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Correlation between Physical Activity, Fitness, and Musculoskeletal Injuries in Police Officers

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Abstract

In order to explore the correlation between physical activity, fitness, and injury among police officers, a cross section of active-duty members of the Minneapolis Police Department were surveyed about their level of fitness, physical activity, and prevalence of injury and chronic pain within the past year. In the study, officers with the highest self-reported fitness levels were less likely to experience sprains (OR 0.27, 95% CI 0.08-0.88), back pain (OR 0.48, 95% CI 0.09-0.88), and chronic pain (OR 0.21, 95% CI 0.06-0.73) than those who considered themselves less fit. Officers who were the most physically active were about a third as likely to report back pain (OR 0.37, 95% CI 0.10-0.73) and less than half as likely to report chronic pain (OR 0.42, 95% CI 0.19-0.91) as those who engaged in less activity. And officers with a BMI greater than 35 were 3 times more likely to report back pain (OR 3.36, 95% CI 1.17-9.66) than those whose BMI fell in the normal range (18-25). Thus, officers who engage in higher levels of physical activity and are more physically fit have a lower prevalence of musculoskeletal injuries and chronic pain.

Being physically fit is essential for police officers, who may find themselves having to chase down or forcibly apprehend a crime suspect or face other unpredictable situations.¹⁻³ Although many police departments encourage physical fitness by providing exercise equipment and sponsoring exercise-related activities, there are no universally recognized fitness standards or guidelines for officers. Many departments use cardiac stress testing or physical ability testing to screen potential applicants.

Police officers and other law enforcement personnel appear to be at increased risk of low back pain, musculoskeletal injuries, cardiovascular disease, and obesity.⁴⁻⁷ It is not clear whether achieving a certain level of fitness has an effect on injury prevention and job performance.

This study looked at whether Minneapolis police officers who had higher levels of fitness and physical activity had fewer musculoskeletal injuries than those who were not as active or fit.

Methods

A cross section of active-duty officers from the Minneapolis Police Department (MPD) received a survey during their annual in-service training that included questions about their physical fitness, the physical activity they engage in, and prevalence of work-related and non-work-related injuries during the previous 12 months (November 2002 through November 2003). Participation was voluntary, and the study was approved by the University of Minnesota and HealthPartners institutional review boards.

The survey collected demographic information as well as information about the officers' overall health status; the type and intensity of exercise they engaged in; how often they exercised; whether they thought their fitness level was below average, slightly below average, slightly above average, or far above average; and whether they experienced back pain, strains, or sprains; had contusions, lacerations, gunshot wounds, or fractures; or experienced chronic pain within the past 12 months.

Their physical activities were analyzed using a method that classified the energy expended during them.⁸ Estimated energy expenditure was used to quantify the intensity of physical activity. The intensity of a specific activity can be expressed in metabolic equivalents (METs), which allow an estimation of energy expenditure.⁸⁻¹⁰ We coded reported physical activities by their respective intensity levels.^{8,10} One MET is considered resting metabolic rate while sitting quietly.⁹ Exercise activities were ranked using a 9-level scale that measures physical exertion, with sleep or rest receiving a MET rating of 0.9 and strenuous activities a MET rating of 6 or greater.

An activity level was calculated for each participant and expressed as quartiles (0% to 25%, 26% to 50%, 51% to 75%, 76% to 100%). We also combined measures of exercise frequency, exercise intensity, and physical exertion (average METs) based on a method developed by Aadahl et al. to create a composite physical activity score.⁹ The activity scale indicator was calculated by multiplying the average METs by the intensity of the activity, then multiplying the product by the frequency of exercise. Respondents' jobs were divided into 3 categories: patrol officers, investigation or administration, and special assignment (eg, SWAT, K-9, and narcotics team members).

Chi-square tests were used to determine the association between self-reported injury and physical activity and fitness. Multivariate analysis by logistic regression was also performed to compare dependent variables or predictors such as BMI, perceived health status, exercise intensity or frequency, perceived fitness level, and calculated activity score with the prevalence of specific injuries.

Results

Of the 650 police officers who received the survey, 332 completed it for a response rate of 52%. The average age of the officers who participated was 38 years. Thirty percent of the respondents were obese (had a BMI greater than 30) (Table 1). Seventy-two percent said they exercised at least twice a week, while 49% said they did so 3 or more times a week. Fifty-eight percent exercised at an intensity level described as medium or high. Seventy-one percent rated their fitness levels as above average, and 6.6% considered themselves far above average. The officers' physical fitness levels by quartile did have a statistically significant correlation with BMI, health status, and job category but not with age or gender. Special-assignment officers (such as SWAT team members and members of narcotic units) tended to be the most fit as indicated by their BMI (none had a BMI over 35), the intensity of exercise they reported engaging in, and their self-reported fitness level.

