

1. 請閱讀以下文章之摘要、簡介、與結果(圖)，並回答以下問題：

Beck EN, Almeida QJ. Dopa-Responsive Balance Changes Depend on Use of Internal Versus External Attentional Focus in Parkinson Disease. *Phys Ther* 2017;97:208-216.

摘要

Background

Parkinson disease (PD) impairs control of well-learned movements. Movement control improvements are found when individuals complete tasks while focusing attention externally on manipulating an object, which is argued to occur due to automatic processing associated with well-learned movements. Focusing attention internally (on movements of one's limbs) is believed to involve conscious control networks and hinders movement performance. Previous work has shown that an external focus of attention (EFA) improved postural stability in individuals with PD (compared with an internal focus of attention [IFA]), but this improvement occurred when patients were taking dopamine medication, which modulates basal ganglia functioning responsible for well-learned movements.

Objective

The purpose of this study was to determine whether an EFA or IFA is beneficial for postural stability in individuals with PD in the absence of dopamine replacement.

Design

A within-participant design was utilized.

Methods

Nineteen individuals with PD stood on a firm, unstable platform in 3 attentional conditions: (1) EFA, (2) IFA, and (3) control (participant asked to stand still). Displacement and variability of anterior-posterior and medial-lateral postural sway were measured with a balance system for fall risk assessment. The protocol was completed both "on" and "off" (minimum 12-hour withdrawal of) dopaminergic medications.

Results

While off medications, anterior-posterior sway variability was significantly lower during an IFA compared with the EFA and control. Anterior-posterior sway displacement and variability were significantly lower during the IFA, when off medications were compared with IFA and EFA while on medications.

Limitations

There was no comparison with a healthy age-matched control group, and a safety harness was used due to task difficulty.

Conclusions

An EFA may recruit automatic processes that involve degenerated basal ganglia in PD, and absence of dopamine exacerbates dysfunction. Training with an EFA may improve upon these automatic processes in individuals with PD.

簡介

Parkinson disease (PD) is a movement disorder in which the dopamine-producing cells of the basal ganglia progressively degenerate.¹ Basal ganglia degeneration results in many motor and nonmotor symptoms in individuals with PD due to vast global connections in the brain between the basal ganglia and cortical areas.²⁻⁷ For example, individuals with PD eventually lose the ability to complete well-learned movements automatically,^{8,9} as the basal ganglia are believed to help automate control of these movements.¹⁰⁻¹² *Automatic movements* are defined as the performance of a skill with little or no demand on attention,¹³ also referred to as *automaticity*. As the automatic movement control system does not function properly in individuals with PD, they are forced to compensate for impaired automaticity by consciously controlling movements that were once automatic. Consciously controlling all movements requires increased attentional demand,¹⁴⁻¹⁷ resulting in a greater chance of falling and injury if attention needs to be

見背面

shared or is diverted away from control of the movement. However, there is evidence to suggest that when a particular instruction is given, aimed at directing one's attention to a specific location (such as toward the manipulation of an object as opposed to the movement of their limbs), individuals with PD are able to efficiently use automatic processes to control the movement, and it provides benefits to movement performance.^{18,19} This instruction pertains to where attention is focused when performing movement tasks.

It has been well supported that the location on which a person focuses attention while performing novel tasks has a critical influence on control of movement.^{20,21} For instance, people can focus on the control of an object that is being manipulated (such as focusing on the motion of the head of a golf club during a golf putt,²² the rungs of vertical jump equipment during a vertical leap,²³ or stabilizing a balance platform during a postural task^{24,25}), or they can focus on their limbs to ensure that the movement is accurate (such as focusing on locking wrist and elbow joints during the swinging motion of the arms in a golf putt,²² full arm swing and the tips of the individual's finger during a vertical jump,²³ or minimizing movement of one's feet during a postural task^{24,25}). Several studies have shown that when healthy individuals perform a novel task and focus their attention on an object while it is being controlled (ie, an external focus of attention [EFA]), performance is typically more successful than when the focus of attention is directed toward controlling movement of one's limbs (ie, an internal focus of attention [IFA]) or when no instruction is provided.^{23,24,26,27} It has been argued that adopting an EFA allows use of automatic processes (that are believed to be controlled by sensorimotor cortical areas typical of automatic movement control²⁸) and, therefore, requires less conscious control of the movement with optimal performance.²⁵ On the other hand, an IFA is argued to involve greater recruitment of frontal areas (such as the prefrontal cortex, premotor cortex, and anterior cingulate cortex) and less recruitment of sensorimotor regions,²⁸ causing detriments to performance.²⁵ Therefore, as automatic processes are utilized when focus of attention is directed externally on the manipulation of objects and individuals with PD demonstrate impairments in using their automatic systems, it might be expected that an EFA would induce greater movement impairment and prove detrimental to performance in individuals with PD.

