A randomized, controlled study of the pain- and tension-reducing effects of 15 min workplace massage treatments versus seated rest for nurses in a large teaching hospital

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OBJECTIVES: To evaluate whether a series of eight 15 min, on-site massage treatments would be effective in reducing pain and tension in nursing staff at a large teaching hospital.

HYPOTHESES: On-site massage treatment would result in reduced pain intensity and tension levels and increased relaxation compared with a control group receiving seated rest.

DESIGN: Randomized, controlled trial of eight sessions of Swedish massage therapy versus eight sessions of seated rest.

PARTICIPANTS: Thirty-two hospital staff (29 registered nurses and three clerical staff) volunteers.

SETTING: Participants were recruited from a tertiary care centre.

OUTCOME MEASURES: Pulse rate (beats/min), pain measured using a 10 cm Visual Analogue Scale (VAS), tension (VAS), relaxation (yes/no) and the Profile of Mood States (POMS) were measured before and after each session.

RESULTS: The groups did not differ significantly on baseline demographic variables or in attendance rates. Post-treatment VAS pain, VAS tension, and total POMS scores showed the same pattern of results: one-way ANCOVAs revealed a significant effect of the covariate (mean pretreatment score averaged across sessions attended) and a significant main effect for groups indicating that post-treatment pain, tension and POMS scores were significantly lower in the massage group than in the seated rest group (all P<0.001). A greater proportion of the massage group reported a sense of relaxation, and had pain and tension relief that persisted for up to a day or longer post massage (P<0.0009).

CONCLUSIONS: The provision of on-site massage treatments for nursing staff at a large teaching hospital resulted in significant reductions in pain and tension levels and an increase in overall mood compared with a control group that received seated rest.

Key Words: Massage therapy; Pain; Randomized clinical trial

Étude randomisée contrôlée sur les effets d’un massage de 15 minutes en milieu de travail sur la douleur et la tension par opposition au repos en position assise pour les infirmières d’un grand hôpital universitaire

OBJECTIFS: Évaluer si une série de huit massages de 15 minutes administrés sur place soulagerait efficacement la douleur et la tension du personnel infirmier d’un grand hôpital universitaire.

voir page suivante
The growing recognition of the changing work environment and the negative impact of job stress on health (1-3) has led to efforts to reduce workplace stress (4-7), and to facilitate coping and a sense of control (5). Massage therapy is being used with increasing frequency to treat pain, stress and burn-out in the general population (8,9) and among health care professionals (4-6,10,11). Recent randomized, controlled studies have shown massage therapy to be effective in reducing a variety of negative mood states including depression, anxiety, fatigue and confusion (5,10,12,13).

However, because of long working hours and time constraints due to shift work, massage therapy is not a feasible option for hospital nurses unless it can be worksite based. We are not aware of any studies that have assessed the feasibility and efficacy of on-site massage therapy for pain and stress reduction in nurses in a large teaching hospital. The aim of the present study was to evaluate whether a series of eight sessions of seated rest.

out with 12 participants undergoing eight massage sessions at The Toronto Hospital, Toronto, Ontario under the same conditions as in the present study. The data obtained from this pilot study reflect the reduction in pain intensity obtained when the mean pretreatment and post-treatment pain scores for the eight sessions were compared by paired Student’s t test.

Participants
Thirty-four staff members (22 women; 2 men) from four Toronto Hospital units volunteered to participate in the study. These were the Multi-Organ Transplant Unit, two dialysis units and the Post-Anaesthetic Care Unit. Nurses from a fifth nursing unit had volunteered to participate, but the unit was closed down due to institutional downsizing and layoffs before the treatment sessions were scheduled. The mean age of the sample was 39.1 6 years. Twenty-nine participants were registered nurses and three were clerical staff.

Measures
At the beginning of the first session, participants completed a brief questionnaire measuring demographic information. The following three measures were obtained immediately before and after each treatment.

Pulse rate: The radial pulse rate was measured over a period of 60 s.