Back pain within the past 12 months resulting from injury was the most frequently reported complaint, and 49% of police officers said they experienced chronic pain within the last 12 months (Table 2). New back injuries during the same time period were reported by 20% of study participants. Increased intensity of exercise was associated with less back pain (P=.02) and moderately associated with less chronic pain (P=.05). Police officers who felt they had a higher level of fitness reported significantly fewer sprains (P=.03) and other back injuries (P=.0002), and significantly less chronic pain (P=.002). Only back pain appeared to be associated with the calculated composite physical activity score classified by quartiles (P= 0.01).

A multivariate analysis was performed using logistic regression to further explore the relationship between demographic predictors, physical activity, and fitness level with sprains, back pain, and chronic pain. Police officers who were markedly obese (BMI greater than 35) were 3 times more likely to report back pain

within the previous 12 months (OR 3.36, 95% CI 1.17-9.66) when controlling for age, gender, and job category. Officers who rated their general health status as fair or poor were 8 times more likely to report chronic pain (OR 8.49, 95% CI 1.94-37.12) than those who rated their health as being excellent or very good. This association was independent of age, gender, BMI, and job category. Those who perceived their health as being very good (OR 0.52, 95% CI 0.29-0.93) or excellent (OR 0.34, 95% CI 0.18-0.69) were less likely to report back pain despite their gender, BMI, or job category than those who gave their health a lesser rating.

Police officers who exercised for at least 30 minutes 4 or more times a week were 73% less likely than those who exercised less to report back pain (OR 0.27, 95% CI 0.12-0.65) despite age, gender, BMI, and job category. Officers who described their fitness level as far above average were about one-quarter as likely to report sprains (OR 0.27, 95% CI 0.08-0.88), half as likely to report back pain (OR 0.48, 95% CI 0.09-0.88), and about one-quarter as likely to report chronic pain (OR 0.21, 95% CI 0.06-0.73) than those with the lowest perceived levels of fitness.

Police officers with a calculated physical activity scale in the highest quartile were about one-third as likely to report back pain (OR 0.37, 95% CI 0.10-0.73) and less than half as likely to report chronic pain (OR 0.42, 95% CI 0.19-0.91) as officers with physical activity scores in the lowest quartile when controlling for age, gender, BMI, and job category.

Discussion

In this group of Minneapolis police officers, higher levels of physical activity and fitness were correlated with a decreased prevalence of musculoskeletal injuries and chronic pain.

Most maintained a high level of physical activity; 72% said they exercised at least 30 minutes twice a week, and 49% reported exercising 3 or more times a week. Back pain was the most commonly reported musculoskeletal complaint. This was not a surprise, as previous studies showed police officers appear to have a higher prevalence of back pain than the general population perhaps because of their job activities or other factors.^{4,5,7,11}

However, those officers with the highest levels of fitness reported less back pain (OR 0.48, 95% CI 0.09-0.88) and less chronic pain (OR 0.21, 95% CI 0.06-0.73) than officers who were less physically fit. A calculated composite physical activity level in the highest quartile was associated with less back pain (OR 0.37, 95% CI 0.10-0.73) and less chronic pain (OR 0.42, 95% CI 0.19-0.91).

Police officers who were markedly obese (BMI greater than 35) were 3 times more likely to report back pain (OR 3.36, 95% CI 1.17-9.66) than those who had a BMI of less than 25. This study also found that fitness level was an excellent independent predictor of sprains, back pain, and chronic pain within the prior 12 months when controlled for gender, BMI, or job category.

Perceived health status appeared to be correlated with back pain, sprains, and chronic pain. The findings also showed a positive correlation between a higher BMI and the risk of sprains and chronic pain. A calculated physical activity score in the highest quartile also appeared to be an excellent independent predictor of back pain and chronic pain, when controlled for gender, BMI, or job category. This parallels the results of a study by Cady et al., who found a clear relationship between fitness level and risk of subsequent back injuries in firefighters.⁵

This study had several potential biases. The participation rate was only 52%, and it is possible there was some selection bias that prompted police officers who were more fit to participate. It is also possible that some respondents overestimated their fitness level. However, several other studies have shown that self-reporting is a valid measure of one's fitness level.^{12,13}

It is also possible that police officers had higher BMIs and exercised less as a result of musculoskeletal problems they had prior to the study period. However, there does appear to be a correlation between back and chronic pain and BMI, perceived health status, intensity and frequency of exercise, fitness level, and physical activity calculations. A future prospective study may help determine whether increased physical activity and fitness levels result in decreased back pain, fewer sprains, or less chronic pain or if the injuries themselves result in decreased fitness levels.

Conclusion

In this study, Minneapolis police officers reported at least modest levels of physical activity, with 72% of survey respondents exercising at least 30 minutes twice a week and 49% exercising 3 or more times a week. Those who considered themselves more physically fit and who engaged in more physical activity have lower prevalence of musculoskeletal injuries and chronic back pain. **MM**

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