易筋经训练对脑卒中患者平衡功能及足底压力的影响

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摘要 **目的:**观察易筋经训练对脑卒中患者睁眼、闭眼状态下静态平衡功能及足底压力变化的影响。**方法:**选取2021年1月—8月在上海市第二康复医院治疗的脑卒中患者48例,采用随机数字表法分为对照组和观察组,每组24例。对照组接受常规康复治疗,包括运动疗法、作业疗法、电疗及针刺治疗等,1次/d,5 d/周,连续治疗4周;观察组在对照组基础上接受易筋经训练,30 min/次,1次/d,5 d/周,连续治疗4周。分别在治疗前后采用Berg平衡功能量表(BBS)进行平衡功能评估;采用足底压力分析系统进行睁眼与闭眼状态下足底压力参数的评估,通过分析系统处理得出患侧足底压力百分比值及包络椭圆参数(长轴长度、短轴长度与面积);记录治疗过程中2组跌倒、肌肉疼痛、血压与心率异常等不良反应发生的情况。**结果:**2组治疗前BBS评分、患侧足底压力百分比值、包络椭圆参数比较均无明显区别,差异无统计学意义($P>0.05$)。与治疗前比较,2组治疗后BBS评分均明显提高;观察组治疗后睁眼与闭眼状态下患侧足底压力百分比值均明显增加,包络椭圆参数值均明显减小,差异均有统计学意义($P<0.05$)。与对照组比较,观察组治疗后BBS评分、睁眼与闭眼状态下患侧足底压力百分比值均明显提高,睁眼状态下包络椭圆参数值明显减小,差异具有统计学意义($P<0.05$)。2组均未出现不良事件。**结论:**易筋经训练有助于提高脑卒中患者患侧肢体的负重能力及重心控制的稳定性,改善其平衡功能,值得临床推广应用。

关键词 脑卒中;易筋经;平衡功能;足底压力;运动训练

脑卒中作为全球第二大死亡和残疾的原因,对人们的健康构成巨大的威胁,是全球重大公共卫生问题之一[1]。我国每年新增脑卒中患者超过200万例,是目前我国致残率最高的疾病。由于人口老龄化等因素的影响,其造成的医疗负担仍在不断加重[2-3]。平衡功能障碍是脑卒中后常见的症状之一,极大影响患者坐、站、转移、行走等日常生活活动能力及生活质量,并增加跌倒风险[4-5]。大部分患者经过康复治疗能够恢复步行功能,但平衡功能障碍在恢复期仍然存在[6]。目前,单纯的药物治疗尚不能满足脑卒中患者平衡功能障碍恢复的需求[7]。研究显示,运动训练能有效改善脑卒中患者的平衡功能,临床上常用的方法包括核心肌群训练、全身振动疗法、水中运动训练、下肢机器人、虚拟现实技术等[8-9],然而大部分的运动训练需要依赖于相关设备的支持[10-11],不适用于患者进行自我康复训练。近年来,具有不受场地及器材限制优势的传统功法训练,在临床中逐渐得到推广应用。

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易筋经作为中国独具特色的传统功法之一，有伸筋拔骨、强身健体等功效，对机体各系统均具有调节作用，已逐渐在临床及社区中推广应用[12-17]。研究显示，易筋经练习的动作与核心稳定性训练在锻炼方式及作用方面有许多相似之处，其中有部分动作具有对角螺旋运动，与神经肌肉促进技术理论相符，对练习者的肌力、平衡功能的改善具有促进作用[18-19]。然而目前有关易筋经在改善脑卒中患者平衡功能方面的干预研究报道较少，且评估指标主要以临床量表为主。本研究旨在观察易筋经训练对脑卒中患者平衡功能与足底压力变化的影响，现报道如下。

1 临床资料

1.1 病例选择标准

1.1.1 诊断标准 符合“中国各类主要脑血管病诊断要点(2019版)”脑卒中的诊断标准[20]，并经影像学检查证实。

1.1.2 纳入标准 ① 年龄50～75岁；② 首次发病，病程1～12个月；③ Brunnstrom分期Ⅲ～Ⅴ期；④ 首次评估Berg平衡量表得分提示有平衡功能障碍[21]；⑤ 站立位下可独立站立1 min以上；⑥ 可配合完成相关康复训练及功能评估；⑦ 患者本人及家属知情同意并自愿签署知情同意书。

