

# COMPARISON OF USE OF BACKREST AND FOREARM SUPPORT WITH A STANDARD WORKSTATION AND A WORKSTATION WITH A BOARD ATTACHMENT

Sohaila El Sagheir and Geneviève Dumas

Department of Mechanical and Materials Engineering, Queen's University, Kingston, Ontario

e-mail: [elsagheir@me.queensu.ca](mailto:elsagheir@me.queensu.ca)

## INTRODUCTION

Lower back pain and upper extremity disorders are commonly associated with computer work. Forearm support on the work surface has been considered as a strategy to prevent these problems[1]. A commercial workstation board attachment (Life with Ease), previously known as the Butterfly Board, is claimed to promote use of back rest and forearm support. The objective of this study was to monitor this usage for the Butterfly Board and compare it to a standard workstation.

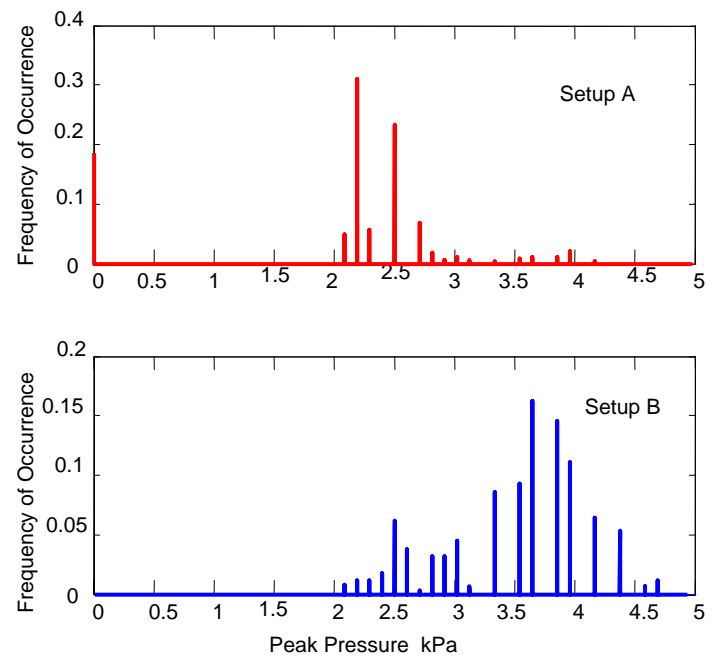
## METHODS

Twelve participants (females, age 18-45) with no previous history of musculoskeletal diseases were tested on two workstation setups: (A) standard workstation with adjustable chair and desk height, (B) workstation with the Butterfly attachment board. Both workstations were ergonomically adjusted according to Canadian Guidelines[2]. Three Novel<sup>TM</sup> Pressure mats (Novel, Munich, Germany) were attached to the chair back and participant's forearms. Each participant performed a standard task involving mouse and keyboard use for 20 minutes on each setup (order alternated between participants). Participant's motion was captured by a synchronized video camera. Amplitude Probability Density Function (APDF) for peak pressure were determined at levels 10%, 50% and 90% by recording the frequency of occurrence of the maximum pressure values (peak pressure) at each time frame and determining the percentage of occurrence of zero pressure values per setup (Figures 1-5). Area of contact with the pressure mats and center of pressure path length were also compared. Center of pressure trajectory patterns were visually compared between the 2 setups.

## RESULTS AND DISCUSSION

For the **Back**, the backrest was used most of the time with both set-ups (A: 84%, B: 98%) but slightly more with the Butterfly Board ( $p<0.05$ ). The mean peak pressure was also larger with the Butterfly Board ( $p=0.04$ ). There was no significant difference in area of contact or in center of pressure path length during the task between the two set-ups.

For the **Forearms**, there was no significant difference in resting time between the two set-ups. Peak pressure was significantly higher with the standard workstation for both the right ( $p=0.02$ ) and the left ( $p=0.004$ ) forearms. There was no significant difference in the mat area of contact for either forearm and for the center of pressure path length for the right forearm. Center of pressure path length was larger while using setup B for left forearm ( $p=0.01$ ).