Interestingly, when asked to control postural stability while standing on an inflated disk (increased task difficulty) placed on top of a forceplate, individuals with PD demonstrated significantly less postural sway (improved control) when instructed to focus attention on minimizing movements of the disk (EFA) in comparison with minimizing movements of their feet (IFA) or when only instructed to stand still.¹⁸ It is important to note that during testing, individuals with PD continued their normal dopamine replacement regimen, also referred to as "on" medications. These findings suggest that when individuals with PD are on dopamine replacement, they are able to effectively use automatic processes that prove beneficial for movement control. However, if an EFA promotes involvement of neural circuits recruited during automatic control of movement, which are dysfunctional in individuals with PD, removing dopamine that is vital for basal ganglia functioning ("off" medication state) might be expected to interfere with the benefits of focusing attention externally while controlling posture. In other words, when dopamine is depleted, an EFA might be expected to result in greater center-of-pressure displacement and variability (worse postural control) compared with an IFA.

Although pinnacle research has explored the influence of dopaminergic therapy on postural control in participants with PD,²⁹⁻³⁴ an investigation of the influence of focus of attention (external versus internal versus control) on postural stability in individuals with PD that includes withdrawal and presence of dopamine replacement medication (greater versus lesser function of automatic processes) has yet to be completed. This examination would provide important insights into the influence of the basal ganglia on attentional focus (ie, external versus internal), automatic movement control, and pathology in people with PD.

Therefore, the first aim of the current study was to determine whether an EFA or an IFA is beneficial for control of postural stability in participants with PD when dopamine replacement was not present. It was expected that if the basal ganglia are critical for

automatic processes involved in movement control when an EFA is adopted, relative depletion of dopamine (off medications) might influence more postural sway (ie, greater postural displacement and variability) when participants with PD focus attention externally on minimizing movements of a platform (automatic control relying on the basal ganglia) compared with focusing internally on minimizing movements of their feet (frontal areas with less basal ganglia involvement).

The second aim of this study was to investigate the interaction among the location in which participants with PD focus attention, medication state (on versus off dopamine medications), and postural stability. If the basal ganglia are involved in the automatic processes recruited when an EFA is adopted, it was expected that the greatest amount of postural sway would be found when participants with PD were off dopamine medications and focusing externally on minimizing the movements of a platform, which would maximize impaired basal ganglia involvement. In contrast, if participants with PD are able to efficiently use their automatic processes when dopamine is present (on medications), the least amount of postural sway was expected to be found when participants with PD were on dopamine medications and focusing externally. ^{18,19} It was not expected that postural stability would differ between medication states in participants with PD when an IFA was adopted, as the basal ganglia were expected to be less involved during movements mediated by frontal areas compared with automatic control of movement and thus not as influenced by changes in dopamine levels.

