Assessing the Effects of Positive Feedback and Reinforcement in the Introduction Phase of an Ergonomic Intervention

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Resistance to change is common in ergonomic interventions, often resulting in negative consequences when the intervention's effectiveness is studied. A lab-based study assessed the effects of positive reinforcement during the intervention process. On Day 1 all participants performed a simple screw-driving task that placed stress on the cervicobrachial region through static loading. On Day 2 a control group received basic information about ergonomics and then performed the task using an ergonomic intervention that has been shown to reduce loading on these muscle groups. The experimental group received the same basic information but also received positive reinforcement while performing the task with the ergonomic intervention. Subjective task assessment surveys and body-part discomfort surveys were administered, and these, along with speed of performance, were assessed in both groups. The results showed a significantly ($p < .05$) more positive subjective impression of the intervention for the feedback group than for the control group (29%–57% improvement) with no real changes in either the performance or discomfort levels. Applications of this research include improving workers' acceptance of ergonomic interventions in industrial and other settings. The reinforcement technique evaluated in this paper has yielded consistently positive effects in our ongoing ergonomic intervention research.

INTRODUCTION

The motivation for ergonomics intervention research stems from statistics of the number and cost of recordable workplace injuries and from literature that has shown that ergonomic solutions can be effective countermeasures. Repetitive motion and overexertion illnesses/injuries cost industry an estimated $13 to $20 billion annually (American Federation of Labor-Congress of Industrial Organizations, 1997; National Institute for Occupational Safety and Health, 1996), and much of this cost is attributable to lost workdays. The review performed by the U.S. General Accounting Office (1997) revealed that the ergonomics approach to these problems yielded reductions in workers' compensation costs as well as the number of days injured workers were out of work and also improved employee morale, productivity, and quality.

Ergonomic intervention is the key component in this process in that it attempts to eliminate or reduce the exposure of the worker to the source of physical stress. The ergonomic intervention process achieves these goals by quantitatively evaluating jobs in the workplace, deciding which jobs or tasks pose an injury risk to the employees, and redesigning the job with the primary aim of reducing the prevalence of musculoskeletal disorders (MSDs) by reducing these exposures.

Goldenhar, LaMontagne, Katz, Heaney, and Landsbergis (2001) provided a three-step template for intervention research: development, implementation, and effectiveness assessment. The development phase begins with the identification of a job to be addressed and ends with the development of the industry-ready prototype. The effectiveness phase involves the evaluation of the intervention once it is in place and functioning

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at steady state. The middle phase, the implementation phase, can be challenging in that at the beginning of this phase the intervention is introduced to workers who may or may not have any problem with the job as it is currently designed and will often have reservations about changing their tools or work method, particularly if they are compensated on a production or piece-rate basis. To further complicate this process, there will often be a short-term reduction in productivity as the intervention is introduced and the worker begins to rethink the task technique to incorporate the new ideas into his or her work process. This process will often result in an immediate negative response from many workers and can lead to their withdrawal from the intervention process before it has really even begun.

This result is very unfortunate because often, once the workers have fully incorporated the tool/method into their work process, they will find not only improved ergonomics but also increased productivity. Experience has shown us that this initial resistance is dramatically reduced with time, and the individual will settle down to a more thoughtful evaluation of the intervention with an hour of use. The challenge is to find a way to encourage workers to continue to use the interventions through the "break-in" period so that they can begin to see the overall benefits.

One approach to this challenge that spans both the development and implementation phases of the intervention process is participatory ergonomics. In a participatory ergonomics process, the employee actively participates in the process of improving the ergonomics of her or his job (Imada, 1991). The major benefits of this approach are that (a) the employees are ones who are the most familiar with the job (work tasks, activities that create or exacerbate pain, ways to improve the job) and (b) if the employees are willing to participate and invest their time in helping with the design, it often means that they will have greater acceptance of any resulting solution (Imada, 1991). The participatory ergonomics approach has been shown to be an effective tool for increasing the acceptance of an intervention by those participating workers and illustrates that there are psychological and social aspects to the intervention process that need to be considered.

