SPINAL CARE EDUCATION AS A PREVENTATIVE STRATEGY FOR OCCUPATIONAL HEALTH & SAFETY

A New Role For Chiropractors

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Abstract:
Objective: To evaluate the cost effectiveness of a spinal care lecture (conducted by a chiropractor) in reducing the number of spinal injuries and their associated costs in the workplace.

Method: A lecture was designed to increase employees awareness of spinal injury and how it might be prevented. The lecture was designed following a work-place inspection, to assess the most likely risk factors for injury. The lecture also included advice on posture, normal biomechanics and alternative strategies to improve spinal health.

Subjects: Volunteer subjects, all from the same company, were randomly assigned to a study group (n = 34) and a control group (n = 27). The remaining employees (n = 60) formed a non intervention (baseline) comparison group.

Main outcome measures: The number and severity of injuries for all groups was monitored over a six month period prior to and following the lecture. In addition, Oswestry pain and disability questionnaires were collected prior to the lecture and at the six month follow up period.

Results: The average cost of injuries went from $451 in the six months prior to training down to $194 in the first three months and then to $269 at six months after training. In comparison, the corresponding control group figures were $396, $409 and $382, respectively.

Discussion: The cost of reported back injuries decreased by 57% in the first three months for the educated group when compared to pre-intervention levels. At the six month follow up the cost of back injuries remained 40% lower than previous levels.

Conclusion: The results from our study demonstrated a statistically significant reduction (p< .05) in the cost of back injuries and Oswestry pain scores, following an employee training program conducted by a chiropractor.

Key Indexing Terms: Back injuries, chiropractic, prevention, education.

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INTRODUCTION

Back pain has been described as the “nemesis of medicine and the albatross of industry” (1). It has been estimated that 80% of the population experience back pain at some stage in their lives (2-6) and of this some 35% are in the workforce (7). Spinal injuries are the largest occupational health and safety problem in Australia, with an estimated annual cost of over $8 billion in disability and lost production (8).

Whilst more than 70% of people with back pain will not develop a disability, approximately 2 - 10% of people will develop into chronic back pain patients (9-13). Chronic back pain (CBP) has been cited as the most frequent cause of limitation of activity and has a high impact on productivity and overall health costs to society (14-16).

Spinal injuries can be caused by either a single over exertion injury, direct trauma or frequent &/or sustained strain and loading (17). It is difficult to determine which occupational factors were significant in the development of the injury due to the multi-factorial nature of pain, and the psychological or social aspect of sickness absence (15, 18). Occupational factors which appear most significant include: heavy physical work, static work postures, frequent bending or twisting, lifting pushing or pulling, repetitive work, vibration, and psychological issues (1, 9, 10, 17, 19-25).

Due to the magnitude of the back pain problem, research is addressing what are the most effective preventative measures in reducing the effect or frequency of spinal injuries. These measures include: careful selection of workers (26, 27), adequate training in safe lifting procedures (28-31), exercise programs (32-4), flexibility (35, 36), radiographic assessment (37-9), and “designing the job to fit the worker” (40, 41). It has been found that many of these selection techniques are not effective control measures for the prevention of back injuries (31).

Previous studies have assessed employees after they have been injured and the effect training or “back schools” have as a method of reducing the disability or improving the lifestyles (42-47). Few projects have assessed the cost-effectiveness of preventative approaches for back pain/injury in the workplace such as the training program outlined in this paper.

The purpose of this study was to test the cost-effectiveness of increasing employee awareness of spinal care and injury prevention in the workplace.

METHODOLOGY

The participants in this study were employees of a large mailing house in Sydney's western suburbs. This company volunteered, partly due to the high level of manual labour involved and the relative frequency of absenteeism due to back injury. Also, the management showed considerable interest in the program and consented to a random selection of workers taking part in the study during working hours. All subjects involved in the project were given information regarding the nature of the study, which included a written consent form. In addition, participants completed a questionnaire regarding previous injury details and their understanding of the mechanism and significance of spinal injuries. This was given to establish the subject's level of knowledge and significance of spinal problems. All subjects were guaranteed anonymity and confidentiality.

In total 61 subjects volunteered to take part, with participants being randomly assigned into two groups via employee identification numbers. The two groups formed were the trained group (n=34) and the control group (n=27). The numbers of each group were uneven due to work shift requirements conflicting with the presentation time of the lecture. All subjects involved in the project were from the same section of the company and had similar work requirements.