結果

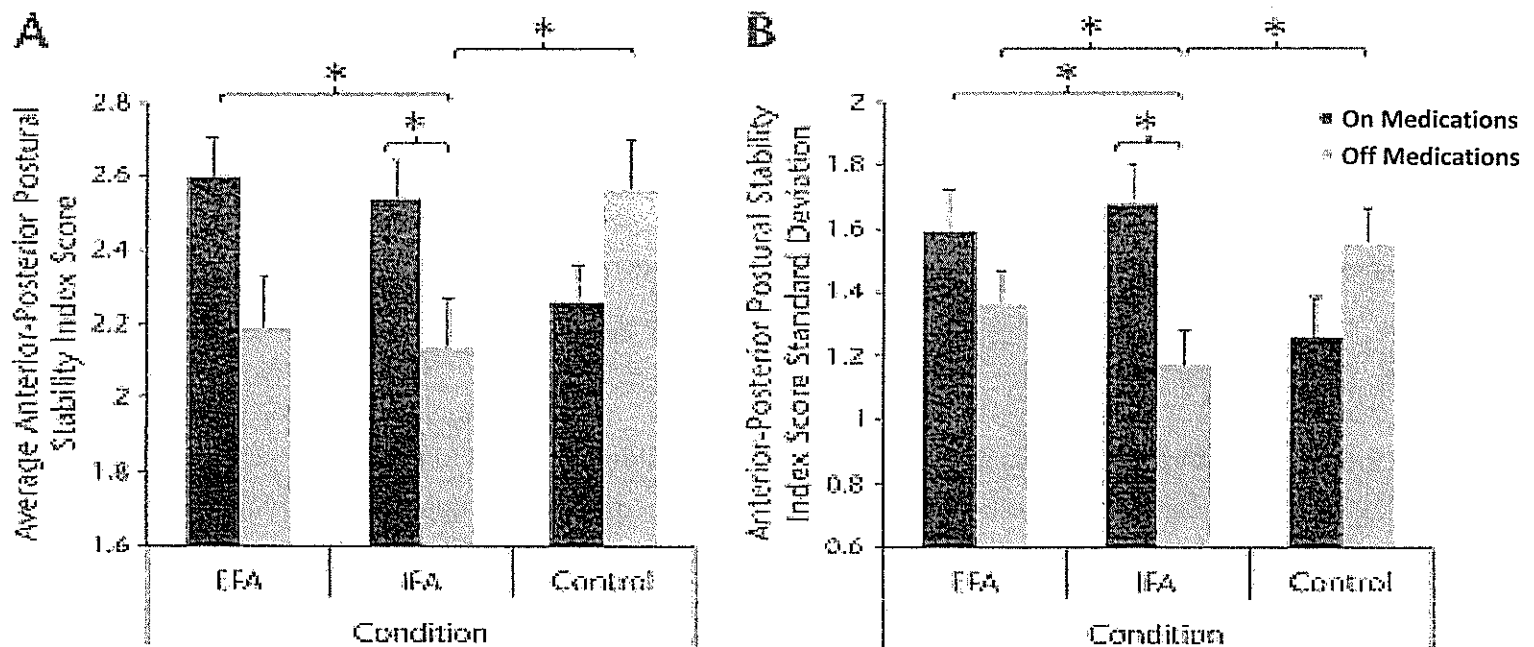


Figure. Graphic illustration of (A) average anterior-posterior postural stability index and (B) anterior-posterior postural stability index standard deviations while participants completed the protocol in both the on (black columns) and off (gray columns) dopamine medication states. External focus of attention (EFA) signifies the condition in which participants were asked to “focus on minimizing the movements of the platform,” internal focus of attention (IFA) signifies the condition in which participants were asked to “focus on minimizing the movements of their feet,” and Control signifies the condition in which participants were asked to “stand still.” * Significant difference at the $P < .05$ level.

見背面

問題：

- (a) 巴金森病患對學習過的動作(well-learned movements)之自主性動作控制能力為何受損？為了代償上述動作控制能力之受損，巴金森病患多採用什麼策略來執行動作？(5%)
- (b) 何謂 internal focus of attention (IFA)與 external focus of attention (EFA)? (5%)
- (c) IFA 及 EFA 會如何影響動作控制? (5%)
- (d) 試以訓練巴金森病患之走路為例，舉出訓練時可用的 IFA 及 EFA 可以是什麼。(10%)
- (e) 本研究想驗證的假說(testing hypothesis)是什麼? (10%)
- (f) 根據本研究的結果，服與不服用多巴胺藥物與使用 IFA 及 EFA 有什麼交互作用? (15%)

2. 請先閱讀下列短文

Int J Rehabil Res. 2016 Sep;39(3):197-210.

Constraint-induced movement therapy as a rehabilitation intervention for upper extremity in stroke patients: systematic review and meta-analysis.

Abstract

Constraint-induced movement therapy (CIMT) is a neurorehabilitation technique designed to improve upper extremity motor functions after stroke. This review aimed to investigate evidence of the effect of CIMT on upper extremity in stroke patients and to identify optimal methods to apply CIMT. Four databases (MEDLINE, EMBASE, CINHAL, and PEDro) and reference lists of relevant articles and reviews were searched. Randomized clinical trials that studied the effect of CIMT on upper extremity outcomes in stroke patients compared with other rehabilitative techniques, usual care, or no intervention were included. Methodological quality was assessed using the PEDro score. The following data were extracted for each trial: patients' characteristics, sample size, eligibility criteria, protocols of CIMT and control groups, outcome measurements, and the PEDro score. A total of 38 trials were identified according to the inclusion criteria. The trials included were heterogeneous in CIMT protocols, time since stroke, and duration and frequency of treatment. The pooled meta-analysis of 36 trials found a heterogeneous significant effect of CIMT on upper extremity. There was no significant effect of CIMT at different durations of follow-up. The majority of included articles did not fulfill powered sample size and quality criteria. The effect of CIMT changed in terms of sample size and quality features of the articles included. These meta-analysis findings indicate that evidence for the superiority of CIMT in comparison with other rehabilitative interventions is weak. Information on the optimal dose of CIMT and optimal time to start CIMT is still limited.

請回答下列問題：

- (a) 請簡單說明何謂 Constraint-induced movement therapy (CIMT) (5%)
- (b) 從這個短文中，作者認為目前 CIMT 的應用在實證上有什麼限制(5%)?
- (c) 如果您想要改善 CIMT 目前實證上的限制，請您設計一個可行的研究 (17%) (請包括想解決那一個問題? 可能的研究方法?以及這類研究方法在實際上可能的限制?)
3. 請說明何謂 task-oriented approach? (8%)，並說明如何利用 task-oriented approach 的概念對脊髓損傷的患者進行步行訓練?(15%)

試題隨卷繳回