One limitation of the participatory approach is that not every worker who is going to be asked to use the intervention can possibly be involved in its development. Typically, a small team will be charged with solution development, and although the employees who participate in the new design may prove to accept the changes readily, other employees who are asked to use the intervention may not be so inclined because of the previously mentioned concerns (productivity, quality, inertia, independence, etc.). An approach that can be implemented when introducing a new idea (whether or not it is through the participatory approach) needs to be considered. One option (and the one considered in the current research) is to spend time with the individual worker at the beginning of the implementation phase and encourage him or her to work through the transition from the old to the new work technique.

One method of facilitating implementation is the use of feedback and positive reinforcement. In their review of occupational health and safety studies, Goldenhar and Schulte (1994) stated that an interdisciplinary approach, such as combining an engineering intervention with a behavioral one, strengthens the foundation for developing intervention research. This position is supported in an article addressing the future of intervention research by Rosenstock (1996), who argued that researchers must consider behavioral procedures, which attempt to influence worker knowledge, beliefs and behaviors. Finally, in a review of occupational injury intervention studies, Zwerling et al. (1997) documented two studies that considered feedback and reinforcement as an administrative intervention, and both had positive results. These studies, however, were focused on the occupational safety realm (not ergonomics) and used the technique of providing feedback to prevent accidents and to reduce laundry linen contamination. These studies did, however, provide further evidence for the potential benefits of feedback/reinforcement and provided support and motivation for the current study.

The specific aim of the present study was to examine the effects of positive feedback and reinforcement during the earliest phases of the implementation of an ergonomic intervention. It is hypothesized that those individuals receiving feedback and reinforcement during this introductory phase of an ergonomic intervention will have a more immediate positive response to the intervention than will the individuals without this feedback. If this hypothesis is found to be true, a new technique for helping to overcome the initial resistance so often encountered in the ergonomic intervention process will have been developed.

METHODS

Participants

Eight men and 8 women, 19 to 53 years of age (mean stature = 172 cm, *SD* = 10.1 cm), were recruited from the university population through the use of fliers as well as word of mouth. Participants were required to be 18 years of age, have normal or corrected-to-normal vision, have no history of chronic neck pain, and be able to stand for at least 1 hr at a time. They were told prior to participating that they would be compensated based on their performance of the task (piece-rate compensation).

Apparatus

The task performed in the experiment consisted of driving screws into and removing them from an aluminum block (Figure 1) using a cordless power screwdriver. The task was performed on a height-adjustable table that was adjusted such that the elbow was at 90° flexion when the participant was using the screwdriver. On Day 1 the participant performed this task by looking down at the workpiece directly (Figure 2). On the second day of the experiment the participant performed the task while looking into a "periscope" mirror configuration, designed to eliminate the static neck flexion (Figure 3). The height of the periscope was set to maintain a neutral neck posture. This experimental configuration and task is presented in detail in Lutz et al. (2001).

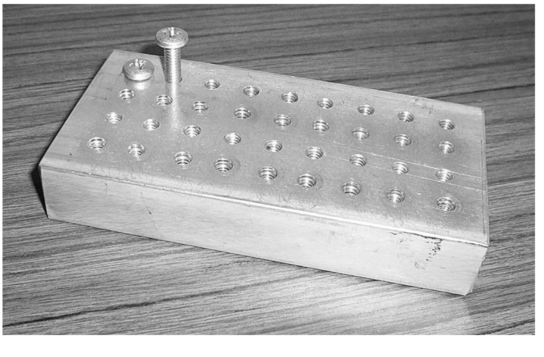

Figure 1. Aluminum block and type of screw used.

Experimental Procedures

The experiment took place over 2 days. The second session in each case took place within a week of the first session but not on the consecutive day. Each session lasted approximately

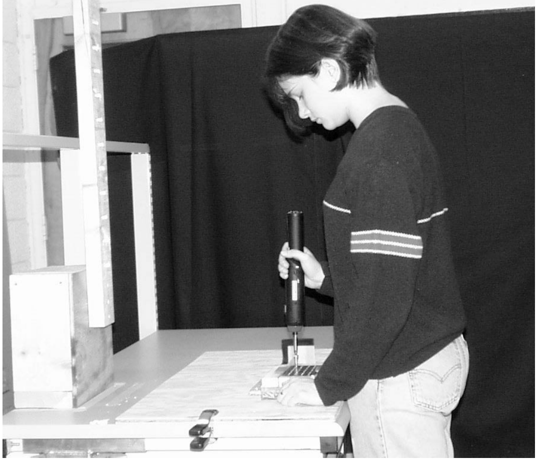

Figure 2. Person performing screw-driving task using the standard configuration (Day 1).