Pain, tension, headache and relaxation: Participants completed a brief questionnaire that assessed the presence and location of pain and tension in the head, neck or shoulders, as well as the presence of headache and degree of relaxation. The degree of pain, tension and headache was assessed with a 10 cm VAS (15) with end points that were labelled with appropriate descriptors (eg, for pain VAS, ‘no pain’ and ‘worst possible pain’). Relaxation was assessed by a forced-choice (yes/no) question.

Profile of mood states: The profile of mood states (POMS) (16) is a self-administered inventory that assesses six current

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mood states: tension-anxiety, depression-dejection, anger-hostility, vigour-activity, fatigue-inertia and confusion-bewilderment using 65 adjectives rated on a five-point Likert scale. A total mood disturbance score can also be calculated that consists of a weighted score from each subscale. The POMS subscales have internal consistency coefficients that range from 0.84 to 0.95 and a fair degree of test-retest reliability (16). In the present study, only the total POMS score was used.

Duration of treatment effects: At the beginning of sessions 2 through 8, participants completed a five-point forced choice evaluation form that assessed the duration of pain relief, tension reduction and relaxation that resulted from the previous session (eg, for pain relief, the five-point scale consisted of 0=no pain to relieve, 1=no pain relief, 2=less than 1 h of pain relief, 3=more than 1 h but less than 24 h of pain relief and 4=more than 24 h of pain relief).

Procedure

Staff were recruited by placing a notice in The Toronto Hospital newsletter and by postings at The Toronto Hospital requesting nursing and nonclinical staff to participate in a research project involving workplace massage treatment. The notice stated that participants would receive either eight weekly, 15 min massage treatments or eight sessions of seated rest. A randomized schedule was prepared before the study that indicated the group to which each prospective participant would be assigned upon entry into the trial (14).

Sessions took place in common staff areas. At the beginning of the first session, participants gave written voluntary consent, completed a brief demographic questionnaire and were informed of the treatment group to which they had been assigned (massage or seated rest). Participants then had a pretreatment measure of pulse rate taken and completed pretreatment questionnaires (POMS and an assessment of pain, tension and relaxation). Following the treatment, participants completed the post-treatment questionnaires, and post-treatment pulse rate was measured. The procedure for all subsequent sessions followed the same format (ie, measurement of pulse rate, administration of questionnaires, treatment, administration of questionnaires, measurement of pulse rate) with the exception that participants also rated the duration of pain relief, tension relief and relaxation obtained from the previous session.

Massage group: When the questionnaires were completed, participants moved to a quieter corner of the room for the massage treatment. Participants were fully clothed and seated for the massage. The massage treatments were carried out by three professional registered massage therapists who used the Swedish massage technique. Each participant was assigned to one massage therapist for the duration of the study. The massage procedure consisted of the following:

- static compressions across the upper trapezius using the heel of the hand;
- squeezing of the deltoids;
- lifting the shoulder girdle from the lateral border of the scapulas;
- thumb kneading of the interscapular area from the inferior angle of the scapula up to the neck;
- opposing thumb compressions along the nuchal ligament from the seventh cervical vertebra to the inion;
- circular thumb kneading on both sides of the spine from the occiput down to the seventh cervical vertebra;
- heel of the hand compression along the erectors down to the sacrum;
- knuckle walking alternately from the sacrum up to the first thoracic vertebra;
- thumb compression and kneading to the paraspinals from the first thoracic vertebra down to the sacrum;
- palmar compressions to the lateral border of the back (ie, latissimus dorsi) on both sides;
- knuckle kneading of the infraspinous fossa;
- static thumb compression along the spine of the scapula, both inferior and superior;
- circular thumb kneading and ischemic compression to the midtrapezius;
- muscle squeezing to the anterior border of the upper trapezius using both hands, unilaterally;
- ischemic pressure to scaleness;
- the last two steps repeated on the other side;
- fingertip circular kneading to the mastoid and medially to the nuchal ligament along the occiput of the skull, bilaterally;
- compression of the web space of the hand, (thenar eminence to first digit);
- mobilizations to the wrists;
- muscle squeezing of the forearm, wrist to the elbow with circular thumb kneading over the common extensor tendon;
- muscle squeezing of the upper arm from the elbow to the glenohumeral joint; and
specific thumb and forefinger squeezing applied to the anterior and posterior border of the deltoids.

