CHAPTER 4

RESULTS AND DISCUSSION

The results of this study are displayed in tabular and graphic form in tables 7 - 10 and figures 12 - 19 respectively. In order to determine whether changes in the clinical and physical evaluation occurred due to the intervention the following procedures were followed for all measurements:

a. T-tests for independent groups were done to determine whether statistically significant differences existed between the experimental and control group prior to the intervention at the pre-test phase. It was done in order to determine whether significant differences existed between the mean scores on all variables tested.

b. T-tests for independent groups were repeated to determine whether statistically significant differences existed between the mean post-test scores for these same variables. This analysis was done to determine whether statistically significant differences existed between the mean scores of control and experimental groups after the intervention took place.

c. Lastly, t-tests for dependent groups were performed to determine whether changes took place within the same group from the pre-test to the post-test phase.

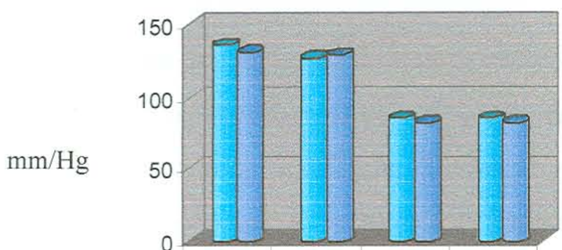
The non-parametric equivalent was performed for each of these tests in the form of Mann-Whitney U-test and Wilcoxon signed ranks test. The results of the non-parametric analysis confirmed the results of the t-tests in all instances - therefore only the results of the t-tests will be reported. The results of all analyses are summarised in tables 7 and 8.

4.1 CLINICAL AND PHYSICAL EVALUATION

4.1.1 BLOOD PRESSURE

No statistically significant difference was found between the mean blood pressure scores of the experimental and control group in the pre-test as well as the post test phase. However, there was a statistically significant difference between the pre-test and post-test systolic blood pressure mean scores of the experimental group (fig. 12). The systolic blood pressure of the experimental group decreased significantly from a mean score of 136 to 127. The improvement in the experimental group was statistically significant on the 5% level of significance ($p \leq 0,05$) with the dependant t-test as seen in table 8. These improvements support findings by Dreyer & Strydom who reported significant improvements ($p \leq 0,05$) in systolic as well as diastolic blood pressure with a corporate fitness programme. This is further supported by Harvey et al. (1993) who reported a decrease of 1,8% in high blood pressure in a period over five years where the impact of a wellness programme was studied.

According to Borhani (1977), any programme that reduces blood pressure would reduce the risk of arteroschlerotic heart disease and thus sick leave and absenteeism.



	Systolic-Pre	Systolic-Post	Diastolic-Pre	Diastolic-Post
Experimental	136	127	85	85
Control	131	129	82	82

Figure 12: Blood Pressure.

4.1.2 FAT PERCENTAGE

There was no statistically significant differences between the fat percentage of the experimental and control group on the pre- as well as the post-test. Dreyer & Strydom (1993) recorded with their corporate fitness programme a significant improvement ($p \leq 0{,}05$) in the fat percentage of executive employees over a study period of six months. As noted in figure 13, the fat percentage of the experimental group decreased when compared to the controls, whose fat percentage increased. The differences were, however, not statistically significant ($p \geq 0{,}05$). This can be due to the fact that almost all these employees have all their meals at the local canteen where unhealthy foods high in fat and carbohydrates are served.

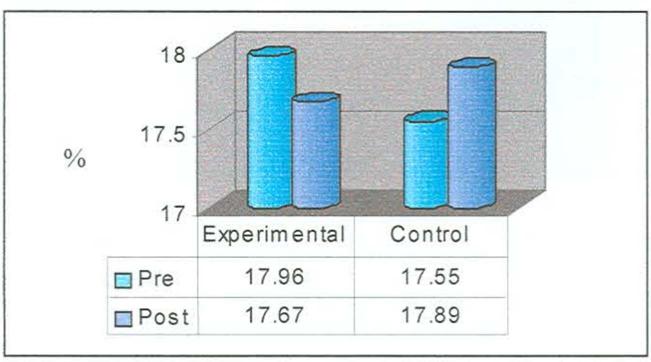


Figure 13: Fat Percentage.

