Health Problems Within Law Enforcement:

How Strength Training Can Be the Solution

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Thesis II

INTRODUCTION

Police officers and other law enforcement personnel are vulnerable to multiple diseases and health problems that are caused by the profession. Previous research will be examined involving health problems, diseases, and injuries as well as research that target strategies for individuals within law enforcement to help prevent deadly diseases and health problems through strength training and physical fitness. Bullock (2007) stresses how police officers have a higher risk of developing diseases such as colon cancer, diabetes, cardiovascular disease, arthritis, and ulcers. Officers also have a high risk of obesity due to lack of physical fitness and unhealthy lifestyle. Police officers become vulnerable to adopt unhealthy lifestyles, which may include tobacco, drug, or alcohol use. The risk of developing these diseases puts police officers at a higher risk of premature death when compared to the general population. Bullock (2007) states that after retirement, the average lifespan of a law enforcement officer is two to five years. Tuohy, Knussen, and Wrennal (2005) found that a third of officers in their study retired early due to existing health problems. Ruiz and Morrow (2005) believe there are aspects of policing that cause pre- and post-retirement problems. Other factors that result in health problems are psychological exhaustion, poor sleep habits, unhealthy diets, and infrequent exercise (Ruiz and Morrow 2005).

Bullock (2007) examined injuries that police officers in Virginia experienced from 2001-2005. Bullock (2007) found arresting a subject, training activities, walking, motor vehicle non-emergency, and foot pursuit most frequently caused injuries Developing muscular balance through strength training and physical fitness can prevent and rehabilitate injuries. Poliquin (2012) acknowledges that in order to combat obesity and burn fat, one must adopt a training program that focuses on building muscle. Polquin also says that when a humanôs body has more

muscle their bodies are more efficient at burning energy during training and when the body is at rest. A study involving police officers from two northeast towns will provide feed back about exercise habits, lower back pain, and overall health.

PREVIOUS RESEARCH

Previous research on lower back problems is presented to understand the prevalence of lower back pain felt by law enforcement officers, as well as the cause of lower back pain to determine what aspect of law enforcement is to blame. Research on cardiovascular disease, metabolic syndromes, high blood pressure, high cholesterol, and obesity is presented to see the prevalence of said diseases and health problems within law enforcement. The benefits of strength training for law enforcement officers will be examined. Strength training has been shown to have multiple benefits towards ones health and prevent an individual from developing certain diseases. The healthier oneôs body is, the better off if will be at protecting itself from injury and fighting off diseases. Previous research will show the benefits of strength training. Input from strength coaches will be presented to get a better understanding on what kind of strength training is most beneficial. The prevalence of physical fitness in police officers and current practices that are used in physical training tests is also researched. A study was conducted on police officers from two different police departments in a northeast state. Also, an interview with Statewide Health and Wellness Coordinator for municipal police in a northeast state is provided.

Lower Back Problems:

Brown, Wells, Trottier, Bonneau, and Ferris (1996) examine back problems within Canadian police officers. Back pain can greatly affect a police officer on the job, especially those who drive a significant amount. This pain will cause an officer to have difficulty performing normal tasks throughout the day. The study performed by Brown et al. (1996) examined 1002

police officers that were actively serving. Police officers were mailed a questionnaire that asked them about their experience with back pain, risk factors that may contribute to their back pain, and opinions about these risk factors. The study found 54.9% of the police officers experienced chronic lower back pain. A significant amount (76.3%) of the sample reported that they experience lower back pain within a year of working as a police officer. Brown et al (2006) found that only 8.6% of the police officers experienced lower back problems before joining the force, ultimately finding that some aspect of policing caused the lower back pain. A quarter of the officers reported that their lower back pain caused them to take sick leave; however, most officers took sick leave for less than five days. More than half of the officers expressed that their lower back pain was sufficient enough to take sick leave but instead worked through the pain. Half of the officers decided to seek help for their lower back problems. Many officers (75.4%) believed that wearing a duty belt for majority of the day caused their lower back pain. More than half the sample was required to wear a duty belt or drive patrol cars for the majority of their day.

Anderson, Zutz, and Plecas (2011) performed another study that examined lower back problems of Canadian police officers. The study used a two-part questionnaire that was given to thirty general duty police officers. Almost half of the police officers, like in Brown et al.ôs (1996) study, reported that they spent a significant amount of time during their shift in a patrol car. Majority of the police officers (86%) reported that they have low back pain. The lower back problems experienced were caused by acute pain, ligament strain, and sprains. Anderson et al. (2011) also found that majority of the police officers did not experience lower back pain before joining the force, which also confirms that some aspect of policing caused the lower back pain. Lower back pain caused police officers to have problems sitting and standing for an extended period of time. The pain even disrupted police officers sleep. Police officers who were employed

the longest reported higher levels of lower back pain. Similarly to findings from Brown et al. (1996) found, the majority of the officers (90%) took less than five days of sick leave because of their lower back pain. Police officers also reported working through their back pain but 63% believed that they should have taken more sick time to help with their recovery. Police officers blamed sitting in a patrol car, sitting for extended periods of time, and wearing a duty belt and vest for their lower back pain. Shea and Poliquin (2011) believe lower back problems are also caused by sitting or driving for long periods of time, inflammation caused by an unhealthy diet, structural imbalance, wearing a duty belt, stress. Vitamin D3 is believed to help relieve lower back pain, but police officers that lack sleep are deficient in vitamin D3.

