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**THE RELATIONSHIP BETWEEN FITNESS LEVELS AND EMPLOYEE'S PERCEIVED
PRODUCTIVITY, JOB SATISFACTION, AND ABSENTEEISM**

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ABSTRACT

THE RELATIONSHIP BETWEEN FITNESS LEVELS AND EMPLOYEE'S PERCEIVED PRODUCTIVITY, JOB SATISFACTION, AND ABSENTEEISM. **Matthew G. Wattles, Chad Harris.** **JEPonline.** 2003;6(1): 24-32. The purpose of this study was to examine the relationship between various components of health-related fitness and employees perceived productivity, job satisfaction and absenteeism. One hundred forty-three individual employees of a northwest community completed a fitness assessment measuring percent body fat, cardiorespiratory endurance, flexibility, and muscular strength. The participants were sent questionnaires to determine the relationship between fitness levels and perceived productivity and job satisfaction. Absenteeism rates, over a one-year period, were compared to the fitness level of each participant. Stepwise regression analyses using backward elimination were utilized to determine which health-related fitness components predicted productivity, job satisfaction and absenteeism. An alpha level of $p < 0.05$ was used to determine statistical significance. It was found that Job satisfaction was influenced by the employees' level of cardiovascular endurance, with a beta weight of 0.28, $F(1,133) = 10.90$, $p < 0.001$, with less than 8% of variance in job satisfaction being explained by VO_2 . Productivity was found to be influenced by employees' level of muscular strength, with a beta weight of 0.21, $F(1,133) = 5.36$, $p < 0.01$, with less than 8% of variance in productivity being explained by muscular strength level. Absenteeism showed a trend when assessed against employees' level of flexibility, with a beta weight of 0.16, $F(1,133) = 0.40$, $p < 0.07$, with less than 3% of variance in absenteeism being explained by flexibility level. This study has identified higher levels of independent components of fitness may positively influence employees' productivity, job satisfaction and absenteeism. Despite the explained variance provided by these variables remaining relatively low, these findings still add valuable insight into the benefits of instituting exercise programs within the work-site.

Key Words: Physical Activity, Health, Productivity, Work-site, Wellness

INTRODUCTION

Work-site fitness programs are gaining in popularity because of the potential to lower absenteeism and job turnover and increase job productivity and morale (1). The percentage of work-sites offering activities to promote exercise and physical fitness in the U.S. has increased from 22% in 1985 to 42% in 1992 (2).

Management hopes these programs will have a positive effect on the physiological and the psychological variables that may positively influence worker performance (3). Furthermore, companies hope to reduce direct expenditures as a result of aforementioned potential benefits of work-site fitness services (4).

Positive relationships between regular exercise and worker productivity have been indicated in past studies (4-10), but the results were subjective and only identified exercise adherence levels by self-evaluation rather than fitness levels via objective assessment (8,4,10). Another aspect related to employee productivity is to increase job satisfaction. If employees feel better about their job, it may be assumed that they will want to be more productive in their position. A number of investigations of employee fitness programs attest to possible changes of mood and worker satisfaction that have resulted from the introduction of fitness programs (6,9,11,12). For example, Shepard et al (12) stated "....possible explanations include a reduction in physical fatigue due to an increase of work capacity, a reduction of minor illness, and relief from boredom, anxiety or pent-up aggression" (12).

The desire to reduce employee absenteeism is another reason initiate employee fitness activities at work-sites. Absenteeism is a major problem for employers, particularly in production line tasks. In Canada, the average time loss from absenteeism is about five days/worker/year in nonunion companies, and 10 days/worker/year in union operations, but in some European nations the loss is 20-25 days/worker/year (13). Initial research linking involvement in corporate health and fitness programs to measures of absenteeism generally found an inverse relationship existed between membership in a company health and fitness program and absenteeism (14). Cost savings within an employee fitness program can be derived from the reduction of costly behaviors such as absenteeism, turnover, and job-related injuries (15). Evidence is accumulating to support the relationship between regular participation in employee fitness programs and lower absenteeism (14). In his review of 39 studies linking physical fitness and absenteeism, Shephard concluded that the average reported impact of fitness programs on absenteeism is between 0.5 and 2.0 days improvement in attendance/year and estimated that the improvement would translate to a dollar savings of 0.35% to 1.4% of payroll costs" (13).