The control group did not receive any education classes, but they were instructed to perform a series of daily exercises and they were monitored over the six month study period. The exercises consisted of a routine series of stretching procedures used as "warm up" program for sports.

In addition, absenteeism statistics and Oswestry pain and disability questionnaires were collected from the remaining employees of the company which were independent of the study (termed the "non intervention" group). This group contained a total of 60 employees, and represented approximately 50% of the remaining work force.

The intervention for the study group involved a comprehensive lecture of approximately 120 minutes duration detailing spinal anatomy, an explanation of pain sensitive structures, causes of back pain and injury, an overview of types of back injuries, basic spinal biomechanics, correct lifting techniques, treatments for back problems, effective exercises, analysis and explanation of ergonomics, specific relationship of back pain to occupation and tasks involved, effects of static posture, etc.

Prior to giving the lecture, a tour of the workplace was undertaken by the author, so as to assess and analyse the task procedure of employees during a typical day. In this way potential problem areas could be highlighted and brought to the employees attention during the lecture. The two groups, control and study, were then monitored over the next three months, during which the incidence of back injury was recorded. Teaching aids included notes and diagrams, overhead projections, class discussion via questions/answer and practical demonstrations.

DATA ANALYSIS

The number of days lost through injury or absenteeism for each employee was recorded and paired t tests were performed for each group. Analysis of variance (ANOVA) with repeated measures and a one-way ANOVA were used to compare groups. SchoolStat and Minitab programs were used for data analysis and the level of significance was set at alpha equal to 0.05.

RESULTS

To calculate the effect of the training program, we assessed the number of injuries for each group and days lost for each injury, then multiplied this by $100, representing average daily earnings. This figure was attained by calculating a standard weekly wages, (without penalty rates, overtime and production bonuses) and dividing the figure by five. The figure was rounded off to the nearest $10.00, for ease of comparison. The total time lost for each injury was identified from employee accident/ sickness records kept by the human resources section of the company.

The total cost of days lost for each group was then divided by the number of employees in each group. We also compared these figures with previous costs related to workers compensation and absenteeism for other staff in the same section of the company, using the same method of calculation.

Whilst this is a simple method of calculation and does not include many significant costs, due to utilisation of a control group, the relative benefit can be assessed. The actual cost of employee injuries to a company could include replacement costs due to casual staff, administration costs, machine down-time, recruitment costs, starting costs, induction costs, reduced quality, loss of customers, etc. (48).

Previous injuries for the company in a two year period from July 1993 to June 1995 included 49 claims made for compensation, totalling in excess of $240,000. During this period the company had 16 spinal injuries, 13 wrist/ hand injuries (including 2 specific RSI claims), 9 injuries to other areas and 11 non-specified injuries. These non-specified injuries are probably due to incorrect or inadequate injury report forms. Some of the non-specified injuries were : ran into pole; lacerations; "lifting"; falling over. These injuries included 2 specific RSI claims, which cost substantially more than the other injuries.

In the six months prior to the commencement of the study, the trained (experimental) group had a total of 153 days lost from work, giving an average per employee figure of 4.5 days lost. The control group and the remaining non intervention group had total figures or 107 and 508 respectively, giving average figures of 3.9 and 4.2 days lost, respectively. The range, sex breakdown and other descriptive information for each group can be seen in Table 1.

Table 1 *: Descriptive statistics for days lost in the 6 month period prior to spinal care class attendance and the 6 month post training period.*

Group	Number	Range of values	Pretest	3 months post (SE)	6 months post (SE)
Training	34.	0-65	4.5 (1.98)	1.91 (0.69)	2.69 (0.73)
Control	27.	0-28	3.94 (1.2)	4.09 (1.21)	3.81 (1.08)
Rest	60.	0-50	4.17 (1.)	4.63 (1.14)	4.22 (0.88)

The average cost per employee of days lost for the trained group went from $451 down to $194 at the three month period and then to $269 at the six month period. The corresponding figures for the control group went from $396 days to $409 at the three month period and then to $382 at the six month period. The figures for the non intervention group went from $420 days to $472 at the three month period and then to $422.50 at the six month period (Table 2). An ANOVA analysis for the three pre training groups confirmed no statistically significantly difference for days lost (Table 3), or Oswestry scores (Table 4).