1.1.3 排除标准 ① 曾患有或伴有脑外伤、脑肿瘤等其他脑部疾病；② 病情不稳定；③ 有严重骨关节及肌肉疾病或肝、肾、心等重要脏器疾病或精神障碍；④ 有严重的语言、视觉及听力受损；⑤ 半年内参加过传统功法训练；⑥ 正在接受其他临床试验。

1.2 一般资料

选择2021年1月—8月在上海市第二康复医院就诊的脑卒中住院患者48例，根据受试者纳入时间顺序进行编号，采用随机数字表法按1∶1分为对照组与观察组，每组24例。2组性别、年龄、身高、体质量、病程、脑卒中类型、偏瘫侧等一般资料比较，差异均无统计学意义($P>0.05$)，具有可比性。见表1。本研究已通过上海市第二康复医院伦理委员会审查通过(审批号：2021-01-01)，所有受试者均自愿参与并签署知情同意书。本研究采用单盲随机对照试验设计，对评估人员与数据统计人员设盲。

表1 2组一般资料比较($\bar{x}\pm s$)

Table 1 Comparison of general data between two groups ($\bar{x}\pm s$)

组别	例数	性别		年龄/岁	身高/cm	体质量/kg	病程/月	脑卒中类型		偏瘫侧	
		男	女					脑梗死	脑出血	左侧	右侧
对照组	24	19	5	68.08±5.90	167.58±7.52	66.00±7.88	5.63±3.21	15	9	14	10
观察组	24	19	5	66.25±6.24	168.92±5.82	68.67±6.13	5.17±3.03	16	8	12	12

2 方 法

2.1 治疗方法

2.1.1 对照组 进行常规康复治疗，主要治疗内容包括：① 运动疗法：关节活动训练、肌力训练、翻身坐起训练、坐立位平衡训练及步行训练、踏车训练等，60 min/次。② 作业疗法：日常生活活动训练、推磨训练、情景模拟训练等，60 min/次。③ 电刺激疗法：50 Hz低频与5 kHz中频电刺激疗法，20 min/次。④ 针刺治疗：头针与体针治疗，20 min/次。以上训练1次/d，5 d/周，共持续治疗4周。本研究在常规康复治疗中尚未对所有受试者进行治疗项目的统一选择，治疗师根据不同患者的实际情况制定并优化康复治疗方案，治疗过程遵守《中国脑卒中康复治疗指南》的相关规定[22]。

2.1.2 观察组 在对照组基础上进行易筋经训练。本课题组前期研究根据国家体育总局编制并推广的《健身气功·易筋经》中十二势易筋经动作的要求，针对脑卒中患者健、患侧肢体功能的特点及动作的完成度选择其中6势(韦陀献杵第一势、韦陀献杵第二势、韦陀献杵第三势、倒拽九牛尾势、九鬼拔马刀势、三盘落地势)进行训练[23]。为了避免不同治疗师对训练效果造成的偏倚，所有受试者均接受同一位治疗师一对一的训练指导，训练强度控制在60%～80%的最大心率，30 min/次，1次/d，5 d/周，持续4周。若受试者完成动作有困难可在治疗师的辅助下进行动作训练。

2.2 观察指标

2.2.1 平衡功能 采用Berg平衡量表(Berg balance scale，BBS)对受试者进行平衡功能的评定。BBS量表由14个测试项目组成，每个项目根据评分标准分为0～4分，总分为56分，最低分为0分，评分越高表明平衡功能越强。

2.2.2 足底压力参数 采用步态分析系统(上海脉

沃医疗科技有限公司,型号:ODONATE)足底压力模块测量受试者在睁眼和闭眼状态双侧足底压力百分比值与包络椭圆参数。

2.2.2.1 患侧足底压力百分比值 双侧足底压力百分比为双下肢足底支撑身体质量的百分比值,双侧比值之和为100%,可在一定程度上反映重心偏移的幅度。左右两侧肢体压力值均为50%时为压力对称,其值越偏离50%,则重心偏移幅度越大,进而造成身体姿势失衡,引起跌倒的风险越大。由于受试者左右侧肢体足底压力百分比值为互补关系,为避免数据的重复说明,本研究仅对受试者患侧足底压力百分比值数据进行统计分析。