Figure 3. Person performing screw-driving task using the periscope configuration (Day 2).

90 min, which included 60 min for each testing period (performing the screw-driving task) and then 30 min on both days for preliminary and posttest activities.

Day 1. Upon arriving at the laboratory, the participant received a brief explanation about the experimental procedures and was shown the workstation and tools used. The participant was then asked to complete a baseline body-part discomfort survey modeled from that of Corlett and Bishop (1976). With the use of the standing elbow height gathered during anthropometric data collection, the workstation height was set and the "Day 1 Introductory Script" (Appendix A) was read out loud to the participant. Following the reading of this script, the participant was taken to the workbench and the experimenter demonstrated how to perform the screw-driving task. The participant then practiced the task for 30 min. While training, the participant was allowed to adopt her or his own style to complete the specified task. The training period was videotaped to better observe each individual method as well as each participant's learning progression.

At the end of those 30 min, the participant was stopped and the experimenter read the "Day 1 Performance Script" (Appendix B). This reminded the participant of the task objectives and explained that they were to perform the task under "simulated" working conditions for the next 30 min (they were paid $0.60 for each block completed within the allotted time). It should be noted that the task performed on Day 1 required a static, flexed neck posture that creates significant discomfort in the cervicobrachial region over the time frame studied (2.2 on a scale of 0–5 in 15 min, as shown by Lutz et al., 2001). The intervention introduced on Day 2 clearly addresses this issue but creates a more challenging visual work task. This task and intervention were specifically chosen for this study in an attempt to simulate an ergonomic intervention that provides effective ergonomics but has a potential downside that the participants would recognize. Upon completion of the testing session, the participant was asked to complete a second body-part discomfort survey as well as Task Assessment Survey 1 (described in the Data Collection Instruments section) and was then released.

Day 2. Upon the participant's arrival on the second day, the workstation was set up with the periscope intervention in place. The participant was instructed that the specific work activity was essentially the same but he or she was going to use the periscope to view the workspace. As on Day 1, the baseline body part discomfort survey was completed first. Upon completion of this survey, the participant was taken to the workstation and the experimenter recited the "Day 2 Introductory Script" (Appendix C).

Group 1: The control group. During the testing hour, the experimenter observed as the "ergonomist" from across the room but did not interact with the participant for the duration of the test session. At the 30-min mark, both screwdrivers were replaced to maintain adequate screwdriver power. At the end of the hour the participant filled out a body-part discomfort survey, completed the three task assessment surveys (described in detail in the Data Collection Instruments section), and was then released.

Group 2: The feedback group. The protocol for the feedback group was nearly identical to that for Group 1 with the exception of the ergonomist's role during the testing session and a brief addition to the "Day 2 Introductory Script": "I understand that learning a new routine can be difficult, especially after being so used to a previous method and now required to relearn the process. Therefore, throughout the morning, I will be talking with you at various times in an attempt to make the transition easier."

The experimenter made five verbal comments throughout the hour with the expressed interest of relieving the frustration of learning a new task. In doing this, the experimenter would reveal to the participant that the periscope was helping her or him physically, that her or his productivity was getting better, and so forth. The five scripts were as follows. Script 1 (5 min after they begin working): "Well, I can definitely see an improvement in your neck posture." Script 2 (10 min later): "I can see you're starting to develop a technique now. Your movements are becoming more fluid." Script 3 (15 min later): "So how are you feeling?" (Pause and wait for answer.) "I hope the periscope is making things more comfortable for you." Script 4 (15 min later): "I've been keeping track of your productivity, and I can really see an improvement across the hour. And I think you're still getting faster!" Script 5 (10 min later): "So how are you feeling?" (Pause and wait for answer.) "You look pretty comfortable with the task, and your productivity is still getting better!" It is important to note that the scripts were not recited verbatim, as it was intended to make them sound like casual observations, not a recited script. Overall, however, each participant in the feedback group received the same content at each point in time.

Data Collection Instruments

Video and survey responses were the main response measures in this study. Video was recorded of the participant performing the experimental tasks to gain accurate productivity data. Self-reported paper surveys were used to capture the subjective body-part discomfort data as well as the subjective assessments of the work tasks. The body-part discomfort survey asked the participants to place an *X* on those body regions (divided on the figure) that were uncomfortable and then rate their discomfort on a scale of 1 (*slight discomfort*) to 10 (*unbearable pain*).