Table 2 *: Average cost & Oswestry scores for each group during trial.*

Group		Initial		3 month		6 month	
	n	Cost	Osw	Cost	Osw	Cost	Osw
T	34	451	10.3	194	6.8	269	7.1
C	27	396	9.2	409	9.4	382	9.9
R	60	420	9.6	472	9.5	422.5	9.7

KEY: T = Trained (experimental) group; C = control group; R = remaining (non intervention) group; Cost = Average days lost for group **x** $100; Osw = Average Oswestry scores for group (maximum 50 points)

Table 3 *: Analysis of variance of days lost (averaged) for 6 months prior to commencement of the study in the three treatment groups (p>0.05, p=0.968)*

Source	SS	df	MS	F
Groups	4.9	2	2.4	0.03^
Error	8929	118	75.7	
Total	8933.9	120		

^p>0.05

Comparison of all pre-training groups demonstrated no significant differences between them.

Table 4 *: Analysis of variance of Oswestry pain scores before involvement: difference between the three groups (P>0.05, p=0.835)*

Source	SS	df	MS	F
Groups	17.6049	2	8.8025	0.1800*
Error	5769.6844	118	48.8956	
Total	5787.2893	120		

*p>0.05

Table 5 presents the result of t-tests between the pre trial average trained group mean and the trained group means at 3 months. The results indicate that their was a significant decrease in days lost in this group at the 3 month (p=0.0035) time. This change occurred whilst there was no change in the other groups.

Table 5 *: Days lost due to back pain in the three groups at 3 months (paired t-test)*

	Mean	SD	T	p
Trained	1.912	4.04	1	-
Control	4.093	6.264	3.15	0.0035
Rest	4.633	8.843	3.93	0.0004

Table 6 also presents the result of a t-test between the pre trial average trained group mean and the trained group means at 6 months. The results of this test indicate that their was a non-significant decrease in days lost in this group at the 6 month time (p=0.13) when compared to the control group. To contrast this finding, the rest group did demonstrate a significant difference at the six month level when compared with the trained group (p=0.04).

Table 6 *: Days lost due to back pain in the three groups at 6 months (paired t-test)*

	Mean	SD	T	p
Trained	2.69	4.2	1	-
Control	3.8	5.6	1.54	0.13
Rest	4.23	6.8	2.12	0.04

The difference in these results can be described by the small incidence in actual days lost in the survey period in the three groups, and particularly the control and trained groups. As the days lost were small at the prior to and during the survey period, small changes in group means had the ability to significantly affect the outcome resulting lowered statistical power. This low statistical power can be improved by implementing measures to increase the sensitivity, or conversely measured designed to decrease error. Greater sensitivity can be achieved by increasing the duration of the survey period allowing a greater number of collection days. Greater average numbers would allow unitary changes to represent a smaller proportion of the overall change, and pass without significant impact upon the group averages. Another method for increasing error in the survey instrument is to increase the numbers recruited in the study.

The results also indicate that the pre intervention Oswestry pain scores for each group were not significantly different to each other (p>0.05). Thus, the statement can be made that these groups all started from the same degree of pain prior any involvement in the project.

Results of the training group Oswestry pain scores indicate significant improvement in the group at both the 3 month ($p<0.05$, $p=0.019$) and 6 month time period ($p<0.05$, $p=0.034$) (Table 7 & 8, respectively). These results occurred whilst the placebo control and rest groups both did not significantly differ from their pre involvement pain findings ($p>0.05$). This lack of significance occurred at both the 3 month ($p>0.05$) and 6 month level ($p>0.05$). Thus, it can be concluded that the education on back care given to the training group also resulted in a significant improvement in the Oswestry pain score when compared with the passage of time in both the control and the rest groups.

***Table 7**: Analysis of variance of Oswestry pain scores at before and after 3 months in the training group ($p<0.05$, $p=0.019$)*

Source	SS	df	MS	F
Groups	204.8	1	204.8	5.76*
Error	2346.2	66	35.5	
Total	2550.9	67		

*p<0.05

***Table 8**: Analysis of variance of Oswestry pain scores before and after 6 months in the training group ($p<0.05$, $p=0.034$)*

Source	SS	df	MS	F
Groups	171.5	1	171.5	4.70*
Error	2407.4	66	36.5	
Total	2578.9	67		

*p<0.05

DISCUSSION

The results are consistent with other findings on back schools (8, 23, 25), and those of improvements in back pain following various treatment protocols (26, 27, 39). The important difference to note between this education process, and that of other back schools is that this study attempted to prevent injuries from occurring in the first place, whereas most back schools attempt to educate afflicted (usually low back pain sufferers) after they have acquired very debilitating conditions. The same may also be said of the preventative aspect of this education process when compared to the post injury intervention of the various treatment protocols undertaken by manual therapists of all persuasions.