It has been shown that police officers have a high rate of lower back problems that develop throughout an officerôs career. Brown et al. (1996) found that almost all the officers within the study believed that driving or sitting in a patrol car was the cause of their lower back pain. Gyi and Porter (1998) examine the relationship between driving and musculoskeletal problems within police officers. Gyi and Porter (1998) chose officers that had high exposure to driving and officers that had less exposure, to examine the relationship between driving and lower back problems. The officers that had high exposure to driving were described as traffic police officers that spent their shift in the same car all day (Gyi and Porter 1998). General duty officers were officers with limited exposure to driving. The sample was given a survey that asked questions about pain that may be present in other parts of their body. The questionnaire included risk factors that contribute to lower back pain and other musculoskeletal problems. Gyi and Porter (1998) examined an officerôs exposure to driving by locating annual mileage, distance, and amount of time driving. The majority in both groups of police officers experienced lower back problems.

Traffic officers reported experiencing lower back pain for longer periods of time within the past year than general duty officers. Some officers even reported experiencing lower back pain every day within the past year. Police officers with higher amounts of driving had higher prevalence of lower back pain and took more sick time because of their pain. Gyi and Porter (1998) examined exposure to driving of general duty officers. General duty officers that had longer commutes to work had a higher prevalence of lower back pain and also took more sick time. Higher amounts of driving also resulted in a higher prevalence and severity of hand and wrist pain (Gyi and Porter 1998). Along with lower back pain, high rates of pain in the hips, buttocks, thighs, and shoulders were reported. When driving was compared to standing for extended periods of time and lifting heavy objects, police officers reported that driving caused lower back pain more often.

***Obesity*:**

Tsismenakis, Christophi, Burress, Kinney, Kim, and Kales (2009) examined obesity within first responder recruits (police, ambulance, and firefighters) in Massachusetts. Even though the first responders have different titles, the job descriptions are similar. Tsismenakis et al. (2009) determined obesity levels by examining first respondersô BMIs. Results showed that only .8% were underweight, 22.4% were normal weight, 43.8% were overweight, and 33% were obese. The study found that 76.8% were overweight and obese, had an increased risk of developing cardiovascular disease, and decreased exercise tolerance. Bullock (2007) expressed how a decreased exercise tolerance would have an effect on job performance. Tharkar, Kumpatla, Muthukumaran, and Viswanathan (2010) found that police officers had higher BMIôs and waist circumference than individuals in the general public. Nabeel, Baker, and McGrail (2007) also found that a significant amount of police officers were obese. The overweight and

obese sample had higher total cholesterol, LDL (bad cholesterol), triglycerides, random glucose, blood pressure, and lower HDL (good cholesterol) (Tsismenakis et al 2009). Mokdad et al. (2003) found that obesity and rates of diabetes increased significantly in the United States from 1991 to 2001. The results found that obesity was correlated with other cardiovascular problems.

Morioka and Brown (1970) examined the prevalence of obesity within Hawaiian police officers and firefighters. The study recorded heights and weights as well as skinfold measurements. The skinfold was taken from the triceps and helped determine body fat content. The samples were divided into ethnic groups: Part-Hawaiian, Caucasian, and Asian. Police officers had larger skinfolds and were heavier than firefighters. The results showed that all ethnic groups within policing had larger skinfold measurements and were heavier than similar groups within firefighting. Morioka and Brown (1970) compared BMIs to desirable measurements for the general population. The authors also took the samples skinfolds and compared them to desirable measurements. Almost all police officers (89.2%) were considered overweight or obese while 70.3% of firefighters were considered overweight or obese. Results also found that police officersô weight increased since they were hired and increased over the years. Firefighters had a greater ability to maintain their weight when compared to police officers.

Mokdad et al. (2003) found that obesity increased significantly in the United States from 1991 to 2001. The results found that obesity was correlated with other health problems such as high blood pressure, asthma, arthritis, and high cholesterol. Brown et al. (2000) also found an increase in obesity in the United States population. Blood pressure, cholesterol, hypertension, dyslipidemia, HDL (bad cholesterol) all increased as individuals BMIôs increased. Mokdad et al. (2003) and Brown et al (2000) found that there is a strong correlation between obesity and the risk of cardiovascular disease and cardiovascular risk factors.

***Cardiovascular Disease and Conditions Related to Cardiovascular Disease*:**

Tharkar, Kumpatla, Muthukumaran, and Viswanathan (2010) examined metabolic syndromes and cardiovascular disease with police officers. The authors compared police officers to the general public to see if the prevalence of metabolic syndromes and cardiovascular disease differ between the two groups. The results showed that there was a significant difference between the police and the general population. Police officers had higher levels metabolic syndromes, type 2 diabetes, and hypertension. Police officers also had higher triglyceride levels and blood pressure. Since police officers were found to be overweight they were better candidates for the health problems that they were measured for. Also the high blood pressure puts them at risk to develop cardiovascular disease. The results found that police officers in the study had an increased risk of premature mortality caused by the symptoms. Sardinas, Miller, and Hansen (1986) found that 161 police officers in Connecticut died from cardiovascular disease. This study also compared police officers to other workers in Connecticut. The results found that police officers are more likely to develop heart disease and die from heart disease. Sardinas et al. (1986) and Tharkar et al. (2010) both found that police officers had a higher risk of developing specific health problems that are linked to cardiovascular disease. