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CLINICAL CARE UPDATE

OUTCOMES OF MOUSE-KEYBOARD TRAINING

In March 2002, the Clinical Care Update featured a two-part article on a new mouse and keyboarding training program designed to reduce the occurrence of computer-related repetitive strain injury. In this two-part article, Dr. Norman J. Kahan reports on outcomes from research conducted on the technique.

By Norman J. Kahan, M.D.

A significant number of computer-related injuries (RSI) are caused by improper work habits and poor computer operator technique despite a well-designed ergonomic office environment (Punnett 1994). The MouseKeyDo™ System was developed in response to this need. (Refer to *Clinical Care Update,* March 11 and 25, 2002.)

The MouseKeyDo™ System is a training program designed to treat and prevent computer-related RSI. The system is based on clinical practice, research, and scientific methodology. The system features a self-paced interactive training manual and video/CD-ROM that teaches a complete set of inputting techniques for mouse, keyboard, and laptop work.

Researchers conducted a three-phase investigation into the efficacy of the MouseKeyDo™ System. According to the findings, patients had less pain and the same or improved function during mouse and keyboard work after undergoing the training program. The results indicate that early intervention that focuses on the worker's habits and techniques at the computer - rather than on workstation and equipment design - results in lasting changes in postural habits as well as in muscle and joint patterns of work. The research shows that these changes afford the computer user a higher level of productivity without pain.

Research Methodology

Researchers conducted a three-phase investigation into the efficacy of the MouseKeyDo System™ using volunteers who had pain, perceived pain or felt they were at risk of injury.

Phase I evaluated the treatment outcome of 102 workers' compensation claimants who underwent the training program in a clinic-based setting.

Phase II evaluated the training experience of 81 injured employees using the method in a worksite-based intervention program. Each subject was evaluated before, after, and at 1.3 years following the training.

Phase III examined muscle activity as measured by surface electromyography (EMG) and joint ranges of motion in the upper limb and neck in seven injured subjects (a subset of the 81 in Phase II) while they performed keyboard and mouse work. Simultaneous measurements of these variables were taken for each subject before and after the training program. Correlation of pain and function allowed for an evaluation of the effectiveness of the technique.

Summary of Findings

Among Subjects in Phases I and II of the study:

1) 85 percent of the clinic-based patients reported less pain and the same or improved function during mouse and keyboard work after undergoing the training program (Phase I). Similar findings were reported by 89 percent of the employees in the worksite-based prevention program (Phase II), and 100 percent of the subjects in the surface EMG/joint range of motion study (Phase III).
2) On average, patients treated in a clinic-based setting reached maximal medical improvement and were declared "permanent and stationary" at six months. After training, the average time that a patient could work on a keyboard increased by one hour. Those unable to type initially due to pain could type 3.6 hours after undergoing training.
3) Group training was effective in the worksite-based prevention program, with 89 percent of the employees reporting a decrease in overall pain.
4) There was high group program satisfaction at the worksite.
5) Persistence of skill, less pain, and the same or better function was reported in the worksite-based prevention program at 1.3 years follow up.
6) Self-paced interactive training programs offered flexibility in learning computer safety technique and were relatively inexpensive to conduct.

Among subjects in Phase III of the study:

1) 100 percent reported less pain in all body parts recorded involving the neck, forearm, and wrist after training.
2) Surface EMG decreased in the wrist and forearm muscles and increased in the neck, scapula, and trapezius muscles without increases in neck pain.
3) Joint range of motion changed toward mid-range. The wrist, elbow, and shoulder joints collectively

work in their most comfortable position (e.g. the middle of their full or capable ranges of motion). The avoidance of extreme angles, such as twisting the wrist sideways or reaching from the shoulder, allows motion to occur at the lowest level of joint stress and muscle tension without compromising productivity.

More About the Research

Phase I: Clinic-Based Outcome Program Design (N = 102)

Research Methods:

- Retrospective review of medical records (1/1/94-3/1/96) before and after the MouseKeyDo™ Training Program.
- Patients were evaluated before and after interventions by a physician who performed a functional history and a physical examination.

Intervention:

The training program was individually tailored to the patient's clinical presentation and included the following:

1) Diagnostic evaluation and medical management under the care of a physician and therapist.
2) Treatment for pain reduction.
3) Sitting posture and flexibility program.
4) Ergonomic evaluation.
5) Training in mouse and keyboard technique.

Measured variables:

- Subjective factors of pain (**Figure 1**: 0-10 maximum).
- Objective factors of pain. *(*Refer to *The Physicians' Guide: Medical Practice in the California Workers' Compensation System*, 1994.)
- Objective diagnostic tests.
- Work status (cumulative hours worked at keyboard/mouse per day).

Figure 1: Pain Levels (Subjective)

0-2: minimal (non ratable)

3-4: slight (some handicap)

5-7: moderate (marked handicap)

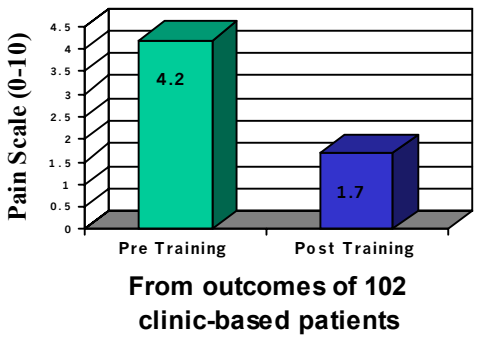
8-10: severe (precludes work)

Clinic-Based Outcome Results

At the outset of the study, the average pain level reported by individuals was 4.2. Upon completion of the program, the average reported pain level was 1.7 (**Figure 2**); 73 percent of the subjects trained reached a non-ratable (minimal) pain status. (A minimal pain rating from 0-2 constitutes an annoyance, but does not cause any handicap in the performance of work.) Furthermore, upon completion of the program, 85 percent of all individuals reported a reduction in pain. The average time course to reach a permanent and stationary status was six months.