Seated rest group: Participants were required to sit quietly for 15 min in a lounge chair or a straight back chair with no obvious distractions (such as reading, listening to music, watching television or conversing with others).

Data reduction and statistical analyses
To simplify data analysis and presentation, and because of the small sample size and variation in the number of sessions attended, the treatment outcome data were not analyzed on a session-by-session basis. Instead, pre-treatment and post-treatment variables (pain, tension, relaxation, pulse rate, POMS) were averaged across sessions within subjects and were analyzed as the mean percentage change from pre-treatment level and/or the percentage of participants reporting symptom reduction.

Demographic and baseline clinical variables were analyzed by Student’s t test for independent samples or $\chi^2$ test for two-way tables. Drop-out rates for the two groups were compared by Kaplan-Meier survival analysis using the log rank test to ascertain statistical significance. For each participant, the mean pretreatment and post-treatment values for pain, tension, pulse rate, and the POMS were calculated based on the number of sessions attended. VAS pain scores, VAS tension scores, pulse rate and the POMS were then analyzed by one-way ANCOVA using the mean pretreatment rating across sessions as the covariate, the mean post-treatment rating across sessions as the dependent variable and group (massage versus seated rest) as the independent samples factor. Thus, only one ANCOVA was performed for each outcome variable.

The reported duration of pain relief, tension relief and relaxation was analyzed by separate $\chi^2$ tests for two-way tables. Significant effects were followed up with subsequent $\chi^2$ tests using a multiple comparison procedure to determine the pattern of significance between the groups (17). In these instances, the type I error rate was adjusted using Bonferroni’s correction for multiple tests of significance (ie, alpha ÷ number of tests).

All data are presented as mean ± SD unless otherwise specified. Data analyses were carried out using SPSS for Windows 8.1 (SPSS Inc, Chicago, Illinois). P<0.05 was considered statistically significant.

RESULTS
Drop-out and attendance rates
In total, 19 participants were randomly assigned to the massage group and 15 were randomly assigned to the seated rest group. Two participants withdrew immediately upon learning that they had been assigned to the seated rest group. Demographic and baseline clinical data from these two participants were not included in the statistical analyses. Kaplan-Meier survival analysis did not reveal a significant difference between the groups in the distribution of sessions attended over time (Figure 1). The number of completed treatment sessions ranged from one to eight. The mean number of sessions completed by the massage group (4.7±2.2) was not significantly different from that of the seated rest group (4.0±2.5). The groups did not differ significantly in the mean number of days between sessions (massage 12.1±5.5; seated rest 16.7±13.2).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Massage (n=19)</th>
<th>Seated rest (n=13)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex (% male)</td>
<td>5</td>
<td>8</td>
<td>ns</td>
</tr>
<tr>
<td>Exercises (%)</td>
<td>63</td>
<td>67</td>
<td>ns</td>
</tr>
<tr>
<td>Wears contact lenses (%)</td>
<td>17</td>
<td>9</td>
<td>ns</td>
</tr>
<tr>
<td>Has tension headaches (%)</td>
<td>83</td>
<td>42</td>
<td>0.05</td>
</tr>
<tr>
<td>Occupation (% RNs)</td>
<td>89</td>
<td>92</td>
<td>ns</td>
</tr>
<tr>
<td>Age (years)</td>
<td>38±5.7</td>
<td>42±7.7</td>
<td>ns</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>168±9.7</td>
<td>165±11.2</td>
<td>ns</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>65±16.6</td>
<td>61±9.1</td>
<td>ns</td>
</tr>
<tr>
<td>Number of sessions</td>
<td>4.7±2.2</td>
<td>4.0±2.5</td>
<td>ns</td>
</tr>
<tr>
<td>Number of days between sessions</td>
<td>12±5.5</td>
<td>17±13.2</td>
<td>ns</td>
</tr>
</tbody>
</table>

ns Not significant; RNs Registered nurses. Values are mean ± SD unless otherwise specified
Demographic and baseline clinical variables
Table 1 shows the demographic and baseline clinical data for participants in the massage group (n=19) and seated rest group (n=13) who received at least one massage treatment or one session of seated rest. Eighty-nine per cent (n=17) of the massage group and 92% (n=12) of the seated rest group were registered nurses. The remaining participants were clerical staff. Each treatment group had only one male participant. At the initial interview, before treatment, participants in the massage group reported regularly experiencing tension headaches more frequently than did participants in the seated rest group (P<0.05). There were no other significant group differences in baseline demographic or clinical variables.

