

Digital Human Modeling and Simulation to Correct Work Postures in Dentistry

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Abstract

The main objective of this paper is to design a dentists' workspace for optimal performance using JACK, developed by Siemens Corporation (Siemens PLM Software Inc.,) is a Digital Human Modeling (DHM) software package capable of simulating human involved in any number of tasks and performing ergonomic analysis. Dentists all over the world are suffering from Musculoskeletal Disorders (MSDs) that are resulted by improper work postures, repetitive tasks, and forced positions for longer time. Thus, to reduce the effects of MSDs among dentists, ergonomic assessments have been implemented to evaluate their work postures and determine the risks at their workspaces. JACK provides some design tools such as Rapid Upper Limb Assessment (RULA) and Ovako Working Analysis System (OWAS) for performing ergonomic analysis of virtual products and work environments. OWAS and RULA are the ergonomic assessments that are used to examine the work postures and the MSDs for dentists resulted by the improper postures by simulating their postures on JACK. By using the results of OWAS and RULA, workspaces of the dentists are redesigned and their postural angles and positions are modified. The final analysis of OWAS and RULA showed that improvements were significant to reduce MSDs while the dentists perform their tasks.

Keywords

Digital Human Modeling, Simulation, Rapid Upper Limb Assessment (RULA), Ovako Working Analysis System (OWAS), Workspace analysis, Ergonomics for Dentist

Biographies

Dana Ahmad holds a degree in Bachelor of Science in Industrial Engineering in American University of the Middle East-AUM

Sarah Hashem holds a degree in Bachelor of Science in Industrial Engineering in American University of the Middle East-AUM.

Kareem Abbady works as Lab Engineer at American University of the Middle East-AUM and holds a degree in Bachelor of Science in Mechanical Engineering from Alexandria University. He worked as a mechanical engineer in maintenance and operations for some companies. He has a certification from National Examination Board in Occupational Safety and Health (NEBOSH) international general certificate and Occupational, Safety and Health Administration (OSHA). He has certifications in 3D modeling from Autodesk (AutoCAD software) and SolidWorks Corp.

Suat Kasap has degrees in electrical-electronics engineering and industrial engineering. He received his Ph.D. in Industrial Engineering from the University of Oklahoma. His research interests are in human factors and ergonomics, occupational safety and health, work and process analysis, technology and innovation management, multi-criteria decision making, financial engineering, data mining, and modeling, analysis, and optimization of complex engineering problems. He worked in different Industrial Engineering Departments of the American

University of Middle East, University of Turkish Aeronautics Association, Hacettepe University, and Çankaya University as an assistant professor. He has taught courses on Work Analysis and Design, Ergonomic Work Analysis, Cognitive Ergonomics Work Analysis, Safety Engineering, Technology and Innovation Management, Management of Information Systems, Introduction to Optimization and Modeling, Deterministic Models of Operation Research, Project Management, Multi-criteria Decision Making.