**Figure 1:** Frequency of occurrence (%) of Peak pressure for the back-Participant (4)

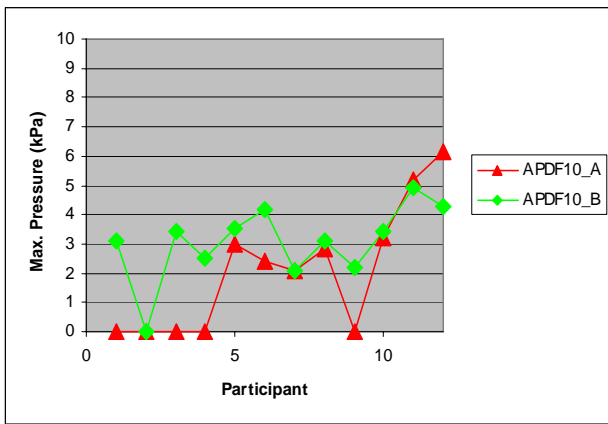


Figure 2: APDF 10% for the back-P(max)

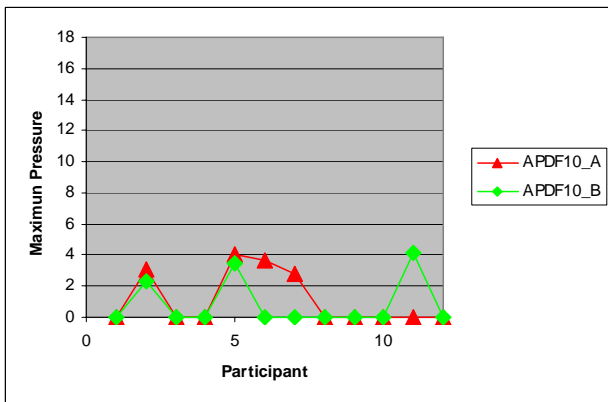


Figure 3: APDF 10% for the Left forearm-P(max)

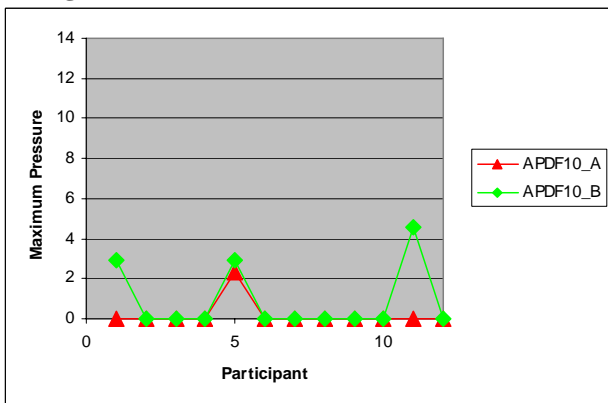


Figure 4: APDF 10% for the right forearm-P(max)

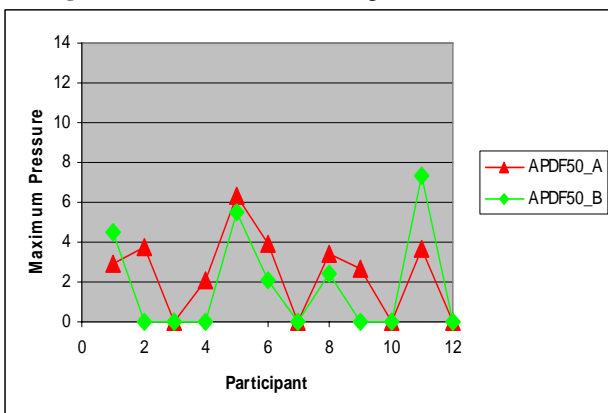


Figure 5: APDF 50% for the right forearm-P(max)

Forearm data were also analyzed with video motion analysis, to account for the resting location by choosing a certain frame on the pliance software that represents peak pressures exerted by both forearms then comparing it to the same frame number cut from the video (frame to frame analysis) to determine the pattern of resting and its location. This was done for the same task for each setup as shown in figures 5 and 6. The participants were found resting on the desk with their wrist while using setup (A), they were found utilizing the forearm support while using setup (B).



Figure 6: Video motion analysis-setup (A)



Figure 7: Video motion analysis-setup (B)

## CONCLUSIONS

The results demonstrated significantly higher usage of back rest with the Butterfly board though the difference was small. From video and pressure data analysis, the Butterfly board seemed to reduce points of excessive pressure at the wrist and elbow areas during computer work, but not to provide longer resting time. The results are consistent with EMG and posture data of a previous study of the same set-ups [3].

## REFERENCES

- [1] Feng Y. et al. *Ergonomics* **40**, 834-848 1997.
- [2] Guidelines on Office Ergonomics. *CSA-Z412 International* (2006).
- [3] Dumas G.A. et al. *Ergonomics* **51**, 1735-1756, 2008.

## ACKNOWLEDGEMENTS

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