Cox et al. selected two similar white-collar insurance companies and demonstrated a 22% reduction in absenteeism with the institution of a fitness program. Using the 22% decrease in absenteeism, or 1.3 days/employee, Cox et al. estimated that a savings of \$83,265/year would be evident in the company under study (16). Baun et al. investigated absenteeism in the Tenneco Corporation. Absenteeism (recorded as the number of sick hours/year) and exercise activity (the number of recorded exercise sessions in the fitness center) was determined from a group of exercisers and non-exercisers. Female exercisers had 32% fewer sick hours than the non-exercisers, but the male exercisers and none-exercisers showed no significant differences (17).

The relationships between exercise and employee absenteeism has mainly focused on exercise participation rates and not exercise intensity. While previous research suggests that fitness levels are associated with improved productivity, satisfaction and attendance relationships are vulnerable, as only employee participation at fitness centers and not fitness levels were assessed. With deteriorating economic conditions, budget cuts are commonplace in American corporations. Corporations may be tempted to eliminate employee fitness programs if the evidence is not forth coming to show that employee fitness has a positive effect on the cost-savings variable of productivity, job satisfaction and absenteeism.

The purpose of this study was to examine the relationship between various components of health-related fitness (i.e., body composition, cardiorespiratory endurance, flexibility, muscular strength) and employees perceived productivity, job satisfaction and absenteeism. Employees' overall rating of fitness was assessed independently against productivity and job satisfaction. Correlations among fitness levels and absenteeism were measured over a one-year period. The main reason for this study was that very few studies on exercise and employee job performance have actually measured employee fitness levels and compared them to productivity, job satisfaction, and absenteeism. This study was unique in the fact that it determined the subjects' level of fitness and related it to their perceived productivity, job satisfaction, and absenteeism.

METHODS

Participants

One hundred forty-three individual employees of a northwest community completed a fitness assessment which measured percent body fat, cardiorespiratory endurance, flexibility, and muscular strength. The employees represented nine different departments within the city: fire, police, finance, public works, parks and recreation, library, airport, customer support and services, and administration. The participants were sent questionnaires to determine the relationship between their fitness levels and perceived productivity and job satisfaction.

Absenteeism rates, over a one-year period, were compared to the fitness level of each participant. Approval for this study was obtained from the University Institutional Review Board for the Protection of the Human Subjects in Research.

Measures

Participants were assessed on three measures of job performance and four health-related components of fitness: body composition, cardiorespiratory endurance, flexibility, and muscular strength. A three-site skinfold test was used to assess body composition. The physical work capacity (PWC) was used to assess cardiorespiratory endurance. From this assessment a predicted maximal oxygen consumption (VO_{2max}) was calculated for each employee. The VO_{2max} was the score that was used for the subjects' cardiovascular endurance assessment. A sit-and-reach test was used to measure hamstring and low back flexibility. A bench press test was used to assess muscular strength.

Questionnaires

A cover letter was sent to 192 employees to explain the purpose of the study, to encourage a quick return, and to guarantee complete confidentiality. The questionnaires were mailed directly to the employees at their work-site. In order to increase the number of returns, follow-up questionnaires were sent at approximately the first and the second week after the initial questionnaires. The questionnaire was divided into three sections: Section A was used to determine employees' current exercise level; Section B measured employees' perceived productivity; Section C measured employees' satisfaction of their job. Survey measures were obtained using questionnaire data based on a 5-point Likert scale ranging from "strongly disagree" (1) to "strongly agree" (5).

Current exercise level

Section A of the questionnaire assessed employees' current exercise level, exercise equipment available, and exercise programs offered at the work-sites. Six items were used to gain additional information on each participant. These questions were created by the investigator to help elaborate on possible findings in this study. Item 1 determined whether employees' level of exercise had changed since the fitness test. Item 2 assessed if employees' begun or ended an exercise program since the fitness test. Item 3 assessed what types of exercise(s) employees engaged in, and the frequency and duration of each exercise. Item 4 assessed what type of exercise equipment was available to employees at the work-site. Item 5 assessed types of exercise programs available at the work-sites. Item 6 assessed if employees' exercise habits would change if there was exercise equipment available at the work-sites.