Effects of treatment on pain intensity
Pain in the head, neck and/or shoulders before treatment was reported in 47.1% of participants in the massage group and 48.4% of participants in the seated rest group. After treatment, 21.8% of participants in the massage group and 43.7% of participants in the seated rest group reported pain. Thus, a significantly greater proportion of participants in the massage group (25.2%) reported pain relief after treatment than in the seated rest group (4.7%; P<0.05). Table 2 contains the mean SD pain intensity ratings for the massage and seated rest groups before and after each treatment session. ANCOVA showed a significant effect of the covariate (mean pretreatment pain intensity across sessions attended) and a significant main effect for groups indicating that pain after treatment was significantly lower in the massage group (0.4±0.62 cm) than in the seated rest group (1.1±1.22 cm, P<0.001). This is a 59% and 3% reduction in pain in the massage and seated rest groups, respectively (P<0.05). Figure 2 shows the reduction in pain intensity from pretreatment to post-treatment reported by participants in the two groups attending each of the eight sessions.

Effects of treatment on tension levels
Tension before treatment was reported in 64.3% of participants in the massage group and 70.7% of participants in the seated rest group. After treatment, 18.4% of participants in the massage group and 59.8% of participants in the seated rest group reported tension. Thus, a significantly greater proportion of participants in the massage group (45.9%) reported pain relief after treatment than in the seated rest group (4.7%; P<0.05). Figure 2 shows the reduction in pain intensity from pretreatment to post-treatment reported by participants in the two groups.

Table 2
Mean ± SD Visual Analogue Scale pain intensity ratings for the massage and seated rest groups before and after each treatment session

<table>
<thead>
<tr>
<th>Session</th>
<th>Massage group</th>
<th>Seated rest group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pretreatment</td>
<td>Post-treatment</td>
</tr>
<tr>
<td>1</td>
<td>2.3±2.53 (18)</td>
<td>0.5±0.94 (18)</td>
</tr>
<tr>
<td>2</td>
<td>1.8±2.42 (16)</td>
<td>0.4±1.08 (16)</td>
</tr>
<tr>
<td>3</td>
<td>2.8±2.70 (16)</td>
<td>1.1±1.89 (15)</td>
</tr>
<tr>
<td>4</td>
<td>2.5±2.54 (13)</td>
<td>0.5±0.77 (14)</td>
</tr>
<tr>
<td>5</td>
<td>1.8±2.28 (11)</td>
<td>0.2±0.49 (11)</td>
</tr>
<tr>
<td>6</td>
<td>0.9±1.6 (9)</td>
<td>0.0±0.0 (9)</td>
</tr>
<tr>
<td>7</td>
<td>0.0±0.0 (3)</td>
<td>0.0±0.0 (3)</td>
</tr>
<tr>
<td>8</td>
<td>2.3±3.25 (2)</td>
<td>0.0±0.0 (2)</td>
</tr>
</tbody>
</table>

Number of participants is shown in parentheses

Figure 2) A session-by-session histogram of the percentage change in Visual Analogue Scale (VAS) pain ratings (top) and tension ratings (bottom) from pretreatment to post-treatment reported by participants in the massage and seated rest groups. See Tables 2 and 3 for the number of participants in the two groups attending each of the eight sessions.
TABLE 3
Mean ± SD Visual Analogue Scale tension ratings for the massage and seated rest groups before and after each treatment session