4.1.3 FITNESS

As seen in figure 14 an improvement occurred in the fitness level of the experimental group compared to the control group where no change occurred. The difference was however not statistically significant. However, results from Bowne et al. (1984) recorded a significant improvement in physical fitness due to an industrial physical fitness programme over a period of five years. A worksite health promotion programme over one year by Blair et al. (1986) resulted in a significant improvement in fitness levels. The results from Blair et al. (1986) further indicated an average of 1,25 days less absenteeism and suggests that this reduction was due to the work site health promotion programme that is positively associated with an improvement in fitness levels.

The improvement in the fitness level of the experimental group could have been statistically significant if the intervention period were longer than six months as indicated by the above mentioned studies from Bowne et al. (1984) and Blair et al. (1986). No statistically significant differences were found between the experimental and control group on the pre- as well as the post-test.

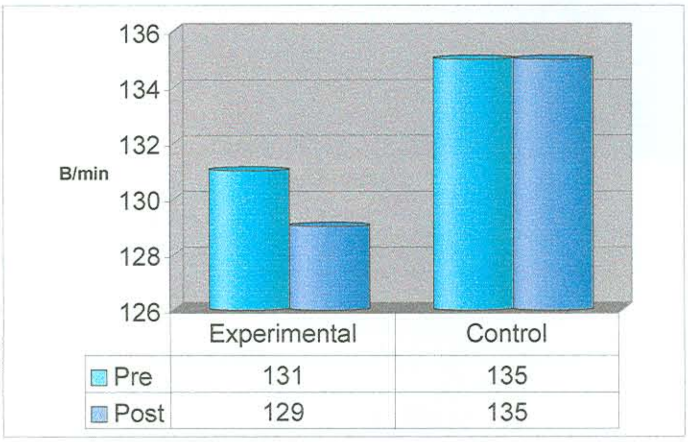


Figure 14: Fitness.

4.1.4 FLEXIBILITY

The positive impact of a physical wellness programme on hamstring and lower back flexibility can contribute to less short-term lower back pain (LBP) absenteeism due to the high correlation between LBP and tight hamstrings (Shephard, 1986).

No statistically significant difference was found between the mean flexibility scores of the experimental and control groups on the pre-test. However, a statistically significant difference was found for the post-test results where the experimental group's flexibility score was significantly higher than the control group. This difference was significant on the level $p \leq 0{,}001$. As noted in table 7 & 8 and figure 15, there was an increase in hamstring and low back flexibility in the experimental group compared to a decrease in the control group. T-tests for dependent samples indicated that a statistically significant improvement occurred in the mean flexibility score of the experimental group. This improvement was statistically significant on the level $p \leq 0{,}001$. This is supported by a study from Blair et al. (1986) who noted a significant improvement in hamstring flexibility as well as a decrease in LBP due to a worksite health promotion programme.

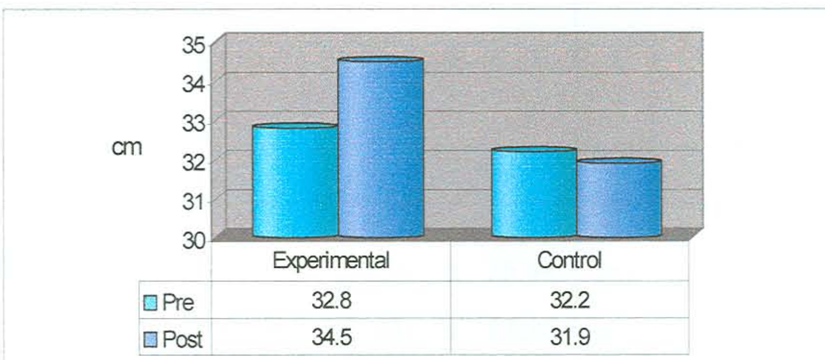


Figure 15: Flexibility.