Perceived Productivity

Section B of the questionnaire was comprised of questions on productivity created by Rudman (4). Seven items were combined to create the scale measuring employee perceptions concerning the direct relationship between exercise and personal productivity. This instrument was used because it determined an indirect measure of productivity by giving an overall productivity score to each participant. Information on test reliability is contained in the study by Rudman (4) and Rudman and Steinhardt (10). This questionnaire has been used in studies by Leutzinger and Blanke⁸, Rudman⁴ and Rudman and Steinhardt (10).

Employee Job satisfaction

Section C of the questionnaire was used to measure employee job satisfaction. The scale of job satisfaction was measured using the Brayfield Rothe scale as a base (18). This instrument was used because it determined an overall job satisfaction score for each participant. Information on test reliability and validity is contained in the study by Brayfield and Rothe (18). This questionnaire has been used in studies by Rudman (4), and Rudman and Steinhardt (10).

Absenteeism

Data on absenteeism were obtained from the human resource department prior to the distribution of the questionnaires. Only involuntary absences (i.e., illness and injury) were included in this study. Absenteeism was measured by the number of hours of involuntary absences recorded from the entire year of 1996. Absenteeism was measured against the fitness level of each employee to determine whether a correlation existed.

Statistical Analyses

Stepwise regression analyses using backward elimination were utilized to determine which health-related fitness components predicted productivity, job satisfaction and absenteeism. The probability level was set at $p < 0.05$ to reach statistical significance.

RESULTS

The purpose of this study was to examine the relationship between various components of health-related fitness (i.e., body composition, cardiorespiratory endurance, flexibility, muscular strength) and employees perceived productivity, job satisfaction and absenteeism. First, body composition, cardiorespiratory endurance, flexibility, muscular strength, productivity, job satisfaction, and absenteeism were examined. Means and standard deviations of these variables are presented in Table 1.

Current Exercise Level

There was a 75% return rate on the questionnaires (143/192). Results of employees' exercise habits revealed that 91% of the employees stated their exercise levels had remained the same or increased since their fitness tests. Over 16% of employees began their exercise program after their fitness test. When asked how the employees' exercise habits may change as a result of having exercise equipment at their worksite, over 44% of the employees stated that their exercise habits would increase.

Table 1. Means and Standard Deviations For Fitness and Work Experience Variables

Variable	<i>Total Group</i> ($n = 143$)		<i>Males</i> ($n = 94$)		<i>Females</i> ($n = 49$)	
	Mean \pm SD	Range	Mean \pm SD	Range	Mean \pm SD	Range
<i>Age</i>	39.9 \pm 8.5	19-64	40.9 \pm 8.3	24-64	37.9 \pm 8.6	19-56
<i>% Fat</i>	23.8 \pm 6.4	11-41	22.1 \pm 5.4	11-32	27.1 \pm 6.9	13-41
<i>VO2</i>	39.9 \pm 12.2	19-91	42.2 \pm 12.9	22-91	35.6 \pm 9.7	19-62
<i>Sit-n-reach</i>	17.4 \pm 4.1	4-26	16.5 \pm 4.1	4-25	19 \pm 33.6	9-26
<i>Bench Press</i>	28.9 \pm 14.5	3-82	28.3 \pm 12.9	4-68	30.1 \pm 17.4	3-82
<i>Productivity</i>	4.2 \pm 0.7	1.43-5.0	4.2 \pm 0.7	1.43-5.0	4.16 \pm 0.7	2.29-5.0
<i>Job Satisfaction</i>	4.1 \pm 0.6	2.36-5.0	4.2 \pm 0.6	2.75-5.0	3.89 \pm 0.6	2.38-5.0
<i>Absenteeism</i>	48.8 \pm 51.4	0-312	43.9 \pm 47.3	0-266	58.1 \pm 57.8	0-312

Exercise and Work Productivity

Table 2 depicts the frequency distributions concerning the direct relationship between exercise and personal work productivity. The seven item scale measuring employees' perceived productivity had a reliability coefficient of $\alpha = 0.92$. Nearly 92% of all employees agreed or strongly agreed that regular exercise would help them to be more productive at work. For most employees exercise is directly related to higher levels of productivity in terms of being able to better relax at work (85% agreed or strongly agreed), think more clearly

about work related problems (83%), concentrate better on work tasks (83%), and has a direct effect on the quality of work performance (85%).

