

Treadmill training for the treatment of gait disturbances in people with Parkinson's disease: a mini-review

T. Herman · N. Giladi · J. M. Hausdorff

Received: 2 September 2008 / Accepted: 6 October 2008 / Published online: 4 November 2008
© Springer-Verlag 2008

Abstract This report reviews recent investigations of the effects of treadmill training (TT) on the gait of patients with Parkinson's disease. A literature search identified 14 relevant studies. Three studies reported on the immediate effects of TT; over-ground walking improved (e.g., increased speed and stride length) after one treadmill session. Effects persisted even 15 min later. Eleven longer-term trials demonstrated feasibility, safety and efficacy, reporting positive benefits in gait speed, stride length and other measures such as disease severity (e.g., Unified Parkinson's Disease Rating Scale) and health-related quality of life, even several weeks after cessation of the TT. Long-term carryover effects also raise the possibility that TT may elicit positive neural plastic changes. While encouraging, the work to date is preliminary; none of the identified studies received a quality rating of Gold or level Ia. Additional high quality randomized controlled studies are needed before TT can be recommended with evidence-based support.

Keywords Parkinson's disease · Gait · Treadmill · Neuroplasticity

Introduction

Treadmill training (TT) is only infrequently prescribed as a treatment option for patients with Parkinson's disease (PD). In contrast, bodyweight supported treadmill training (BWSTT) is often used to promote gait training in patients with spinal cord injuries and post-stroke (Hesse et al. 1995; Laufer et al. 2001; Behrman and Harkema 2000; Dietz et al. 1994; Dobkin et al. 2007; Dobkin 2005; van Hedel et al. 2006). The off loading of bodyweight allows for early intervention and plays a critical role in this rehabilitation process, enabling patients who have difficulties standing to begin gait training. In PD, patients typically are able to stand throughout most of the stages of the disease and they do not suffer from marked muscle weakness. The challenge in PD is to improve motor control, but not necessarily to target muscle strength. Perhaps, this explains why BWSTT has not been widely applied to PD in the past. Nonetheless, recent studies have demonstrated the potential of TT training in PD. Here we review this evidence and describe the rationale for applying TT to PD (and perhaps other disorders that share similar symptoms).

Gait disturbances are an integral part of the clinical manifestation of PD and among the most disabling symptoms of the disease. The gait of patients with PD is typically marked by reduced speed, shortened stride length, and longer double support phase (Ebersbach et al. 1999; Sofuwa et al. 2005; Morris et al. 1994). In addition, gait dynamics are characterized by exaggerated stride-to-stride variability (Blin et al. 1990; Hausdorff et al. 1998; Schaafsma et al. 2003; Baltadjieva et al. 2006). This high

T. Herman · N. Giladi · J. M. Hausdorff (✉)
Laboratory for Gait and Neurodynamics, Movement Disorders
Unit and Parkinson Center, Department of Neurology,
Tel-Aviv Sourasky Medical Center, 6 Weizman Street,
64239 Tel Aviv, Israel
e-mail: jhausdor@bidmc.harvard.edu

J. M. Hausdorff
Department of Physical Therapy, Sackler Faculty of Medicine,
Tel-Aviv University, Tel Aviv, Israel

J. M. Hausdorff
Division on Aging, Harvard Medical School, Boston, MA, USA

N. Giladi
Department of Neurology, Sackler Faculty of Medicine,
Tel-Aviv University, Tel Aviv, Israel