2.2.2.2 包络椭圆参数 包络椭圆参数包括长轴长度、短轴长度与面积3个参数。长轴长度与短轴长度分别为椭圆面积的长轴直径长度与短轴直径长度,反映人体站立时压力重心在横向与纵向摆动的趋势,数值越大,摆动幅度越大;面积为包络95%重心轨迹在内区域的椭圆面积,面积越大,则说明站立时身体移动范围也越大。

2.2.2.3 采集方法

① 场地准备 在评估测试前保持室内光线充足且安静,将足底定位垫置于距摄像臂正前方2 m处,以保证每次采集的位置相同,并在摄像臂的正上方外置"+"标记物。

② 受试者准备 选择与受试者相匹配的足底压力检测鞋垫安置在鞋内并进行配戴,见图1。嘱受试者站立于带标记的足底定位垫上进行睁眼和闭眼的静态平衡检测。

图1 足底压力检测鞋垫示意图

Figure 1 Plantar pressure detection insoles

③ 检测 检测开始前告知受试者保持独立站立状态并放松,调整"+"标记物至与受试者双眼平行,检测过程均先测试睁眼状态,再测试闭眼状态,全程由1名治疗师在受试者的正后方进行防护,以保证检测的安全性。睁眼状态下嘱受试者目视前方的"+"标记物,并保持身体不动,待其准备好后开始记录,记录时间为10 s;闭眼状态下嘱受试者站立保持身体不动后闭眼,待其准备好后开始记录,记录时间为10 s。

2.2.2.4 足底压力参数分析 使用系统自带的分析软件(ODONATE-Workstation)进行数据分析,生成足底压力参数,包括左右两侧足底压力所占百分比值及包络椭圆参数。生成受试者双侧足底压力负荷图见图2。

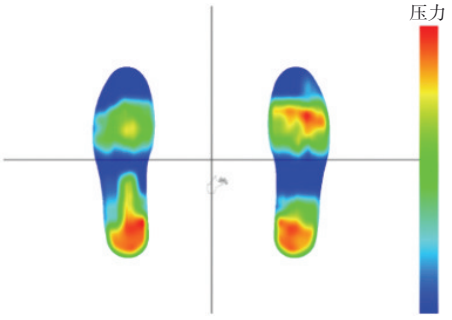

图2 受试者双侧足底压力负荷图

Figure 2 Pressure load of the subject´s bilateral planters

2.2.3 安全性评估 记录治疗过程中2组患者出现跌倒、肌肉疼痛、血压与心率异常等不良反应发生的情况。

2.3 统计学方法

使用SPSS 24.0统计软件进行数据分析。计量资料服从正态分布以($\bar{x}\pm s$)表示,若数据满足正态性及方差齐性检验,组内治疗前后比较采用配对t检验,组间比较采用两独立样本t检验;数据不服从正态分布以[$M(P_{25},P_{75})$]表示,组内比较采用Wilcoxon秩和检验,组间比较采用Mann-Whitney U检验。计数资料采用频数(n)表示,采用χ^2检验。$P<0.05$为差异具有统计学意义。

3 结 果

3.1 2组治疗前后BBS评分比较

与治疗前比较,2组治疗后BBS评分均明显提高,差异具有统计学意义($P<0.05$)。与对照组比较,观察组治疗后BBS评分明显更高,差异具有统计学意义($P<0.05$)。见表2。

表2 2组治疗前后BBS评分比较($\bar{x}\pm s$) 分

Table 2 Comparison of BBS score between two groups before and after treatment ($\bar{x}\pm s$) Scores

组 别	例数	治疗前	治疗后
对照组	24	31.92±5.28	38.79±5.42[1)]
观察组	24	32.75±3.63	44.58±4.01[1)2)]

注:与治疗前比较,1) $P<0.05$;与对照组比较,2) $P<0.05$。

Note: Compared with before treatment, 1) $P<0.05$; compared with the control group, 2) $P<0.05$.