Table 7: Results of tests for significant differences between experimental and control group on pre- and post test (Independent samples t-tests).

Variables tested differences that took place - gain score)	Experimental X ± SD	Control X ± SD	Statistical significance	
			t-test value	Significance
CLINICAL AND PHYSICAL DATA				
PRE-TEST				
Blood Pressure - systolic	136 ± 26,84	131 ± 20,14	0,858	NS p > 0,05
- diastolic	84 ± 17,36	82 ± 13,82	0,773	NS p > 0,05
Fat Percentage	17,95 ± 5,01	17,67 ± 5,32	0,225	NS p > 0,05
Fitness	1,23 ± 0,56	1,21 ± 0,48	0,160	NS p > 0,05
Flexibility	32,82 ± 9,10	32,17 ± 8,05	0,310	NS p ≤ 0,001
POST-TEST				
Blood Pressure - systolic	127 ± 19,94	129 ± 19,72	-0,397	NS p > 0,05
- diastolic	85 ± 12,08	82 ± 14,32	1,226	NS p > 0,05
Fat Percentage	17,55 ± 4,71	17,89 ± 5,46	-0,273	NS p > 0,05
Fitness	1,23 ± 0,50	1,18 ± 0,46	0,422	NS p > 0,05
Flexibility	34,5 ± 8,22	31,88 ± 8,30	1,305	*** p ≤ 0,001
Gain Flexibility	1,67 ± 3,00	-0,32 ± 1,49	3,479	*** p ≤ 0,001

♦ Positive change + Mean

♦ Negative change – Mean

Table 8: Results of tests for statistically significant differences between the pre- and post-test scores within groups (Dependent samples t-test).

Variables Tested	Experimental group				Control group			
	X	**± SD**	**T-value**	**Significance**	**X**	**± SD**	**T-value**	**Significance**
CLINICAL AND PHYSICAL DATA								
Blood Pressure – systolic								
(pre-test)	135	26,85	**2,037**	** p ≤ 0,05	130	20,15	**0,958**	NS p > 0,05
(post test)	127	19,94			129	19,72		
diastolic								
(pre-test)	85	17,37	**-0,247**	NS p > 0,05	82	13,82	**0,301**	NS p > 0,05
(post test)	85	12,08			82	14,32		
Fat Percentage								
(pre test)	17,96	5,02	**1,18**	NS p > 0,05	17,67	5,32	**-1,257**	NS p > 0,05
(post-test)	17,55	4,71			17,88	5,46		
Fitness								
(pre-test)	1,23	0,57	**0,000**	NS p > 0,05	1,21	0,48	**1,000**	NS p > 0,05
(post-test)	1,23	0,50			1,18	0,46		
Flexibility								
(pre-test)	32,82	9,10	**-3,256**	** p ≤ 0,001	32,17	8,05	**1,068**	NS p > 0,05
(post-test)	34,50	8,23			31,88	8,30		

♦ Positive change + Mean

♦ Negative change – Mean

4.2 MEDICAL AND HEALTH HABITS QUESTIONNAIRE

4.2.1 STRESS

Dreyer & Strydom (1993) recorded with their corporate fitness programme over a six-month period that 44,6% of the respondents indicated an improvement in stress levels. Pretorius et al. (1989) supports this in a three-month study. They noted that respondents with a tendency for high stress levels that participated in a physical exercise programme presented with different prolactin-, cortisol- and testosterone levels with regards to physical and cognitive stress situations compared to a control group. The experimental group that followed a physical exercise programme tended to regard any stress situation as a challenge compared to the control group who tended to perceive the situation as a huge threat. As noted in figure 16 there was a decrease in the stress levels of the experimental group compared to an increase in the stress levels of the control group. This improvement was however not statistically significant, but could be due to the fact that the worker's unions forced their employees to partake in major strikes and "no-work, no-pay" applied, possibly resulting in an increase in stress levels.

