Evaluating the Impact of Digital Tool Utilization in Dentistry on Burnout Syndrome Among Dentists: An Entropy Analysis and AI-Driven Approach

Hossam Dawa [1,2], José Neves [1,3] and Henrique Vicente [3,4,5,*]

1 IA&Saúde—Unidade de Investigação em Inteligência Artificial e Saúde, Instituto Politécnico de Saúde do Norte, CESPU, Rua José António Vidal, 81, 4760-409 Famalicão, Portugal; hossam.dawa@cespu.pt (H.D.); jneves@di.uminho.pt (J.N.)

2 UNIPRO—Oral Pathology and Rehabilitation Research Unit, University Institute of Health Science, CESPU, Avenida Central de Gandra, 1317, 4585-116 Gandra, Portugal

3 LASI—Laboratório Associado de Sistemas Inteligentes, Centro Algoritmi, Universidade do Minho, Campus de Gualtar, Rua da Universidade, 4710-057 Braga, Portugal

4 Departamento de Química e Bioquímica, Escola de Ciências e Tecnologia, Universidade de Évora, Rua Romão Ramalho, 59, 7000-671 Évora, Portugal

5 LAQV REQUIMTE—Laboratório Associado para a Química Verde da Rede de Química e Tecnologia, Universidade de Évora, Rua Romão Ramalho, 59, 7000-671 Évora, Portugal

* Correspondence: hvicente@uevora.pt

Abstract: In the high-pressure environment of dental practice, dentistry burnout syndrome frequently manifests as emotional exhaustion, depersonalization, and reduced professional fulfillment. While traditional methods for assessing dentistry burnout syndrome often overlook the complex dynamics of stress factors, this study specifically aims to predict burnout syndrome utilizing entropy and artificial intelligence to verify whether digital tools can alleviate burnout levels among dental professionals. The methodology used incorporates ideas from thermodynamics to facilitate reasoning and data representation. Data were obtained through a questionnaire exploring four key areas, which integrated job satisfaction, artificial intelligence-powered tools, time and communication, and patient expectations. The cohort included 126 dental professionals aged 25 to 65, with a mean age of 39.2 ± 9.5, comprising both genders. An artificial neural network model is proposed, delivering an accuracy greater than 85% to predict the impact of digital tools on dentistry burnout syndrome. The findings suggest that digital tools hold substantial promise in reducing burnout levels, paving the way for improved early detection, prevention, and management strategies for dentistry burnout syndrome. The study also demonstrates the transformative potential of integrating entropy analysis and artificial intelligence in healthcare to provide more refined and predictive models for managing work-induced stress and burnout.

Keywords: dentistry; burnout; artificial intelligence; machine learning; entropy; artificial neural networks