3.2 2组治疗前后患侧足底压力百分比值比较

与治疗前比较,观察组治疗后睁眼与闭眼状态下患侧足底压力百分比值均明显增加,差异具有统计学意义($P<0.05$)。与对照组比较,观察组治疗后睁眼与闭眼状态下患侧足底压力百分比值均明显增加,差异具有统计学意义($P<0.05$)。见表3。

3.3 2组治疗前后包络椭圆参数比较

与治疗前比较,对照组治疗后睁眼状态下长轴长度明显减小,差异具有统计学意义($P<0.05$),观察组治疗后睁眼与闭眼状态下,长轴长度、短轴长度与面积均明显减小,差异具有统计学意义($P<0.05$)。与对照组比较,观察组治疗后睁眼状态下长轴长度、短轴长度与面积均减小,差异具有统计学意义($P<0.05$)。见表4。

表3 2组治疗前后患侧足底压力百分比值比较($\bar{x}\pm s$) %

Table 3 Comparison of plantar pressure percentage on hemiplegic side between two groups before and after treatment ($\bar{x}\pm s$) %

组 别	例数	睁眼		闭眼	
		治疗前	治疗后	治疗前	治疗后
对照组	24	35.46±8.94	37.11±8.29	37.49±7.84	38.13±8.52
观察组	24	34.08±9.23	45.93±2.19[1)2)]	34.76±9.26	45.46±2.57[1)2)]

注:与治疗前比较,1) $P<0.05$;与对照组比较,2) $P<0.05$。

Note: Compared with before treatment, 1) $P<0.05$; compared with the control group, 2) $P<0.05$.

表4 2组治疗前后包络椭圆参数比较($\bar{x}\pm s$)/[M (P_{25},P_{75})]

Table 4 Comparison of envelope ellipse parameters between two groups before and after treatment ($\bar{x}\pm s$)/[M(P_{25},P_{75})]

组 别	例数	时 间	长轴长度/mm		短轴长度/mm		面积/mm^2	
			睁眼	闭眼	睁眼	闭眼	睁眼	闭眼
对照组	24	治疗前	12.71(10.53,17.97)	12.36±5.78	3.35±1.35	3.71(3.31,4.64)	153.03±113.33	129.27(114.43,241.75)
		治疗后	11.19±4.08[1)]	12.96±5.13	3.29±1.21	3.63±1.59	126.13±83.20	115.91(105.34,227.53)
观察组	24	治疗前	12.15±4.89	13.56(12.81,21.94)	3.69±1.72	4.65±2.05	105.40(105.13,217.34)	234.72(180.52,370.24)
		治疗后	7.36±2.53[1)2)]	9.87(8.98,11.97)[1)]	2.44±0.93[1)2)]	3.17±1.37[1)]	49.63(44.60,75.64)[1)2)]	93.12(86.90,162.76)[1)]

注:与治疗前比较,1) $P<0.05$;与对照组比较,2) $P<0.05$。

Note: Compared with before treatment, 1) $P<0.05$; compared with the control group, 2) $P<0.05$.

3.4 安全性评估

在研究期间2组患者均未出现跌倒、肌肉疼痛、血压及心率异常等不良事件。

4 讨 论

平衡功能由中枢神经系统进行调控,包括视觉调控、前庭觉调控及本体感觉调控[24]。研究发现,下肢的运动、足底本体觉刺激及视觉刺激这3个方面在维持身体平衡过程中起到关键的调节作用[25]。具备良好的平衡功能是脑卒中患者恢复日常生活活动的基本条件,因平衡功能障碍导致的继发性躯体功能结构损伤将会对患者产生身体及心理上的不良效应,极大延缓患者的康复进程[26]。提高脑卒中患者的平衡功能不仅能进一步促进其躯体功能及日常生活活动能力的恢复,同时也能更好地增加患者的自信心,加快康复进程。

4.1 易筋经训练能有效改善脑卒中患者平衡功能

本研究结果显示,与治疗前比较,2组治疗后BBS评分均明显提高,这提示2组治疗后平衡能力均有明显改善。与对照组比较,观察组治疗后BBS评分明显更高,这提示增加易筋经训练能在相同康复时间内加速患者平衡功能的恢复。这可能与以下因素有关:① 易筋经作为传统健身气功是我国传统康复治疗技术之一,是在中医学整体观念及脏