Table 2. Frequency Distributions Of Measures of Employee Perceptions Concerning the Relationship Between Exercise and Work Productivity.

<i>Exercise and Work Productivity</i>	<i>SD</i>	<i>D</i>	<i>UD</i>	<i>A</i>	<i>SA</i>
1. <i>Be more productive at work</i>	0	1.4	6.9	41.0	50.7
2. <i>Relax better at home</i>	0.7	2.8	11.1	36.8	48.6
3. <i>Think more clearly about work-related problems</i>	0.7	2.1	13.9	47.9	35.4
4. <i>Concentrate on work tasks</i>	0.7	2.8	13.9	47.2	35.4
5. <i>Enjoy my work better</i>	0.7	3.5	17.4	43.1	35.4
6. <i>Relate better to my co-workers</i>	1.4	3.5	25	42.4	27.8
7. <i>Has no effect on how I perform at work</i>	57.6	27.1	9.0	4.9	1.4

Values represent percentages

SD = Strongly Disagree; D = Disagree; UD = Undecided; A = Agree; SA = Strongly Agree

Job Satisfaction

Table 3 shows the frequency distributions concerning employees' satisfaction with their jobs. The job satisfaction scale consisted of eight items and had a reliability coefficient of $\alpha=0.87$. A large majority of workers were satisfied with their jobs and their employer. Over 75% of all employees agreed or strongly agreed that they were satisfied with their current job. Most employees were enthusiastic about their work (83%) and believe their jobs are interesting (84%). Over 88% disagreed or strongly disagreed with the statement "each day seems like it will never end" (Table 3).

Table 3: Frequency Distributions Reporting Measures of Employee Attitudes Concerning Job Satisfaction.

<i>Exercise and Job Satisfaction</i>	<i>SD</i>	<i>D</i>	<i>UD</i>	<i>A</i>	<i>SA</i>
1. <i>My job is usually interesting enough to keep me from getting bored</i>	1.4	5.6	9	53.5	30.6
2. <i>I am often bored with my job</i>	40.3	44.4	9.7	5.6	0
3. <i>I feel fairly well satisfied with my present job</i>	3.5	4.2	13.2	54.2	25
4. <i>Most of the time I have to force myself to go to work</i>	40.3	45.8	4.2	7.6	2.1
5. <i>I feel happier in my job than most other people</i>	0	4.9	25.7	47.2	22.2
6. <i>Most days I am enthusiastic about about my work</i>	0	3.5	13.9	65.3	17.4
7. <i>Each day seems like it will never end in my work</i>	34.7	53.5	7.6	4.2	0

Values represent percentages

SD=Strongly Disagree; D=Disagree; UD=Undecided; A=Agree; SA=Strongly Agree

Stepwise Regression Analysis

Correlations ranged from -0.01 to -0.19 indicating that these variables measured relatively independent constructs. To further examine the multivariate relationship, stepwise regression analyses using backward elimination were conducted. Separate stepwise regressions using backward elimination were performed on each of the work experience measures (i.e., job satisfaction, productivity, and absenteeism) and the four fitness measures. Employees' cardiovascular endurance ($VO_2\max$) remained in the equation with a beta weight of 0.28, $F(1,133)=10.90$, $p<0.001$ with less than 8% of variance in job satisfaction being explained by oxygen consumption level. Employees' muscular strength (bench press) remained in the equation with a beta weight of 0.21, $F(1,133)=5.36$, $p<0.01$ with less than 8% of variance in productivity being explained by muscular strength level. Employees' flexibility (sit-n-reach) remained in the equation with a beta weight of 0.16, $F(1,133)=3.40$, $p<0.07$ with less than 3 % of variance in absenteeism being explained by flexibility level.

DISCUSSION

The relationship between exercise and job performance has not been widely studied (15,21,22). A significant relationship was established between the set of predictor (fitness levels) and criterion (work experience) variables.

