

Prioritizing Symptoms of CTDs for the Design of Warning Labels

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1. Introduction

In recent years, considerable attention has been given to computer keyboards as a risk factor for development of cumulative trauma disorders (CTDs) (e.g., Hales, Sauter, et al., 1994). In the U.S., several major computer manufacturers have had lawsuits filed against them by keyboard users; one of these lawsuits was successful using *failure-to-warn* tort theory (CTDNEWS, 1997). Currently at least three manufacturers in the U.S. place warning labels on the underside of their keyboards with the intended purpose of increasing users' *awareness* of the potential for developing CTDs (CTDNEWS, 1994). Although these warnings encourage users who perceive any discomfort or pain to promptly see a health care provider, the content of the warnings tends to focus on risk factors for CTDs, for example, exposure to "... long periods of repetitive motion ..." (CTDNEWS, 1994), rather than the symptoms an operator might experience. Some warning labels refer users to accompanying documentation, e.g., the users' manual, for more information on recommended work practices. It is important for operators to know what symptoms to look for so that they can determine whether they are possibly developing a CTD and to catch problems early before they become more serious. It also is important that the effectiveness of the warnings be evaluated. The purpose of the present study was to determine and then evaluate potential symptoms of CTDs in an effort to ascertain the best ones to include on a keyboard warning label or on a posted placard. Such information would serve to alert computer operators if a related health problem begins to develop so that some type of intervention can be implemented such as changes in workstation design, user posture, or the seeking the advice of a health care provider.

2. Method

Initially, a list of symptoms of CTDs was compiled from the ergonomics and medical literature. An effort was made to include terminology used by health professionals as well as individuals affected by CTDs. Thus, whereas a health professional might record a symptom as *tingling*, the affected person might refer to this sensation as "pin-and-needles." A few signs of CTDs, i.e., degeneration of thumb muscles and swelling also were included; herein we refer to all terms evaluated as "symptoms."

The compiled list was given to 14 individuals with expertise in treating and/or dealing with (e.g., workstation design) persons with CTDs. Occupational physicians comprised half of the group; the remainder included occupational health nurses, physical therapists, and ergonomists with an average of 6.4 years experience. Participants were asked to rate each item or "symptom" on eight-point scales (1 = minimum and 8 = maximum quantity) on three dimensions: *Time of Onset*, *Frequency* and *Importance*. The questions and anchors were as follows: (a) "When does each symptom typically appear in the course of cumulative trauma disorders?" ("early onset" = 1, "late onset" = 8, "mid-onset" = between 4 and 5); (b) "How frequently do people with cumulative trauma disorders report each symptom?" ("not frequent (rare)" = 1, "extremely frequent (all)" = 8, and "moderately frequent" = between 4 and 5); and (c) "How important is each symptom in making an accurate diagnosis or prognosis?" ("not important" = 1, "extremely important" = 8, and "sometimes important" = between 4 and 5).

3. Results

Table 1 shows a summary of the ratings for each term. The symptoms rated earliest in *Time of Onset* were discomfort, unpleasant sensation, aching, stiffness, cramping and pain. Pain was rated highest in *Frequency* followed by discomfort, numbness, unpleasant sensation, tingling, symptoms-worse-at-night, aching, difficulty pinching or grasping, pins-and-needles, tired-earlier, weakness, stiffness, burning, swelling fingers-feel-swollen, cramping and, lastly, degeneration of muscle. For *Importance*, the highest-rated symptoms were degeneration of muscle, followed by numbness, difficulty grasping, tingling, difficulty pinching, symptoms-worse-at-night, weakness, pain, pins-and-needles, burning, swelling, tired-earlier, aching, fingers-feel-swollen, stiffness, discomfort, cramping, and unpleasant sensation.

4. Discussion

Not surprisingly, pain, discomfort and related symptoms such as aching and cramping rated earliest in onset. Rated last were manifestations of motor nerve involvement such as weakness and difficulty pinching or grasping, and muscle degeneration, which usually occur later than sensory symptoms in carpal tunnel syndrome, for example (Feldman, Goldman and Keyserling, 1983). Although these symptoms were rated last for *Time of Onset*, they tended to be rated first for *Importance*. Thus, in an effort to catch symptoms early, it might make sense to use these early symptoms on a space-restricted warning label. "Discomfort" may be useful because it is concise and yet broad enough to include more specific terms such as "aching," "cramping," and "pain." Using "pain and discomfort" would be even more all-encompassing.

The mean ratings in this study provide a method for prioritizing message content so that for situations in which warning label space is limited, designers will have a better idea of what should be included, what could be excluded and what might be placed elsewhere, e.g., in an accompanying booklet. This information would be helpful in advising users about CTD symptoms so that they might seek help early and make changes that could prevent further physical damage.

Table 1
Average Ratings for *Time of Onset*, *Frequency* and *Importance* of CTD Symptoms*

Symptoms	<i>Time of Onset</i>	<i>Frequency</i>	<i>Importance</i>
Discomfort	1.5	5.5	3.3
Unpleasant sensation	2.3	5.1	2.8
Aching	2.5	4.9	3.7
Stiffness	2.7	3.9	3.5
Cramping	3.3	3.3	3.0
Pain	3.9	6.6	6.0
Pins-and-needles	4.0	4.3	5.9
Hands-feel-tired	4.4	4.2	4.3
Tingling	4.4	5.1	6.9
Swelling	4.6	3.8	4.8
Fingers-feel-swollen	4.8	3.6	3.7
Numbness	5.3	5.2	7.3
Burning	5.3	3.8	5.1
Symptoms-worse-at-night	6.1	5.0	6.6
Weakness	6.3	4.2	6.2
Difficulty pinching	6.7	4.7	6.8
Difficulty grasping	7.1	4.5	6.9
Degeneration of muscle	7.5	2.9	7.7

*Table is ordered by *Time of Onset* with lower numbers being earlier. For *Frequency*, lower numbers indicate lower frequency; for *Importance*, lower numbers indicate less important.

This study is the first step of a multi-phase project to develop a meaningful information system, such as a warning label or poster, that will alert computer operators of some of the early symptoms of CTDs that should not be ignored. In future studies we plan to ask individuals affected with CTDs to evaluate CTD-related symptoms in a similar fashion.

5. References

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