A total of three surveys were designed to arrive at a subjective assessment of the work task. Task Assessment Survey 1 was administered after the completion of the experimental task each day and simply asked the respondent to assess (on a 5-point Likert scale) the following four categories: ease of use, comfort, accuracy, and productivity. The five points of the scale were *strongly disagree, disagree, neutral, agree,* and *strongly agree.* For example, one statement read, "The workstation configuration allowed me to easily complete the task." The participants were instructed to give their level of agreement to the question by circling one of the five choices, answering according to their experience of performing the task using the configuration on that day.

On the second day of experimentation, participants completed two additional surveys. Task Assessment Survey 2 was nearly identical to Task Assessment Survey 1, but this time the participant was asked to compare the two workstations' setups using the same four categories. As a result, the example statement given in the previous paragraph was reworded as "The periscope configuration allowed me to more easily complete the task," using the same rating system. Two additional questions were asked on Task Assessment Survey 2. The first asked the participants to rate on the 5-point scale their agreement with the statement "While getting used to the periscope, the *support from the ergonomist* was helpful," and the second directly asked the participants to rate on the 5-point scale their agreement with the statement "*Overall,* I would prefer to work with the periscope workstation setup." Finally, Task Assessment Survey 3 was a forced-choice survey that addressed each of the four areas (ease of use, comfort, accuracy, and productivity) but required the participant to choose between the standard configuration (Day 1) and the periscope configuration (Day 2). The final question on this survey asked the participants to rate on a scale of 1 (*not very willing*) to 10 (*very willing*) their response to the question "Looking at all aspects of the screw-driving task (ease of completion, comfort, accuracy, and speed), how willing would you be to use the periscope setup for the next 2 months while performing this task (assuming the other alternative would be the industry standard setup)?"

Experimental Design

Independent variable. Group type was the independent variable in the experiment. This variable consisted of two levels: the control group and the feedback group.

Dependent variables. Two types of dependent variables were collected during the study. The first dependent variable quantified performance on the screw-driving task. Total blocks completed during the experimental session and the time to complete each block were collected. The responses on the first two task assessment surveys were the responses (1–5) to each question, and the responses to Task Assessment Survey 3 were which configuration the participants preferred (1 = periscope configuration, 2 = no preference, 3 = industry standard configuration) along with their response (1–10) as to their willingness to use the periscope configuration for the next 2 months.

Data Processing

Video data were used to precisely quantify the time to complete each block during the data collection time frame. Only the last 30 min of the time on Day 1 was under the piece-rate system, so the average time to complete a block during this 30-min segment on Day 1 was compared with the average time to complete a block in the last 30 min of Day 2. In calculating this difference in performance, we subtracted the average time to complete one block on Day 2 from the average time to complete one block on Day 1. A positive number therefore represented an increase in performance.

The discomfort data gathered from the body-part discomfort survey ranged from 0 to 10 for each region. Zero was the value given if a participant did not report discomfort in that region. For each day, the difference in discomfort was calculated for each of the body parts by subtracting the preexperiment discomfort value from the postexperiment discomfort value, thus representing the increase in discomfort as a result of the task. A discomfort score was then obtained by subtracting the discomfort value on Day 2 from discomfort on Day 1 for each region. The score calculated in this way would show a decrease in discomfort from Day 1 to Day 2 as a positive value. The analysis data from Task Assessment Survey 1, which was also administered on both days, used a similar calculation (Day 1 value minus Day 2 value) to arrive at a comparative value. No calculations were necessary in the second and third subjective task assessment surveys, as these were administered only on Day 2.

Statistical Analysis

The performance data were analyzed through a one-way analysis of variance (ANOVA) comparing performance between groups. Throughout this and the remaining analyses, a probability of less than .05 indicated a significant difference. As the surveys are subjective and can be classified as interval scales, a nonparametric ANOVA (Kruskal-Wallis test) was performed.