There was a 75% return rate on the questionnaires (143/192). The participants were sent questionnaires to determine their current levels of fitness and the effects of fitness levels on their productivity and job satisfaction. Absenteeism rates, over a one-year period, were compared to the fitness level of each participant. Nearly all of the participants (91%) stated that their exercise habits had remained the same or had increased since their fitness test despite the time lapse between the fitness testing and distribution of the questionnaires. Over 16% of the participants began an exercise program after their fitness test. In this study, it appears that the fitness test itself motivated a number of employees to begin an exercise program. It may be interesting to see how fitness testing contributes toward the motivation and adherence of employee fitness programs.

The city does not offer fitness programs or exercise equipment to the majority of its employees. In this study, only the fire and police department had access to on-site exercise equipment. Nearly 44 % of the employees believed their exercise habits would increase if they had exercise equipment available at their work-site. The results of this study indicate that the city would benefit from expanding their current work-site exercise equipment and add more comprehensive fitness programs. It would be worth while for the city to do a study to determine how their entire work force would feel about exercise equipment at their work-sites.

Productivity

Employees' muscular strength, as assessed through a bench press test, predicted their perception of their work productivity. The more repetitions the employees performed on their bench press test, the more productive they felt at work. The maintenance or improvement of muscular strength enables individuals to perform tasks with less physiological stress (19). This may be one reason why muscular strength played a role in the employees' productivity. Employees who have more muscular strength would not be as physically taxed as employees with lower strength levels. This may make the employees physical work feel less demanding and may have contributed to their feelings of increased productivity. The findings of this research indicate that muscular strength should be included when developing employee fitness programs. In this study, employees' muscular strength was assessed using a bench press test but other measures of strength may be more appropriate since the bench test is confined to the upper body and therefore may have limited application to many jobs.

Muscular strength has not been indicated in past studies to increase productivity, but several studies have indicated positive relationships between regular exercise and worker productivity. Durbeck et al. (7) indicated a correlation between adherence level with increases in self-perception of work productivity and positive attitude toward work. For example, 50% of the participants in the high adherence group reported increases in work performance and positive work attitudes, compared to 26% for the moderate group, and 13% for the low adherence group (7). Bernacki and Baun studied the effects of exercise on job performance on white-collar workers employed by Tenneco Inc. The results indicated a significantly greater proportion of exercisers had above average job performance, as measured by current job performance ratings, than non-exercisers (6).

Job Satisfaction

Employees' cardiovascular endurance, as assessed through their estimated VO_2 max on a physical work capacity bicycle ergometer test, predicted their job satisfaction. The estimated VO_2 max was done due to the number of subjects in the study. Limitations of this predication are PWC_{170} to VO_2 max correlation=0.88 with a standard error of prediction of $\pm 9.4\%$ (24). Employees with higher levels of cardiovascular endurance have greater cardiovascular efficiency, tend to feel less tired, concentrate better on their jobs, and may feel more satisfied in their quality of work. Cardiovascular endurance has been indicated to be related to job satisfaction in another study involving employees of the Xerox Corporation. Employees indicated decreased anxiety, increased self-esteem and increased job satisfaction upon completion of a 14-week fitness program (9). Jasonski et al. found

subjects positive self-perception increased following a 10-week aerobic exercise class (11). This finding illustrates the influence of aerobic exercise to benefit employees' sense of well being and satisfaction. Possible explanations for these findings may include a reduction in physical fatigue due to an increase of work capacity, a reduction of minor illness, and relief from boredom, anxiety or pent-up aggression (12), or simply a response to the attention given to them by administrators.

Absenteeism

Employees' flexibility, as assessed through a sit-n-reach test, indicated a trend when compared to their absenteeism, where the more flexible employees tended to be absent from their jobs less often than inflexible employees. Employees' flexibility was determined through the sit-and-reach test, which assesses hamstring and low back flexibility. Lack of flexibility in this area may be associated with an increased risk for the development of chronic lower back pain (19). It would seem possible then that employees with less flexibility may have been absent more often with low back pain. Although past research has not identified flexibility to correlate with employees' absenteeism, research has indicated relationships between participants in employee fitness programs and lower absenteeism. In a review of 39 studies linking physical fitness and absenteeism, Shephard concluded that the average reported impact of fitness programs on absenteeism is between 0.5 and 2.0 days improvement in attendance/year (13). Cox et al. demonstrated a 22% reduction in absenteeism with the institution of a fitness program. Baun et al. investigated absenteeism in the Tenneco Corporation. The results indicated that female exercisers had 32% fewer sick hours than the non-exercisers (17).