Among the 102 subjects, 30 were referred directly to the training program by their employer and were able to start the training program approximately two months after the onset of symptoms. For the rest of the group, approximately eight months passed between symptom onset and the initiation of training.

Figure 2: Pain Levels Pre & Post Training



From outcomes of 102 clinic-based patients

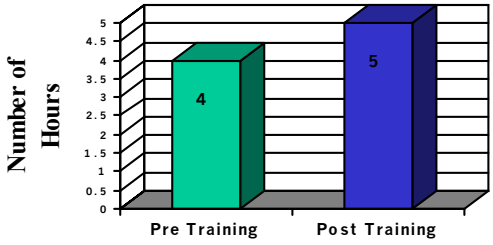
Among the earlier intervention group of 30 subjects, 93 percent reached a non-ratable (minimal) pain status; 90 percent reported an overall reduction in pain. The average time course to reach a permanent and stationary status for these individuals was 4.8 months.

Productivity and Work Status

Out of the group of 102:

- One subject reported a reduction in their daily typing hours upon completion of the program;
- 42 percent reported an increase in daily typing hours;
- 57 percent maintained pre-program typing capability;
- On average, an individual in the group prior to the program was typing four hours per day. Upon completion of the program, average daily hours of typing rose to five **(Figure 3).**
- While average keyboard use increased 1 hour, there was no degradation in the overall work status of individuals.
- Subjects who were unable to type due to pain before training were able to type 3.6 hours on average

Figure 3: Typing Hours Pre & Post Training



From outcomes of 102 clinic-based patients

Phase II: Worksite-Based Prevention Group Program Design N = 81

Research Methods:

A prospective study with patients self-reporting pain and function before, immediately after, and at 1.3 years following the MouseKeyDo™ training program.

Intervention:

The program consisted of 12 hours of group training with 12 student per group (six two-hour training sessions over a six-week period) in which subjects underwent the following:

1) Evaluation and management by a physician/therapist team.
2) Sitting posture and flexibility program.
3) Ergonomic evaluation.
4) Training in mouse and keyboard technique.

Measured Variables:

1) Self-reporting pain rating scale (0-10 maximum).
2) Self-reporting mouse and keyboard function (cumulative hours/day).
3) Self-reporting persistence of mouse and keyboard technique.

Subjects N = 81:

Experienced keyboard/mouse users with computer-related RSI who are able to work without job modifications.

Group Outcome Results:

In this study of 81 employees from the city of San Jose, worksite-based group training was provided. Employees underwent training led by a physician, ergonomist, and therapist. Training topics addressed posture, stretching, ergonomics, and mouse and keyboard technique. No medications were used for pain management. Subjects underwent approximately 12 hours of group training using an earlier, non-interactive version of the mouse and keyboard training materials.

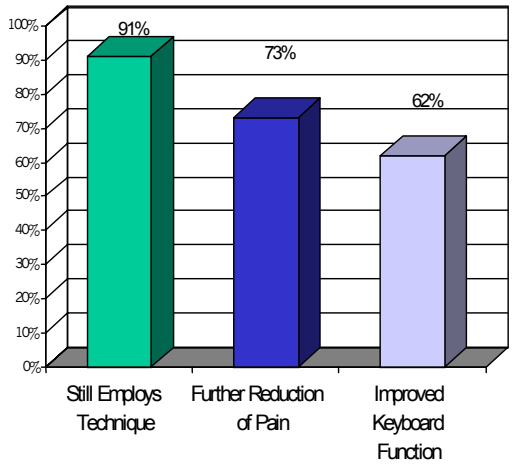
The average age of this group was 36, with ages ranging from 26 to 44. Participants worked an average of 6.5 hours per day. They typed an average of 60 words per minute. They had three or more areas of pain relating to wrists, elbows, and neck. Typical diagnoses included nerve entrapments and muscle and tendon disorders. On average, they had experienced pain for approximately two years prior to training. All volunteered to participate; 98 percent of the participants had discomfort associated with computer use.

Findings:

- Results of pain ratings before and after training showed that 89 percent improved after training. The level of pain declined from 3.0 to 1.5 for the subjects.
- 100 percent of participants felt that the MouseKeyDo™ training should be taken by colleagues. Of this group, 25 percent felt it should be required, 47 percent felt it should be recommended and 28 percent felt it should be optional.
- After 1.3 years, 91 percent of employees reported that they still employed the technique; 73 percent reported a further reduction in pain; 62 percent reported improved keyboard function. **(Figure 4.)**

Conclusion:

Figure 4: Percentage of employees reporting results 1.3 years after worksite-based training.



Outcome studies show the MouseKeyDo™ System is effective and employees continued to benefit from the program 1.3 years later, reducing the number of recurrences and flares.

Part II of this article will feature findings from Phase III of the research. Dr. Norman J. Kahan is director of Sports and Occupation Medical Associates, Cupertino, CA. He is board certified by the American Academy of Physical Medicine and Rehabilitation; njkahan@yahoo.com; 408-725-7277; www.mousekeydo.com. Dr. Kahan is scheduled to speak April 13 at the Ergonomics Roundtable in Sacramento, CA; May 3 at the American Occupational Health Conference in Kansas City, and May 14 at the California Society of Physical Medicine and Rehabilitation meeting in Las Vegas.

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