Beside the fact that these results demonstrate an ability to prevent injury, it is important to note that once the education program has been developed it may be taught to OHS personnel. This training of on-site personnel has the benefit of saving the company money in terms of acquiring expensive personnel to present these talks in favour of those personnel who are already training in local OHS management and who are already on the pay list.

Whilst the results of this study are encouraging, the authors would like to stress the need for further investigation. It is important that these results be duplicated with larger samples, and longer follow up periods (that is, 3, 6, 9, 12 months) in order to determine the appropriate time interval before reinforcement of the educational message is required. Also of need, is a comparative study investigating the effects of musculo-skeletal professionals versus trained OHS staff in delivering the educational material.

This study has shown a short term benefit in reducing the number of back injuries reported over the three to six month study period when compared to the previous levels prior to the spinal education lecture. Figures 1, 2 and 3 depict the average number of injuries in each group at the beginning of the trial (pre-training), at three months post training and at six months, respectively. These results could be due to many factors which need further research to substantiate effects on each area.

***Figure 1**: Days lost due to back pain in the three groups at commencement of the trial*

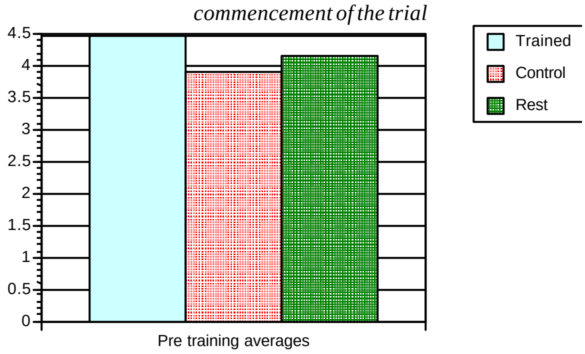


***Figure 2**: Days lost due to back pain in the three groups at 3 months*

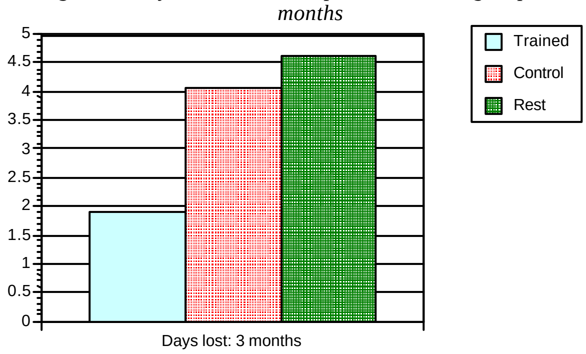
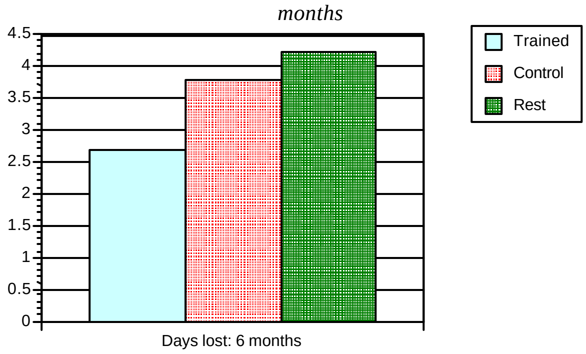


***Figure 3**: Days lost due to back pain in the three groups at 6 months*



For example, it would appear that subjects retained a sufficient level of knowledge, gained from the lecture, and were able to incorporate this into their daily working activities. Hence, employee awareness of correct lifting techniques, etc. as outlined in the lecture, could indicate that subjects gave some thought to the task at hand before performing it, particularly when there was a high risk of back injury, as a result. In time it is hoped that employees will reduce or eliminate bad habits that could lead to back injury.

Our results lend favourable support to the notion that health care and education in the workplace can significantly reduce employee health risks, engender better attitudes towards health care and improve attitudes towards the employer organisation. Admittedly the employer has a vested interest in the success of the project, because any gains or positive results will mean net savings for the company in terms of decreased number of days lost due to sick leave as well as increased productivity. But one could also argue that the employees might view the introduction of such programs as an attempt by the employer to show that the employee is important as a human being and not just as a worker.