There is a general assumption that involuntary absenteeism rates will drop with increased physical fitness level. Increased fitness levels lead to improved health, and healthier employees are less likely to be absent. However, this assumption only relates to absences due to medical reasons, yet employees stay away from work for more reasons than simply health problems (20). Several studies do not indicate positive relationships between exercise and absenteeism (12,21). Shephard et al. investigated the effects of an employee fitness program on absenteeism and productivity. Upon concluding the completion of a six-month exercise program, exercising employees developed substantial gains in fitness. There was no difference found in absenteeism between the exercising and the non-exercising groups (12). A study by Cox and Montgomery (21) examined fitness and absenteeism relative to demographic and job profiles. It was found that absenteeism and fitness were not significantly associated. As stated previously, absenteeism is very hard to directly measure.

Recommendations

Most of the literature on productivity has looked at exercise adherence or membership in an on-site employee fitness center. Very little information is available distinguishing overall levels of fitness and employee productivity. This study took a direct measure (employees' muscular strength) and indicated a positive correlation to their perceived productivity. As noted previously, it is virtually impossible to quantify productivity levels (22). Much of the research that has examined the relationship between exercise and worker performance has used indirect (employees' perception of their productivity) rather than direct (company job performance ratings or supervisor ratings) measures to determine productivity. Future studies should use a direct measure of employee productivity. A direct measure may be more tangible to the management of work-sites and may increase the funding of work-site fitness programs.

This research could only define and quantify involuntary absenteeism. It is quite possible that variables other than deliberate participation in physical fitness activities may have significantly influenced employee absenteeism in this study. There is a general assumption that involuntary absenteeism rates will drop with increased physical fitness. Increased physical fitness leads to improved health, and healthier employees are less likely to be absent. However, this assumption only relates to absences due to medical reasons, yet employees stay away from work for more reasons than simply illness (11). Future research must obtain direct measurements of employee absenteeism and try to relate it to illness related absenteeism only. When comparing an employee's absenteeism to their fitness level, absenteeism could not be honestly indicated if an employee called off because a child was sick. Future research needs to concentrate on how fitness levels may

influence minor illness related absenteeism. A measure of this illness related absenteeism should include ways to determine absenteeism and weed out non-illness related absenteeism.

According to Bernacki, the strategy of companies should be to attract and retain exercisers as employees in order to build a work force with low absenteeism and high job performance (23). This would be a great mistake. We cannot label employees into categories based on exercise habits, and then discriminate against people who have not or are not currently engaged in an exercise program. If we did this we may decrease the entire work force of our country to the 15-20% of the population who regularly participate in exercise. We must implement programs within our work-sites that foster regular participation in exercise for employees. We must develop fitness programs for the employees who do not regularly participate in exercise, for it is the sedentary employee who will attain the most benefit from a structured work-site fitness program. Employees who do not regularly participate in exercise programs will, most likely, have higher health care costs than employees who regularly exercise. If research can show a relationship between exercise and decreased health care costs, corporations would invest a great deal of money to help employees participate in regular exercise programs.

Conclusion

In conclusion, this study has indicated that improved levels of fitness may positively influence employees' productivity, job satisfaction and absenteeism. There are many other factors that may contribute to employees' productivity, job satisfaction and absenteeism, but we should not ignore the results of this study. This research should add valuable insight into the benefits of instituting exercise programs within the work-site. We must develop ways to help employees begin and adhere to exercise programs within our work-sites. Enough research has indicated improvements in employees' fitness levels to warrant investing money to work-site fitness programs (3,6-10). It should up to the individuals within the exercise science field to develop and implement these programs. The future of work-site fitness programs is dependent on the ability to present research-based evidence of the benefits of such programs to the management, and in turn, gain their support and financial backing of such programs.

