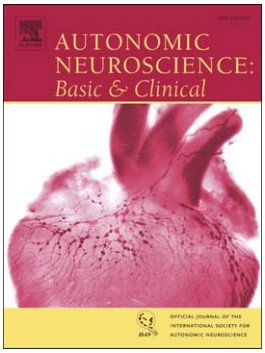

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M. De Couck, R. Cserjesi, R. Caers, W.P. Zijlstra, D. Widjaja, N. Wolf, O. Luminet, J. Ellrich, Y. Gidron

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Effects of short and prolonged transcutaneous vagus nerve stimulation on heart rate variability in healthy subjects

De Couck, M.[1,2], Cserjesi, R.[3], Caers, R.[4], Zijlstra, W.P.[5], Widjaja, D.[6], Wolf, N.[7], Luminet, O.[8], Ellrich, J.[9,10], Gidron, Y[1,11,12].

[1] Vrije Universiteit Brussel, Mental Health and Wellbeing Research Group, Brussels, Belgium
2 Odisee University College, Department of Health, Aalst, Belgium
3 Eötvös Loránd University, Health Psychology, Budapest, Hungary
4 KULeuven, Work and Organisation Studies, Brussels, Belgium
5 Department Methodology and Statistics, Center of Research on Psychology in Somatic diseases (CoRPS), Tilburg University, the Netherlands.
[6] KULEuven, Department of Electrical Engineering, ESAT-STADIUS Center for Dynamical Systems, Signal Processing and Data Analytics, KU Leuven, Medical IT, iMinds, Belgium.
[7] Cerbomed GmbH, Medical Valley Center, Erlangen, Germany
[8] Université catholique de Louvain, Louvain-la-Neuve and National Fund for Scientific Research (FNRS-FRS), Louvain, Belgium.
[9] Aalborg University, Medical Faculty, Department of Health Science and Technology, Aalborg, Denmark
[10] University of Erlangen-Nurenberg, Medical Faculty, Institute of Physiology and Pathophysiology, Erlangen, Germany
[11] SCaLab, University Lille 3, Lille, France
[12] Centre Oscar Lambret, Lille, France

Abstract

The vagus nerve is strategically located in the body, and has multiple homeostatic and health-promoting effects. Low vagal activity predicts onset and progression of diseases. These are the reasons to activate this nerve. This study examined the effects of transcutaneous vagus nerve stimulation (t-VNS) on a main index of vagal activity, namely heart rate variability (HRV). In Study 1, we compared short (10 min) left versus right ear t-VNS versus sham (no stimulation) in a within-subjects experimental design. Results revealed significant increases in only one HRV parameter (standard deviation of the RR intervals (SDNN)) following right-ear t-VNS. Study 2 examined the prolonged effects of t-VNS (1 hour) in the right ear. Compared to baseline, right-t-VNS significantly increased the LF and LF/HF components of HRV, and SDNN in women, but not in men. These results show limited effects of t-VNS on HRV, and are discussed in light of neuroanatomical and statistical considerations and future directions are proposed.

Introduction

The vagus nerve, the tenth cranial nerve, has important physiological and homeostatic roles because of its strategic location and multiple functions in the body. This nerve contains both afferent (sensory) (80%) and efferent (motor) (20%) pathways. The sensory vagal pathways terminating in the nucleus of the solitary tract transmit a wide range of signals to the brain, including cardiac, digestive and immunological signals [1]. The motor pathways descend from the nucleus ambiguus and nucleus dorsalis nervi vagi in the brainstem to many visceral organs including the lungs, heart, pancreas and gastrointestinal tract, bridging these organs with the central nerve system (CNS) [1].