腑、经络等理论基础上融合养生康复理论而形成的以改善运动功能为核心的训练方法,其动作要求缓慢且具有连贯性,大多数动作是在一定的肢体姿势维持下的静止性肌肉锻炼,对增强肌力和肌耐力有促进作用,可提高躯干的平衡能力和四肢的协调性[12,27]。② 训练动作韦陀献杵第一、二、三势能够加强患者独立站立位下进行上肢肢体活动时控制身体的重心及平衡能力;倒拽九牛尾势训练强化患者重心在矢状轴上前后转移的能力;九鬼拔马刀势训练强化患者重心在冠状轴上左右转移的能力;三盘落地势训练强化患者重心在垂直轴上上下转移的能力。

4.2 易筋经训练能提高脑卒中患者患侧下肢负重能力

本研究结果显示,与对照组比较,观察组治疗后在睁眼与闭眼状态下患侧足底压力百分比值均明显增加,这提示易筋经训练能显著提高脑卒中患者站立位下患侧肢体的负重能力。这可能是因为易筋经训练过程中注重身体姿势的调整和重心的转移,患侧肢体的负重能力提高,其重心靠近身体中线。此外,本研究结果显示,受试者在治疗前患侧肢体所承受的足底压力值均小于健侧,即患侧足底压力百分比值<50%,这提示脑卒中后患者由于患侧偏瘫导致偏侧肌肉力量下降,躯体两侧肌肉力量不对称,患者在站立位下过度地代偿使用健侧肢体支撑身体重力,导致身体重心偏向健侧[28]。这与杨冬岚等[29]研究结果一致。脑卒中患者患侧下肢虽然通过肌力训练后肌肉力量得到提高,但如果仅接受常规康复训练,这种代偿模式仍然存在,这将导致患侧肢体无法充分发挥其作用。特别是当行走或转移过程中需要重心转移或需要患侧肢体支撑身体重量时,由于健侧肢体无法提供过度的代偿,其平衡容易被打破,进而增加跌倒风险。因此需要寻找积极有效的方法进行联合治疗。

4.3 易筋经训练能改善脑卒中患者重心稳定能力

包络椭圆参数反映了人体站立时重心的摆动幅度,摆动幅度越大,站立时越不稳定。本研究结果显示,与治疗前比较,观察组治疗后睁眼与闭眼状态下长轴长度、短轴长度与面积均明显减小;与对照组比较,观察组治疗后睁眼状态下长轴长度、短轴长度与面积均较小,这提示在易筋经训练后脑卒中患者重心稳定能力得到较大的改善。这可能与以下因素有关:① 易筋经训练对速度加以控制,要求每一个动作轻柔缓慢,自然流畅,可加强机体神经与肌肉间的协调关系[12]。② 易筋经训练动作是以脊柱为中心轴,这能够充分锻炼患者的核心肌群,使肌力与肌耐力得到提升。此外,有研究表明视觉的限制会对脑卒中患者平衡功能造成明显的障碍[24,30]。本研究显示在闭眼状态下2组长轴长度、短轴长度及面积比较无明显区别,这可能与脑卒中患者平衡能力过度依赖视觉的调节有关。

5 总 结

易筋经训练有助于提高脑卒中患者患侧肢体的负重能力及整体重心控制的稳定性,有效改善其平衡功能,安全性较高,值得推广应用。但本研究仍存在纳入样本量较小、干预时间较短等不足之处,下一步研究将扩大样本量、延长观察时间并开展定期随访,为易筋经训练干预脑卒中患者平衡功能提供更多循证依据。

参考文献

[1] GBD 2016 Neurology Collaborators. Global, regional, and national burden of neurological disorders, 1990-2016: a systematic analysis for the Global Burden of Disease Study 2016 [J]. Lancet Neurol, 2019, 18(5): 459-480.

[2] WU S M, WU B, LIU M, et al. Stroke in China: advances and challenges in epidemiology, prevention, and management [J]. Lancet Neurol, 2019, 18(4): 394-405.

[3] WANG Y J, LI Z X, GU H Q, et al. China stroke statistics 2019: a report from the National Center for Healthcare Quality Management in Neurological Diseases, China National Clinical Research Center for Neurological Diseases, the Chinese Stroke Association, National Center for Chronic and Non-communicable Disease Control and Prevention, Chinese Center for Disease Control and Prevention and Institute for Global Neuroscience and Stroke Collaborations [J]. Stroke Vasc Neurol, 2020, 5(3): 211-239.