RESULTS

The results of the ANOVA performed on the performance data showed no difference between the feedback and the control group in the change in productivity levels from Day 1 to Day 2. The level of reduction in productivity as a result of the intervention shown in the current study is consistent with that shown in the previous evaluation of this particular ergonomic intervention (Lutz et al., 2001). In addition, the profile of the learning curve of the intervention demonstrated in the current study (Figure 4) is also consistent with those previous results. Most pertinent to the current study, however, is the result that this reduction was not significantly affected by whether or not the participant received feedback on Day 2.

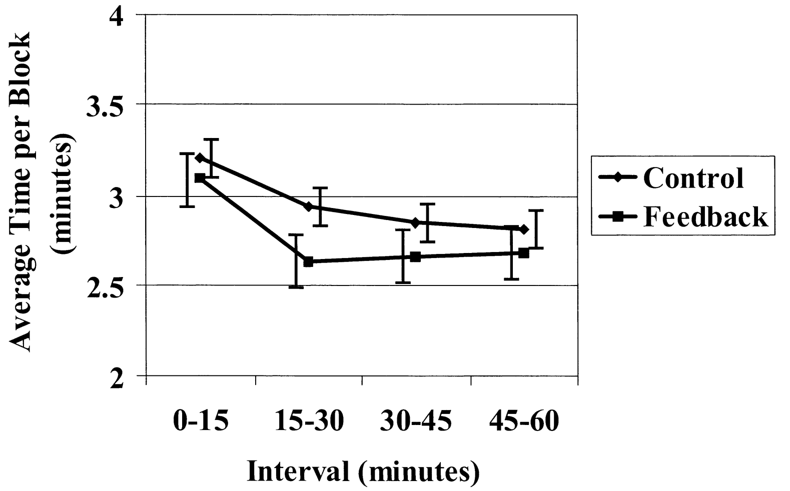

Figure 4. Average time to complete block plotted by time interval demonstrating the learning process on Day 2 (standard error bars shown).

The Kruskal-Wallis test used to evaluate all survey data generated mixed results. First, there was no significant effect of the independent variable on the discomfort data reported by the participants, indicating that one of the important measures used to assess the effectiveness of an ergonomic intervention is not tainted by an artificial effect generated by this feedback process. It should be noted that the Day 1 task did, in fact, generate discomfort in the neck with an average rating of 2.5 (out of 10) and that the periscope intervention did significantly reduce these discomfort levels to 0.5 (out of 10). The important result here, however, was that feedback did not significantly affect this response. No other discomfort rating changed significantly from Day 1 to Day 2, showing a very focused effect of the intervention.

The results with regard to the effect of the feedback did show a significant effect on some of the subjective responses related to the work task. Specifically, the results of Task Assessment Survey 2 show that participants receiving feedback had a greater perception of (a) accuracy, $p < .009$ (3.4 vs. 2.1 on the 5-point Likert scale), (b) quickness, $p < .048$ (3.6 vs. 2.5 on the 5-point Likert scale), and (c) ergonomist support, $p < .025$ (4.5 vs. 3.5 on the 5-point Likert scale) as compared with the control group. These differences are shown graphically in Figure 5. Of particular interest with regard to these significant results is the finding that for the questions regarding accuracy and quickness, the average response of the individuals in the control group was more negative than neutral (3 on the Likert scale), whereas the average response from the reinforcement group was more positive than neutral. Also of interest is the finding that none of the results from Task Assessment Survey 1 showed significance, indicating that the participants were better able to create relative judgments of the two workstations than to create absolute judgments. Finally, both groups thought the support provided through the interaction received was helpful in getting them used to the periscope, but the reinforcement group thought that the interactions were more helpful.

DISCUSSION

Performing ergonomic intervention research is a challenging endeavor. Skepticism from management, reluctance from shop-floor employees, and a general sense of inertia are challenges that often take blockbuster ergonomic solutions to overcome. The one exception to this general rule is when dealing with an individual who has experienced a work-related musculoskeletal disorder. In this case the person will often tolerate some of the obstacles with the hope that the intervention can improve his or her personal