High stress levels indirectly impose huge financial burdens on companies as confirmed by Berry (1981) where the implementation of an employee assistance programme resulted in a 60% decrease in sick leave over a period of one year. As noted in table 9 there was a statistical relationship between the respondent's experiencing of stress and the number of day's sick leave and absenteeism. Regardless of whether the respondent's indicated that they experience stress or not, the majority of them in both cases had between 0 and 7 days sick leave.

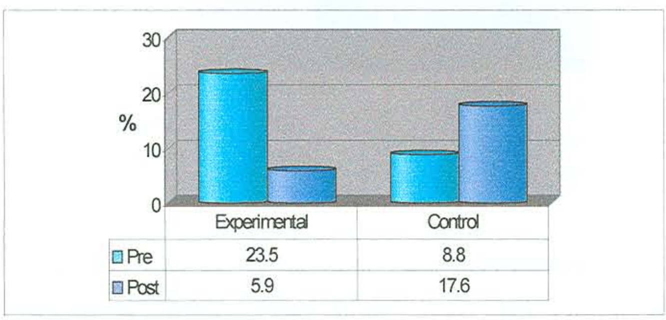


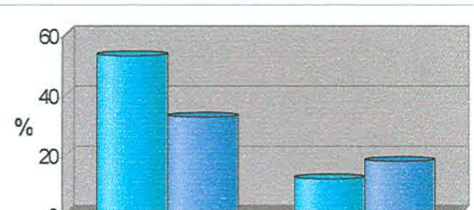
Figure 16: Stress – questionnaire.

4.2.2 LOWER BACK PAIN (LBP)

In chapter 2 a decrease in LBP due to IBM's Plan for Life was mentioned (Beck, 1982). As noted in figure 17, there was a decrease in LBP in the experimental group compared to an increase in low back pain in the control group. This improvement was however not statistically significant and can be contributed to the fact that the employees perform physical labour that constantly imposes additional strains on the LBP. Shi (1993) supports this in an one-year injury prevention programme amongst physical labourers in parks, recreation and public works where a modest decline in back pain prevalence rates occurred.

According to Thomas (1983), 66% of back injuries that happened at the Liberty Mutual Insurance company could have been prevented if the employees had been physically fit. This resulted in more sick leave being taken.

As noted in table 9, before the implementation of the intervention programme, 11% of the respondents from the experimental group had more than 16 sick leave and absenteeism days compared to nil sick leave and absenteeism days (0%) after the intervention (table 9). All the respondents who indicated that they did not experience LBP were absent or sick 0 - 7 days in six months. However, 27,8% of the respondents who indicated that they did experience low back pain were absent or sick for more than 8 days (table 9).



	Experimental	Control
Pre	52.9	11.8
Post	32.4	17.6

Figure 17: Lower back pain – questionnaire.

4.2.3 PERSONAL COMPUTER (PC) STRESS

As noted in figure 18, there was a decrease in P C stress in the experimental group compared to an increase in P C stress in the control group. The improvement was again not statistically significant and could be due to the fact that the employees performed physical labour and not sedentary, stationary and computer related work. Hardly any of the respondents experienced typical personal computer stress symptoms, namely red and sore eyes, stiff neck and shoulder muscles, as well as headaches. The findings in table 9 are interesting however: almost all the respondents who experienced P C stress were ill or absent for not longer than 8 days.