[4] MAEDA N, URABE Y, MURAKAMI M, et al. Discriminant analysis for predictor of falls in stroke patients by using the Berg Balance Scale [J]. Singapore Med J, 2015, 56(5): 280-283.

[5] PARK J, KIM T H. The effects of balance and gait function on quality of life of stroke patients [J]. NeuroRehabilitation, 2019, 44(1): 37-41.

[6] 娄天伟,田梦,刘彦彬,等. 本体感觉神经肌肉促进疗法躯干训练结合神经肌肉电刺激对脑卒中患者平衡功能的影响[J]. 中国康复医学杂志, 2020, 35(8): 986-989.
LOU T W, TIAN M, LIU Y B, et al. Effect of proprioceptive neuromuscular facilitation trunk training combined with neuromuscular electrical stimulation on balance function in patients with cerebral apoplexy [J]. Chin J Rehabil Med, 2020, 35(8): 986-989.

[7] NAVE A H, RACKOLL T, GRITTNER U, et al. Physical Fitness Training in Patients with Subacute Stroke (PHYS-STROKE): multicentre, randomised controlled, endpoint blinded trial [J]. BMJ, 2019, 366: l5101.

[8] SAUNDERS D H, SANDERSON M, HAYES S, et al. Physical fitness training for stroke patients [J]. Cochrane Database Syst Rev, 2020, 3(3): CD003316.

[9] THILARAJAH S, MENTIPLAY B F, BOWER K J, et al. Factors associated with post-stroke physical activity: a systematic review and meta-analysis [J]. Arch Phys Med Rehabil, 2018, 99(9): 1876-1889.

[10] ARIENTI C, LAZZARINI S G, POLLOCK A, et al. Rehabilitation interventions for improving balance following stroke: an overview of systematic reviews [J]. PLoS One, 2019, 14(7): e0219781.

[11] ZHU F S, KERN M, FOWKES E, et al. Effects of an exoskeleton-assisted gait training on post-stroke lower-limb muscle coordination [J]. J Neural Eng, 2021, 18(4): 046039.

[12] 孔亚敏，严隽陶，史智君. 健身气功易筋经临床研究进展[J]. 中国中医药信息杂志，2019，26(2)：133-136.
KONG Y M, YAN J T, SHI Z J. Clinical research progress in health Qigong•Yijinjing [J]. Chin J Inf Tradit Chin Med, 2019, 26(2): 133-136.

[13] SONG Y, LI J L, ISTVÁN B, et al. Current evidence on traditional Chinese exercises for quality of life in patients with essential hypertension: a systematic review and Meta-analysis [J]. Front Cardiovasc Med, 2020, 7: 627518.

[14] XUE X, JIN X M, LUO K L, et al. Effectiveness of Yijinjing on cognitive functions in post-stroke patients with mild cognitive impairment: study protocol for a randomized controlled trial [J]. Trials, 2021, 22(1): 265-273.

[15] 张敏，徐桂华，李峰，等. 健身气功易筋经促进慢性阻塞性肺疾病稳定期患者康复[J]. 中国运动医学杂志，2016，35(4)：339-343.
ZHANG M, XU G H, LI F, et al. Chinese gymnastic Qigong-Yijinjing promotes the function of patients with chronic obstructive pulmonary disease [J]. Chin J Sports Med, 2016, 35(4): 339-343.

[16] 方磊，李振瑞，陶旭辰，等. 易筋经对老年骨骼肌减少症平衡障碍患者跌倒风险影响的临床研究[J]. 中国康复医学杂志，2020，35(3)：319-323.
FANG L, LI Z R, TAO X C, et al. Effects of Yi Jin Jing on the risk of falling of sarcopenia and disequilibrium elderly [J]. Chin J Rehabil Med, 2020, 35(3): 319-323.

[17] 仲卫红，洪昆达，李天骄，等. 经筋推拿配合易筋经训练治疗膝骨性关节炎的临床研究[J]. 中华中医药杂志，2019，34(8)：3861-3863.
ZHONG W H, HONG K D, LI T J, et al. Clinical study on treatment of tendon massage combined with Yijinjing training on knee osteoarthritis [J]. China J Tradit Chin Med Pharm, 2019, 34(8): 3861-3863.