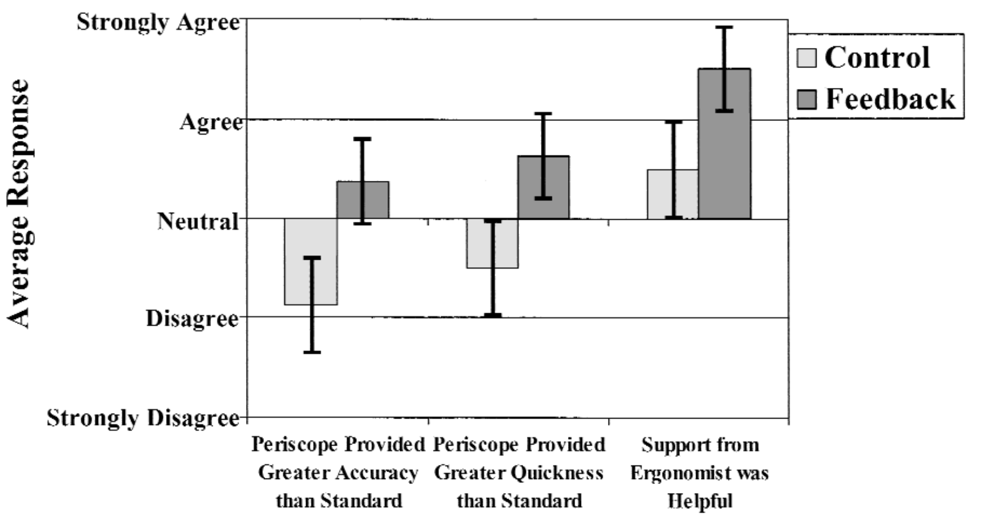

Figure 5. Significant effects of feedback on the subjective responses of the participants (standard error bars shown).

situation. Unfortunately, this is completely antithetical to the goal of being proactive in ergonomic intervention. The goal of the current work, therefore, was to better understand some of the more social or behavioral aspects of the intervention process in order to find things that ergonomists can do to increase the likelihood that an ergonomic intervention is given adequate time to realize its full potential at steady state.

The results of the current research are promising and have provided some valuable suggestions to guide our ongoing intervention research projects. Two key concerns that individuals often cite as reasons they do not like an intervention are that (a) it slows them down and (b) it affects the quality of their work. The results of the current study have shown that verbal encouragement provided through a simple interaction with the user can have an impact on both perceived quickness and perceived accuracy. Although there were no specific objective measures of accuracy, the objective results related to productivity indicate that there was no real increase in productivity, but the positive perception remained. The one result that did not confirm our hypothesis was related to the final question, regarding the participant's willingness to use the intervention for the next 2 months. The expectation was that the participants receiving the feedback and reinforcement would be more likely to continue to use the intervention than would the participants who did not get this type of feedback. The results showed no difference between the two groups. Further investigation into the data, however, revealed that almost all participants expressed a willingness to continue to use the intervention, indicating that the overwhelming benefits of the intervention itself were motivating all participants' responses, regardless of the level of feedback received.

One risk that was of concern in this study was the potential impact that the positive feedback and reinforcement would have on those variables that are principal measures of the effectiveness of an intervention. Specifically, a difference in the objective measures of productivity or in the subjective discomfort levels between the reinforcement and the control groups would indicate a potential bias that was introduced into the intervention process. A bias of this sort could make the interpretation of subsequent intervention data more difficult because the expected improvement in productivity as a function of time spent learning might not follow the normal inverse logarithmic trend. Also, accurate measures of discomfort are often important indicators of the success of an intervention, and any masking of the true discomfort levels that are associated with the intervention would be counterproductive. Fortunately, neither the objective productivity levels nor the subjective discomfort levels were affected by the feedback condition. The results with regard to the effects of feedback are inconsistent with previous research that regarded feedback as being a predictor or an influence in performance (e.g., Becker & Klimoski, 1989; Pavett, 1983), but these differences may be related to the intensity and duration of the feedback process.

This study had limitations that may limit the generalizabilty of these results. The most significant limitation is the laboratory setting in which this study was conducted. It is not clear that the responses of a person putting himself or herself in the place of a worker performing this task will be identical to those that would be obtained in a real work situation. Subsequent fieldwork wherein these reinforcement techniques have been employed, however, has shown similar effects on employee acceptance to change.

The second limitation to generalizabilty is related to the specific intervention used. The task that the participants performed preintervention was quite uncomfortable because of the static neck and upper back postures assumed. The intervention was very effective at reducing these discomforts and therefore may have masked some of the potential benefits of the feedback process (as evidenced previously when describing the question of the participant's willingness to use the intervention).