In essence, the employer is concerned for the overall welfare of the employee. We feel that this type of cooperation and attitude should be fostered and encouraged between employers and employees. Injuries sustained in the workplace will not only affect an individual's working capacity, but will also have ramifications affecting other aspects of the individual's lifestyle. Thus, there would be social as well as economic gains from programs such as this. Also, we found this program to be very cost effective, there was little disruption to the working day (as workers were educated during their "breaks") and overall there was positive feedback from the employees, of the study group, in regard to the effectiveness of the spinal care class.

It would appear that the workplace is an ideal location for the implementation of back injury prevention programs, not only because there is a direct benefit to both employee and employer but also because of the culture-shaping incentives and peer group influence that may contribute to positive behavioural changes in the workplace (50-52).

During the running of this study some limitations were noted. These limitations should be considered for future studies. One of these is the problem of language, as many employees are Australians with English is their second language. As such there may be some problems in understanding the content of the lecture and the concepts presented. In addition, there may have been difficulty for some employees in understanding the Oswestry questionnaire, which could effect the relative changes observed during the study.

The multifactorial nature of workplace injuries required a broadly based education program, as there were many ways in which employees might injure themselves. It was possible that not all aspects for injury were covered in the spinal care lecture. Another confounding variable was the potential that information may have been relayed between the two groups, such that the control group was privy to the content of the spinal care lecture. As a result the control group may have altered their behaviour in light of this information. Without extremely tight and rigid control measures, this type of "cross-talk" between groups would be virtually impossible to police.

It is also likely that there may have been a Hawthorne effect amongst participating subjects, in that the employees knew that they were being studied and so modified their behaviour as a result.

In part, this could be due to a perceived idea that the employees were being "observed" by management in the performance of their duties. Similarly, the control group was not given a placebo, yet they knew that the study group was told "something" and thus may have modified their behaviour.

Whilst 61 subjects took place in the study, it would be desirable to have an even larger sample size to reinforce the effectiveness of the spinal care lecture. In addition, the two groups to be compared could be physically isolated from each other, for example, interstate divisions in the same company. Also, it would be interesting to see the long-term effects (ie. over 6 months to 1 year) in a larger sample group.

It is envisaged that there will be a further study with this company, to establish the level of employee retention of knowledge from the first spinal care lecture. A detailed questionnaire could be used to test the retention level and a follow up lecture could be given to reinforce principles outlined in the initial lecture.

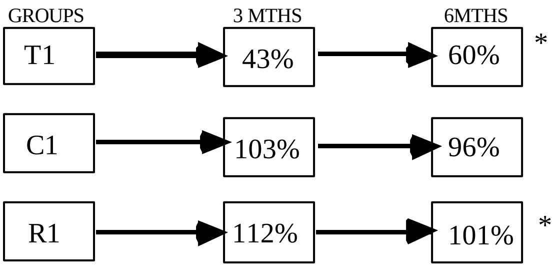
Using the potential savings for the trained group and extrapolating this to entire company, the saving could be in excess of $50,000 for a three month period. This is calculated by assessing the cost of the training each employee and the wages paid as overtime to allow the training to not interfere with production. The cost was then compared to the saving of $257 ($451-$194) per employee, multiplying this by the total number of employees and subtracting the cost of the training.

The cost of the training includes a charge of $35.00 per employee to conduct on site training sessions, and two hours paid overtime for each employee, at $18.00 per hour (part time hourly rate of $12.00, multiplied by 1.5 for overtime). Therefore the total cost per employee to attend a two hour training session is $71.00. Based on the entire employee compliment of 280, for the section in the company where the study was conducted, the reduction in costs is $71,960 (280 multiplied by $257.00).

CONCLUSION

A single spinal care class of 120 minutes duration appears to be a cost-effective method of reducing days lost from work due to back pain or injury. An overview of the results expressed as percentages of the pre-training figures show substantial reduction for the trained group compared to the other groups (Figure 4).

Figure 4 *: Results Overview- Days lost changes compared to pre spinal care class value (pre class value equal to 100%)*



* Significantly difference with pre spinal care class value to non intervention group (p<0.05)

Whilst a simple means of calculation was used, which did not include other potential costs or savings, a trend is apparent, signifying the need for a larger and longer study in the possible benefits of employee spinal care education.

In view of these considerations and shortcomings, this study offers preliminary evidence for the beneficial effects of spinal injury prevention classes conducted by a chiropractor. Chiropractors education ensures substantial knowledge of spinal injury mechanisms, thus apparently making them ideally suited to conduct classes for the prevention of spinal injury.

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