[18] KRUKOWSKA J, BUGAJSKI M, SIENKIEWICZ M, et al. The influence of NDT-Bobath and PNF methods on the field support and total path length measure foot pressure (COP) in patients after stroke [J]. Neurol Neurochir Pol, 2016, 50: 449-454.

[19] 殷萱，姚斐，孙萍萍，等. 易筋经与核心稳定性训练的比较分析[J]. 上海中医药大学学报，2015，29(4)：12-15.
YIN X, YAO F, SUN P P, et al. Comparative analysis of YijinJing and core stability training [J]. Acta Univ Tradit Med Sin Pharmacol Shanghai, 2015, 29(4): 12-15.

[20] 中华医学会神经病学分会，中华医学会神经病学分会脑血管病学组. 中国各类主要脑血管病诊断要点2019[J]. 中华神经科杂志，2019，52(9)：710-715.
Chinese Society of Neurology, Chinese Stroke Society. Diagnostic criteria of cerebrovascular diseases in China (version 2019) [J]. Chin J Neurol, 2019, 52(9): 710-715.

[21] BERG K. Measuring balance in the elderly: preliminary development of an instrument [J]. Physiother Can, 1989, 41(6): 304-311.

[22] 中华医学会神经病学分会神经康复学组，中华医学会神经病学分会脑血管病学组，卫生部脑卒中筛查与防治工程委员会办公室. 中国脑卒中康复治疗指南(2011完全版)[J]. 中国康复理论与实践，2012，18(4)：301-318.
Neurorehabilitation Group of Neurology Branch of Chinese Medical Association, Cerebrovascular Disease Group of Neurology Branch of Chinese Medical Association, Office of Stroke Screening and Prevention Engineering Committee of the Ministry of health. Chinese guidelines for stroke rehabilitation (2011 full edition) [J]. Chin J Rehabil Theory Pract, 2012, 18(4): 301-318.

[23] 张丽，胡军，薛炘，等. 改良易筋经对脑卒中恢复期睡眠障碍患者睡眠质量的影响[J]. 康复学报，2020，30(1)：74-78.
ZHANG L, HU J, XUE X, et al. Effect of modified Yijinjing exercise on sleep quality in stroke patients with sleep disorder during convalescent period [J]. Rehabil Med, 2020, 30(1): 74-78.

[24] 林强，郑煜欣，廖婉晨，等. 脑卒中患者静态平衡的足底压力分析[J]. 中国康复理论与实践，2021，27(3)：290-296.
LIN Q, ZHENG Y X, LIAO W C, et al. Static balance function in stroke patients: a plantar pressure analysis [J]. Chin J Rehabil Theory Pract, 2021, 27(3): 290-296.

[25] PATTI A, MESSINA G, PALMA R, et al. Comparison of posturographic parameters between young taekwondo and tennis athletes [J]. J Phys Ther Sci, 2018, 30(8): 1052-1055.

[26] KOCH G, BONNÌ S, CASULA E P, et al. Effect of cerebellar stimulation on gait and balance recovery in patients with hemiparetic stroke: a randomized clinical trial [J]. JAMA Neurol, 2019, 76(2): 170-178.

[27] 程海昉，张丽，李扬，等. 改良易筋经对社区睡眠障碍老年人睡眠质量的影响[J]. 康复学报，2018，28(3)：6-11.
CHENG H F, ZHANG L, LI Y, et al. Modified Yi Jin Jing efficacy on sleep quality of elderly people with sleep disorders in community [J]. Rehabil Med, 2018, 28(3): 6-11.

[28] SHUMWAY-COOK A, ANSON D, HALLER S. Postural sway biofeedback: its effect on reestablishing stance stability in hemiplegic patients [J]. Arch Phys Med Rehabil, 1988, 69(6): 395-400.

[29] 杨冬岚，林希丹，周文强. 穴位埋线对中风偏瘫患者平衡功能及足底压力的影响[J]. 针刺研究，2021，46(2)：152-157.
YANG D L, LIN X D, ZHOU W Q. Therapeutic effect of acupoint catgut embedding on balance function and plantar pressure in hemiplegic patients [J]. Acupunct Res, 2021, 46(2): 152-157.