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REFERENCES

1. Anspaugh DJ, Hunter S, Mosley J. The economic impact of corporate wellness programs: Past and future considerations. **AAOHN Journal** 1995;43:203-210.
2. U.S. Department of Health and Human Services. 1992 national survey of worksite health promotion activities: Summary. **American Journal of Health Promotion** 1993;7:452-464.
3. Oden G, Crouse SF, Reynolds C. Worker productivity, job satisfaction and work-related stress: The influence of an employee fitness program. **Fitness in Business** 1989;4:198-204.
4. Rudman WJ. Do onsite health and fitness programs affect worker productivity. **Fitness in Business** 1987;2:2-8.
5. Robison JI, Rogers MA, Carlson JJ, Mavis BE, Stachinik T, Stoffelmayr B, Sprague HA, McGrew CR, & Van Huss WD. Effects of a 6-month incentive-based exercise program on adherence and work capacity. **Medicine and Science in Sports and Exercise** 1992;24:85-93.
6. Bernacki EJ, Baun WB. The relationship of job performance to exercise adherence in a corporate fitness program. **Journal of Occupational Medicine** 1984;26:529-531.
7. Durbeck DC, Heinzelmann F, Schacter J, Haskell WL, Payne GH, Moxley RT, Nemiroff M, Limoncelli DD, Arnoldi LB, Fox SM. The National Aeronautics and Space Administration-U.S. Public Health Service evaluation and enhancement program. **American Journal of Cardiology** 1972;30:784-790.
8. Leutzinger J, Blanke D. The effect of a corporate fitness program on perceived

9. worker productivity. **Health Values** 1991;15:20-29.
10. Pauly JT, Palmer JA, Wright CC, Pfeiffer GJ. The effects of a 14-week employee fitness program on selected physiological and psychological parameters. **Journal of Occupational Medicine** 1982;24:457-463.
11. Rudman WJ, Steinhardt M. Fitness in the workplace: The effects of a corporate health and fitness program on work culture. **Health Values** 1988;12:4-17.
12. Jasnoski ML, Holmes DS, Solomon S, Aguiar C. Exercise, changes in aerobic capacity, and changes in self-perceptions: An experimental investigation. **Journal of Research in Personality** 1981;15:460-466.
13. Shephard RJ, Cox M, Corey P. Fitness program participation: Its effect on worker's performance. **Journal of Occupational Medicine** 1981;23:359-363.
14. Shephard RJ. A critical analysis of work-site fitness programs and their postulated economic benefits. **Medicine and Science in Sport and Exercise** 1992;24:354-370.
15. Pender NJ, Smith LC, Vernof JA. Building better workers. **AAOHN Journal** 1987;35:386-390.
16. Gebhardt DL, Crump CE. Employee fitness and wellness in the workplace. **American Psychologist** 1990;45:262-272.
17. Cox MH, Shephard RJ, Corey P. Influence of an employee fitness programme upon fitness, productivity, and absenteeism. **Ergonomics** 1981;24:795-806.
18. Baun, WB, Bernacki EJ, Tsai SP. A Preliminary investigation: Effect of a corporate fitness program on absenteeism and health care cost. **Journal of Occupational Medicine**, 1986;28:18-22.
19. Brayfield AH, Rothe HF. An index of job satisfaction. **Journal of Applied Psychology** 1951;35:307-311.
20. American College of Sports Medicine. **Guidelines for exercise testing and**
21. **prescription** (5thed.). Philadelphia: Williams & Willkins, 1995.
22. Falkenberg LE. Employee fitness programs: Their impact on the employee and the organization. **Academy of Management Review** 1987;12:511-522.
23. Cox MH, Montgomery AC. Fitness and absenteeism among hospital workers. **AAOHN Journal** 1991;39:189-198.
24. Price JL. **Handbook of organizational measurement**. Mansfield, MA: Pitman Publishing Inc., 1986
25. Bernacki EJ. Can corporate fitness programs be justified? **Fitness in Business** 1987;1:173-174.
26. Devries HA and Klafs, CE. Prediction of maximal oxygen intake from submaximal tests. **Journal of Sports Medicine and Physical Fitness**. 1965; 5:207-214.