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## Diego F Villegas

Universidad Industrial de Santander, Colombia

### Loss of handgrip force due to emulated finger amputations

Hands are strongly associated with sense of touch. Finger allows the hand to perform a lot of different activities. Therefore, losing part of a finger will change the biomechanics of the grip (Smith, 2007). Finger amputation is a surgical procedure to remove the phalanx involve in a trauma, which most of the time is a result of accidents. The motivation for this study was the difficulty of finding a group of finger amputees with different type of finger amputation. Then, this study seeks to establish the combination of finger amputation which is more critical in terms of losing handgrip force. Total finger amputation was not considered in this study. A cylindrical mechanical device was designed and built to emulate different eleven different combinations of finger amputations. It consists of eight gates which open by means of a motorized gear depending of what combination will be used to emulate amputated phalanx. A total of 10 adult subjects (five women, five men), right-handed, average height and weight, palm length less than 112 mm were used for this study. Subjects with muscular lessons, amputations, or any physical problem in hands or forearm did not participate on this study. Although several studies have found the force on each phalanx, or loss of handgrip in natural finger amputations, none of them had emulated finger amputations. Our results strongly agree with those found by Kong (Kong, 2005). Men handgrip force was found to be greater than women. However, handgrip force is reduced in 62% and 48.55% for men and women respectively in a combination including the distal and middle phalanx for index and middle fingers. Some of the results were expected and agree with previous studies. Notice that finger amputations in men are more critical than women, which suggest gender differences in hand biomechanics. This study will aid in the development of finger prosthesis, and hand rehabilitation.

### Biography

Diego F Villegas is an Associate Professor in Mechanical Engineering. He obtained his PhD degree 4 years ago from Michigan Technological University. He has about 8 years of experience in the biomedical field, working on experimental and computational biomechanics. He has published about 6 articles in reputed biomedical journals. He is currently running undergraduate and graduate projects on prosthesis, orthosis, medical devices using computational and analytical tools.

[dfvilleg@uis.edu.co](mailto:dfvilleg@uis.edu.co); [dfvillegas@hotmail.com](mailto:dfvillegas@hotmail.com)

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