Third, it must be emphasized that it may be problematic to extrapolate these results to make statements regarding more long-term acceptance of the intervention. Experience has shown us that productivity and comfort levels at steady state will be the factors that will determine whether the intervention is adopted. The results of the current study simply indicate that positive feedback during this introductory phase may increase the likelihood that steady state is ever achieved.

Finally, certain participants seemed internally motivated while performing the task. This internal locus of control was not measured or quantified in any way, it was simply observed. There is published evidence that some people prefer not to have or do not need external feedback (Ilgen, Fisher, & Taylor, 1979). In fact, it was observed that some participants were distracted by the feedback and that it affected their productivity. Conversely, it is believed that some participants could have used much more feedback – consistent with a more external locus of control. Research has shown that this type of person may require more external feedback to improve performance (Ilgen et al., 1979). Using an additional pretest survey to categorize internal versus external locus of control might have rendered additional information regarding the appropriate level of feedback/reinforcement to optimize subjective response to the intervention.

Conclusions

The specific aims of the current study were to assess the impact of feedback and reinforcement in the intervention process, the ultimate goal being to help improve the intervention process. Two groups of participants, a control group and a feedback group, worked both with and without an intervention and provided subjective and objective views of the effectiveness of the intervention. The results showed that the group receiving the feedback had a subjectively better experience in using the intervention, whereas the more objective measures showed no significant differences. Given that one of the challenges facing ergonomists is getting workers through the "break-in" period of the intervention process, these results are viewed as very positive and have, in fact, influenced the technique that our research team currently employs in introducing interventions in our ongoing intervention research.

APPENDIX A: DAY 1 INTRODUCTORY SCRIPT (ALL PARTICIPANTS)

You are an employee at a major auto manufacturing facility. Your job assignment is to assist in building the engine block. During this task you will be using the cordless screwdrivers to drive and then remove screws in Rows 1 and 3 on the block, alternating between each row. It is important that you approach the task as if you were actually working in a manufacturing facility.

Imagine that you just arrived at work and that you are to work for the next hour until your morning break. For the first half hour, I will ask that you do as thorough a job as possible, not worrying too much about how long it takes you to do the work. During the second half of the hour, you will get paid based on the number of blocks completed, so the more you produce the more you get paid.

APPENDIX B: DAY 1 PERFORMANCE SCRIPT (ALL PARTICIPANTS)

During this task you will be using the cordless screwdrivers to drive and then remove screws in Rows 1 and 3 on the block, alternating between each row. For the next half hour, you will get paid based on the number of blocks completed, so the more you produce the more you get paid. I will be observing you as you work. Ready? You may begin.

APPENDIX C: DAY 2 INTRODUCTORY SCRIPT (ALL PARTICIPANTS)

To refresh, you are an employee at a major auto manufacturing facility. Your job assignment is to assist in building the engine block. During this task you will be using the cordless screwdrivers to drive and then remove screws in Rows 1 and 3 on the block, alternating between each row. It is important that you approach the task as if you were actually working in a manufacturing facility. You will get paid based on the number of blocks completed for the entire hour, so the more you produce the more you get paid.

Imagine that you just arrived at work and that you are to work for the next hour until your morning break. Today, however, you will be asked to perform the same task at a newly configured workstation. The new workstation is an attempt to improve the ergonomics of your job.

As plant ergonomist, I would like to educate you a little on exactly what ergonomics is. What do you know about it? [Pause and wait for an answer.]

[Based on answer, respond accordingly, including the following:] The job of the plant ergonomist is to make sure that the workstation setup is such that the employee is not at risk of developing an injury over time. Certain risk factors that are important to observe would be high force requirement, high repetition rate, awkward postures, and any combination of the three.

Certain examples of injuries are low-back injuries, which could be attributed to long hours spent in a bent-over position or repetitive heavy lifting, or shoulder tendonitis, which might be due to repetitive and/or forceful above-the-head reaching. The workstation that you are going to use today is specifically designed to reduce neck and shoulder discomfort by reducing the static, awkward posture of the neck while you do this task. Do you have any questions? [Pause to wait for answers, and respond accordingly.]

You will be asked to look through the periscope in order to perform the task, which allows you to maintain a neutral neck angle. Only look down if you have dropped a screw or the screwdriver and need to locate it. Otherwise, keep your eyes directed at the mirror. You will be asked to work as efficiently as possible, as you will be paid for each piece that is finished within the allotted time.

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