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Physical factors investigation on surgical dexterity parameters using computer-based assessment system

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Abstract:
Surgical dexterity is one of the crucial metrics for evaluating candidates during surgical residency training. Many factors influence surgical dexterity performance, but they are not studied in depth. Hence, the objective of this study is to investigate the correlation between factors and surgical dexterity performance with the aid of a computer-based assessment system. A custom data acquisition module was developed, namely the "Green Target Module," to acquire positional data of hand movements from the subjects when controlling a cursor in a 3D virtual reality (VR) scene. The positional data were recorded and extracted into seven objective parameters, which are motion path length, the economy of movement, motion smoothness, motion path accuracy, motion path precision, endpoint accuracy, and endpoint precision. Body posture, magnification, and handedness were investigated to figure out a preferable setup for better performance. A total of thirty-four subjects from different surgical backgrounds were recruited for the experiments. Fourteen trials were recorded in each test, and every subject was required to complete eight tests with different experimental configurations. Results showed that endpoint accuracy while sitting was significantly better than standing. Using 10x magnification during surgical dexterity assessment showed significantly better performance outcomes than 1x magnification. Performing dexterity test using dominant hand also showed significantly better when compared to non-dominant hand.