VIDEO EVALUATION OF DISTAL UPPER EXTREMITY POSTURE

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INTRODUCTION

Limited tools are available to assess injury risk of the distal upper extremity. Observational posture-based tools are most commonly used in the workplace to quantify risk of injury because they are practical and provide reliable measures (Bao et al., 1999). Most of these assessment methods require onsite observation or video capture and posturing-sampling strategies to approximate a still-frame image representative of the task. However, several sampling techniques, including extreme, average and most frequently occurring postures, are reported in the literature and often predict different results (Bao et al., 1999). Also, posture-based observation methods for the wrist and forearm continue to be applied in the workplace without validation of their posture classification schemes (Lowe, 2004).

To eliminate posture sampling dependency from injury risk predictions researchers have employed real-time posture-based observation methods with low-to-moderate reliability (Burt & Punnett, 1999). It has been suggested that accurate and reliable observations were limited since too many body joints and posture categories were required to adequately code posture (Bao et al., 1999). However, slow motion video playback while focusing on individual joint movements might allow observers to reliably code posture. The purpose of this study was to test the effects of video playback speed (real-time, half-time and quarter-time) and number of representative bins on observational outcomes.

METHODS AND PROCEDURES

Eight graduate students with previous experience in human movement observation participated in this study. Occupational videos were cut to include 3 to 5 cycles (approximately 20 seconds) of automotive seat assembly tasks. An adaptable observation software suite (Observer 6.0, Noldus Information Technology, VA, USA) was used to code forearm pronation/supination, wrist flexion/extension, wrist radial/ulnar deviation and hand postures from video at three playback speeds (real-time, half-time, quarter-time) and two different categorical scales (6 bins, 3 bins) for flexion/extension (Figure 1).

Figure 1. Example time series data of angular wrist flexion/extension displacement across three playback speeds with 6 bins.

RESULTS

Preliminary results demonstrated an effect of video playback speed on observed posture categorical ratings (Figure 2). Using a 6-bin scheme to catalogue wrist flexion/extension, real-time analysis appears to result in fewer postural observations and increased...
disagreement when compared to quarter-time analysis (Figure 2a). However, the effect of speed is diminished when percent duration is considered (Figure 2b). Using a 3-bin scheme, both count and percent duration agreeability are improved across quarter-, half- and real-time video analysis (Figure 2c, 2d).

DISCUSSION

These results suggest that slower playback speeds might not significantly improve rater ability to classify postures during continuous time video analysis. The application of this finding to ergonomic tool development could drastically reduce analysis time associated with current video-based frame-by-frame procedures.

Also, fewer bins appear to improve posture coding agreement for flexion/extension trials.

This finding is consistent with research conducted by Lowe et al. (2004). However, future research is required to further investigate the tradeoff between precession and misclassification with categorical posture coding.

REFERENCES

Bao S et al. (1999). *Ergonomics* 50 (12); 2118–2136.

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**Figure 2.** Recorded mean counts and percentage durations with standard error of the mean across wrist flexion/extension trials with three playback speeds and two posture classification schemes: a.) counts over a six bin classification scheme; b.) % duration over a six bin classification scheme; c.) counts over a three bin classification scheme; d.) % duration over a three bin classification scheme. Bin abbreviations are as follows: F – flexion; E – extension.