[30] 林强，陈武德，郑煜欣，等. 基于足底压力下睁闭眼对静态平衡功能的影响[J]. 康复学报，2021，31(1)：17-23.
LIN Q, CHEN W D, ZHENG Y X, et al. Effect of eyes open/closed on plantar pressure during static balance evaluation [J]. Rehabil Med, 2021, 31(1): 17-23.

Effect of Yijinjing Training on Balance Function and Plantar Pressure of Stroke Patients

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ABSTRACT **Objective:** To observe the effect of Yijinjing training on static balance function and plantar pressure of stroke patient under the condition of eyes opened or closed. **Methods:** A total of 48 stroke patients who were treated in the Second Rehabilitation Hospital of Shanghai from January to August 2021, which were randomly divided into the control group and the observation group according to the random number table method, with 24 cases in each groups. The control group received routine rehabilitation therapy, including exercise therapy, occupational therapy, electrotherapy and acupuncture therapy, once a day, five days a week, continuous treatment for four weeks. The observation group received Yijinjing training on the basis of the control group, 30 minutes a time, once a day, five days a week, continuous treatment for four weeks. Before and after treatment, the Berg balance scale (BBS) was used to evaluate balance function; the plantar pressure analysis system was used to evaluate the plantar pressure parameters under the condition of eyes opened or closed, the percentage of plantar pressure of the hemiplegic side and envelope ellipse parameters (long axis length, short axis length and area) were obtained through the analysis of the system; the adverse reactions such as falls, muscle pain, abnormal blood pressure and heart rate of the two groups were recorded. **Results:** There was no significant difference in BBS score, percentage of plantar pressure on the hemiplegic side and envelope ellipse parameters of the two groups before treatment,the difference was no statistically significant (P>0.05). Compared with before treatment, the BBS score of the two groups after treatment were significantly increased, and the percentage of plantar pressure on the hemiplegic side of the observation group after treatment were significantly increased, while the envelope ellipse parameters of the observation group after treatment were significantly decreased under the condition of eyes open and closed,the difference was statistically significant (P<0.05). Compared with the control group, the BBS score and the percentage of plantar pressure on the hemiplegic side under the condition of eyes opened and closed were significantly increased, and the envelope ellipse parameters under the condition of eyes open were significantly lower in the observation group after treatment, the difference was statistically significant (P<0.05). There were no adverse events in both groups. **Conclusion:** Yijinjing training is helpful to improve the weight-bearing ability of the hemiplegic limb and the stability of center of gravity control of stroke patients, and effectively improve their balance function, which is worthy of clinical application and promotion.

KEY WORDS stroke; Yijinjing; balance function; plantar pressure; exercise training
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Standard for Organization Construction and Management of Rehabilitation Institutions

Working Group of Standard for Organization Construction and Management of Rehabilitation Institutions
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ABSTRACT National-level, provincial-level, prefectural-level, county-level rehabilitation centers and a large number of community-based rehabilitation institutions have been established in our country, basically forming a nationwide network of rehabilitation institutions. However, the development of rehabilitation institutions in China is restricted due to the lack of standardized and unified industry management standards. It is of great significance for guiding the development of various types of rehabilitation institutions at all levels in China to carry out research on the organization construction and management of rehabilitation institutions, to explore the suitable management mode of rehabilitation institutions for China's actual conditions, and to standardize the construction and service standards of rehabilitation institutions. The guideline adheres to the concept of "patient-centered", combined with the concept of CARF, focuses on the special requirements of rehabilitation, and mainly expounds from the aspects of standard application scope, organization construction standard, organization management standard, talent team allocation and rehabilitation service standard, so as to improve the standardization of organization construction and management of rehabilitation institutions and promote the development of rehabilitation medicine in China.The organization construction standards mainly include building construction standards, department construction standards, equipment configuration standards, etc; and the organization management standards mainly include leadership structure, formulation of strategies, collection of opinions and suggestions, legal requirements, financial planning and management, risk management, safety management, patients' rights and interests, performance evaluation and management, the performance improvement, etc; rehabilitation service standards mainly include the scope of rehabilitation service and the way of rehabilitation service. This guideline is applicable to guide the organizational construction and management of rehabilitation institutions of all levels, traditional Chinese medicine hospitals or rehabilitation departments of general hospitals in China, with good clinical applicability and effectiveness.

KEY WORDS rehabilitation institutions; organization construction; organization management; standardization management; management standard
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