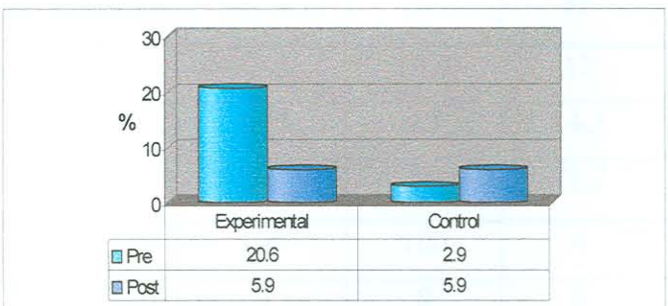


Figure 18: P C stress – questionnaire.

Table 9: Relationship between stress, lower back pain, P C stress, sick leave and absenteeism.

Variables tested	Experimental		Control		NSICK
	Pre (%)	Post (%)	Pre (%)	Post (%)	Sick leave & Absenteeism (days)
Stress	87,5	100	12	83,3	0 - 7
	0	0	0	16,7	8 -15
	12,5	0	88	0	> 16
Low back pain	72,2	90,9	12	66,7	0 - 7
	16,7	9,1	14,3	16,7	8 -15
	11,1	0	73,7	16,7	> 16
PC stress	100	100	4	100	0 - 7
	0	0	0	0	8 -15
	0	0	94	0	> 16

4.3 SICK LEAVE AND ABSENTEEISM DATA

As noted in figure 19 and table 10, the experimental group' s sick leave and absenteeism days improved significantly ($p \leq 0,01$) compared to the control group (6,3 days to 1,4 days in the experimental group compared to 4,9 days to 4,6 days in the control group). These differences were due to the implementation of the physical wellness programme. This is supported by similar findings from Richardson (1974). He compared the absence and sick leave days of an exercise and non-exercise group and found that during the six months before the programme started, the difference in the average number of sick leave days per person between the groups was 1,08 days. As it continued, the exercise group missed an average of 2,5 days' work compared to the 4,4 days missed by the non-exercisers. According to Keelor (1974), the introduction of an employee fitness programme by Goodyear in Narrköping, Sweden, caused a decrease in absenteeism of nearly 50%. Pravosudov (1976) referred to a study by Zholdak, Vasiyeva and Malova who found that those who are physically inactive are ill five to eight times more often than those who exercise.

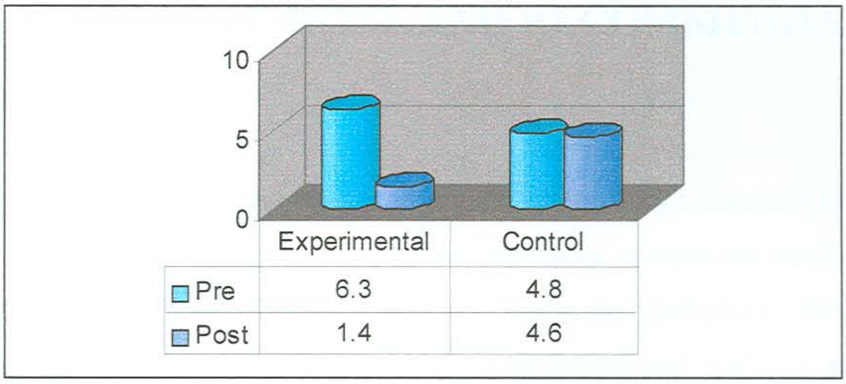


Figure 19: Differences in mean number of sick leave and absenteeism in days.

Table 10: Sick leave and absenteeism data.

Variables tested differences that took place - t-test	**Experimental X ± SD**	**Control X ± SD**	**t-test value (independent)**	**df (degree of freedom)**	**Signif. (2-tailed)**
SICK LEAVE & ABSENTEEISM DATA					
* Pre	6,3 ± 15,35	4,9 ± 5,70	0,523	66	NS p > 0,05
* Post	1,4 ± 3,31	4,6 ± 6,03	-2,690	66	** p < 0,01

- ♦ Positive change + Mean
- ♦ Negative change – Mean

* Pre – 6 months retrospective before intervention programme.

* Post – 6 months prospective during intervention programme.