Physiological Effects of Deep Touch Pressure on Anxiety Alleviation: The Weighted Blanket Approach

Hsin-Yung Chen1† Hsiang Yang2† Huang-Ju Chi3 Hsin-Ming Chen24,5,6,*

1Department of Occupational Therapy & Graduate Institute of Clinical Behavioral Science, College of Medicine, Chang Gung University, Taoyuan 333, Taiwan, ROC
2Department of Dentistry, National Taiwan University Hospital, Taipei 100, Taiwan, ROC
3Dementia Center, Chang Gung Memorial Hospital-Taoyuan, Taoyuan 333, Taiwan, ROC
4Department of Dentistry, National Taiwan University, Taipei 106, Taiwan, ROC
5Graduate Institute of Clinical Dentistry, National Taiwan University, Taipei 106, Taiwan, ROC
6Graduate Institute of Oral Biology, National Taiwan University, Taipei 106, Taiwan, ROC

Abstract

The application of deep touch pressure (DTP) has been suggested to provide positive effects on anxiety modulation. However, empirical and theoretical evidence linked to the clinical effects of DTP are relatively rare. This study conducts a quantitative analysis of behavioral assessments and performs physiological measurements, including those of electrodermal activity and heart rate variability, to understand the modulation of the autonomic nervous system (ANS), and the orchestration of sympathetic (SNS) and parasympathetic nervous systems (PsNS). The results suggest that the activation of PsNS plays a critical role in ANS modulation. This study provides physiological evidence to support the positive clinical effects of DTP for reducing anxiety in dental environments.

Keywords: Deep touch pressure (DTP), Anxiety, Heart rate variability (HRV), Electrodermal activity (EDA)

1. Introduction

Deep touch pressure (DTP) is generally referred to as a form of tactile sensory input, which is often provided by holding, stroking, hugging, swaddling, and squeezing. It can calm people who are anxious and thereby improve their coping behavior for adaptation [1-3]. The application of DTP is usually used to manage the anxiety of clients with cognitive developmental disorders, sensory modulation disorders, or psychological disorders [1,2,4]. In clinical applications, DTP intervention is a non-invasive and easily applied approach, with the client not required to have a high level of cognitive function and attention [2,3]. Therapeutic approaches related to DTP intervention modulate physiological (through proprioceptive input from the central nervous system) and psychological (calm the client) status [2]. Research has indicated that DTP intervention can increase the quality of life of patients suffering from anxiety, pain, and unrest, including individuals with developmental disability, dementia, attention deficits, and non-specific special needs [5-7]. Several devices have been designed to provide continuous DTP on the lateral and dorsal parts of the body for reducing stereotypic, self-stimulatory behavior for clinical applications [1-3]. The weighted blanket (WB) is used as a DTP intervention tool for sensory modulation. It has been increasingly employed in acute mental health care settings for crisis intervention, preparatory purposes, and as it gives subjects the feelings of safety, relaxation, and comfort [4,8]. For patients with high levels of anxiety or arousal, DTP intervention acts as a calming or focusing agent to increase activity in the parasympathetic division of the autonomic nervous system (ANS) [6]. When using a WB as a calming modality, adult subjects have demonstrated lower activity in the sympathetic division of the ANS, as reflected by electrodermal activity (EDA) [4,8]. Although a stabilizing effect was observed after the application of WB during behavioral assessments, quantitative weight of loading to the therapeutic effect is relative rare in previous studies. In addition, it is known that ANS function includes the activation of the sympathetic nervous system (SNS) in association with the relative effects of the parasympathetic nervous system (PsNS) [9]. However, few studies have used physiological variations to understand the contribution of the ANS related to anxiety performance [10]. Systematic theoretical research on the contribution of the ANS to neurobehavioral and neurophysiological effects of DTP is limited.

Heart rate variability (HRV) has been identified as a useful parameter for investigating the effect of heart rate...