<table>
<thead>
<tr>
<th>Session</th>
<th>Massage group</th>
<th></th>
<th>Seated rest group</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-treatment</td>
<td>Post-treatment</td>
<td>Pre-treatment</td>
<td>Post-treatment</td>
</tr>
<tr>
<td>1</td>
<td>2.6±2.77</td>
<td>0.1±0.46</td>
<td>3.5±2.70</td>
<td>1.4±1.85</td>
</tr>
<tr>
<td>(18)</td>
<td>(19)</td>
<td>(13)</td>
<td>(13)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>3.3±2.56</td>
<td>0.7±1.69</td>
<td>3.7±1.95</td>
<td>2.7±2.45</td>
</tr>
<tr>
<td>(16)</td>
<td>(16)</td>
<td>(10)</td>
<td>(9)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3.3±2.76</td>
<td>0.3±0.53</td>
<td>2.7±2.96</td>
<td>1.0±1.58</td>
</tr>
<tr>
<td>(14)</td>
<td>(16)</td>
<td>(8)</td>
<td>(9)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>2.5±2.70</td>
<td>0.6±1.31</td>
<td>4.9±2.96</td>
<td>2.0±3.02</td>
</tr>
<tr>
<td>(14)</td>
<td>(14)</td>
<td>(6)</td>
<td>(6)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>4.1±2.22</td>
<td>0.5±1.51</td>
<td>3.2±3.71</td>
<td>0.7±1.76</td>
</tr>
<tr>
<td>(11)</td>
<td>(11)</td>
<td>(6)</td>
<td>(5)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>2.8±2.84</td>
<td>0.0±0.0</td>
<td>3.3±3.31</td>
<td>2.5±2.67</td>
</tr>
<tr>
<td>(9)</td>
<td>(8)</td>
<td>(6)</td>
<td>(5)</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>0.0±0.0</td>
<td>0.0±0.0</td>
<td>1.5±2.12</td>
<td>1.0±1.41</td>
</tr>
<tr>
<td>(2)</td>
<td>(3)</td>
<td>(2)</td>
<td>(2)</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>3.0±4.17</td>
<td>1.0±1.41</td>
<td>2.8±0.0</td>
<td>0.8±0.0</td>
</tr>
<tr>
<td>(2)</td>
<td>(2)</td>
<td>(1)</td>
<td>(1)</td>
<td></td>
</tr>
</tbody>
</table>

Number of participants is shown in parentheses

Effects of treatment on degree of relaxation

There were no significant differences between the groups in the proportion of participants who reported feeling relaxed before or after massage or seated rest. The mean percentage increase from pretreatment to post-treatment in the proportion of participants who reported feeling relaxed was 58±26.4% for the massage group and 67±32.0% for the seated rest group (P>0.05).

Effects of treatment on pulse rate

Table 4 contains the mean ± SD pulse rates for the massage and seated rest groups before and after each treatment session. ANCOVA showed a significant effect of the covariate (mean pretreatment pulse rate across sessions attended) and a significant main effect for groups indicating that overall mood state after treatment was significantly more positive in the massage group (–15.3±14.16) than in the seated rest group (–2.6±14.98, P<0.001).

Effects of treatment on POMS

ANCOVA showed a significant effect of the covariate (mean pretreatment total POMS score across sessions attended) and a significant main effect for groups indicating that overall mood state after treatment was significantly more positive in the massage group (–15.3±14.16) than in the seated rest group (–2.6±14.98, P<0.001).

Effects of treatment on headache

Although participants in the massage group reported a higher tendency to experience tension headaches regularly when asked at the initial assessment before any treatment (Table 1), the groups did not differ significantly in terms of the presence or severity of headache during the course of treatment. Across the eight sessions, there were nine reports of headache in the massage group and six reports of headache in the seated rest group. The mean ± SD intensity of headache before and after treatment was 2.0±1.78 and 0.8±1.06, respectively, for the massage group and 1.1±1.46 and 2.0±2.69, respectively, for the seated rest group. The results of the ANCOVA did not show any significant effects.
(76.0±6.6 bpm). Overall, post-treatment pulse rate was reduced by 9.3% in the massage group and by 3.8% in the seated rest group (P<0.05).

