.05$), and there were significant differences in the open eyes COPx slosh distance between the non-supplemental focus group and the no-exercise group ($p<0.05$), but no significant differences between the supplemental focus group and the non-supplemental focus group ($p>0.05$). There was a significant difference in the open eyes COPy shaking distance between the supplemental focus group and the no-exercise group ($p<0.01$), a significant difference in open eyes COPy shaking distance between the non-supplemental focus group and the no-exercise group ($p<0.05$), and no significant difference between the supplemental focus group and the non-supplemental focus group ($p>0.05$). There was significant difference in open eye area between the supplemental focus group and the no-practice group ($p<0.05$), but no significant difference in open eye area between the non-supplemental focus group and the no-practice group ($p>0.05$). There was significant difference between the supplementary focus group and the non-supplementary focus group ($p>0.05$). There were significant differences in YBT-front scores between the supplemental focus group and the no-practice group ($p<0.05$), and there were significant differences in YBT-front scores between the non-supplemental focus group and the no-practice group ($p<0.05$), but no significant differences in YBT-front scores between the supplemental focus group and the non-supplemental focus group ($p>0.05$). There was a significant difference in YBT-posterior medial scores between the supplemental focus group and the no-practice group ($p<0.01$), and a significant difference in YBT-posterior medial scores between the non-supplemental focus group and the no-practice group ($p<0.05$), but no significant difference in YBT-posterior medial scores between the supplemental focus group and the non-supplemental focus group ($p>0.05$)). There was a significant difference in YBT-posterior

medial scores between the supplemental focus group and the no-practice group ($p<0.01$), there was a significant difference in YBT-posterior medial scores between the non-supplemental focus group and the no-practice group ($p<0.05$), and there was no significant difference between the supplemental focus group and the non-supplemental focus group ($p>0.05$). There was a significant difference of 5° dorsiflexion between the supplemental focus group and the no-practice group ($p<0.05$), no significant difference between the non-supplemental focus group and the no-practice group, and no significant difference between the supplemental focus group and the non-supplemental focus group ($p>0.05$). The difference of 10° plantar flexion between supplemental focus group and no practice group was significant ($p<0.05$), the difference between non-supplemental focus group and no practice group was significant ($p<0.05$), and the difference between supplemental focus group and no practice group was significant ($p<0.05$). There was a significant difference of 15° inversion between the supplemental focus group and the no-practice group ($p<0.01$), a significant difference between the non-supplemental focus group and the no-practice group ($p<0.01$), and a significant difference between the supplemental focus group and the non-supplemental focus group ($p<0.05$). There was a significant difference of 15° between the supplemental focus group and the no-practice group ($p<0.01$), a significant difference between the non-supplemental focus group and the no-practice group ($p<0.01$), and a significant difference between the supplemental focus group and the non-supplemental focus group ($p<0.05$).**Conclusion:** The balance ability and position sense of FAI patients were significantly improved by Taijiquan with added focus and without added focus. The effect of Taijiquan with additional attention focus was better than that of the non-additional attention focus group. There was no significant improvement in balance and position perception in the non-training group.

Key words: Focus of attention，Taijiquan，FAI