**Reported duration of treatment effects**

Participants reported, on a five-point scale, the duration of pain relief, tension relief and relaxation that resulted from the previous session. The pattern of the results was the same for the duration of pain relief, relief of tension and relaxation. A test for two-way tables showed that there was a significant difference between the groups in the proportion of participants reporting the various degrees of relief and relaxation (Table 5). Multiple comparisons showed that a greater proportion of participants in the massage group reported feeling a sense of relaxation and had pain and tension relief lasting 1 h or more, while a greater proportion of participants in the seated rest group reported no relaxation or relief at all, or an effect that lasted less than 1 h (all P<0.0009).

**DISCUSSION**

This is the first study to demonstrated the benefits of an eight-session, worksite-based massage therapy program for pain and tension experienced by a sample of nurses working in a large teaching hospital. The results indicate that on-site massage treatment for nursing staff significantly reduced pain intensity and tension levels compared with a control condition consisting of seated rest. In addition, the massage treatments resulted in a greater percentage of participants reporting a sense of relaxation and a significant improvement in overall mood. Finally, these effects were reported to have lasted longer in the massage group than in the seated rest group. Pain relief, tension reduction and relaxation were reported to have persisted for up to a day or longer in more than 70% of the massage group participants.

Although post-treatment pulse rate was not significantly different between the groups when pretreatment pulse rate was used as a covariate, this lack of effect appeared to be due to the significantly higher pretreatment pulse rate in the massage group. We cannot explain why pretreatment pulse rate was higher in the massage group. Treatment factors cannot explain the group difference: the two groups were treated identically before receiving massage or seated rest. When the data were analyzed to show the percentage reduction in pulse rate from pretreatment to post-treatment level, the massage group showed a significantly greater reduction than the seated rest group (ie, 9.3% versus 3.8%, respectively). These findings fit well both with the greater reduction in pain and tension reported by the massage group participants and with the increased percentage of participants reporting relaxation following massage. The results are also consistent with recent controlled (12) and uncontrolled (4, 6) studies that have examined changes in hemodynamic variables after massage therapy. For example, Field et al (12) found a significant reduction in pulse rate following 30 min massage treatments, but not after relaxation therapy, for depressed adolescent mothers. However, because pulse rate was measured shortly after the participants arrived for the session, we do not know whether the higher pretreatment values in the massage group reflect a higher resting heart rate or the effects of physical exertion and an insufficient period of time to become habituated. Further research is needed to clarify the relationship between massage therapy and pulse rate.

The drop-out rate among participants in the massage group was much higher than we had anticipated despite the reported benefits obtained. Surprisingly, only one participant completed all eight massage treatments: the average number of sessions attended was 4.7, which did not differ significantly from that of the control group (4.0 sessions). Other studies have not reported drop-out rates. It is our impression that the scheduling difficulties, longer than expected intervals between sessions and low rates of attendance in the present study were, in large part, due to the stress associated with hospital restructuring initiatives and downsizing that were occurring at the time the study was conducted. This is supported by a lower drop-out rate in our pilot study that was carried out several months earlier, before the implementation of these institutional changes, which employed the same massage therapists at the same hospital. In that study, the mean number of sessions completed was 6.4, not one participant dropped out until session five, and 33% of participants completed all eight massage treatments (18).

A limitation of the present study is the use of a control group that received seated rest rather than a treatment with demonstrated efficacy (eg, relaxation therapy). Use of a con-
trol condition with limited benefit may have led to maximal differences in efficacy between the groups. As such, we cannot comment on the mechanism(s) by which massage therapy exerts its beneficial effects (eg, stress reduction, relaxation or attention diversion). Although the drop-out rate did not differ for the two groups overall, the fact that two participants dropped out upon receiving their group assignment to seated rest raises the possibility that subjects were preselected for their belief that massage is efficacious and seated rest is not.

In summary, the provision of on-site massage treatments for nursing staff at a large teaching hospital resulted in significant reductions in pain and tension levels compared with a control group that received seated rest. In spite of these beneficial effects, the drop-out rate in the massage group was much higher than we had anticipated. Further research is warranted to examine the feasibility of instituting a hospital-wide massage therapy program. The effects of such a program on job satisfaction, performance and absenteeism remain to be determined.

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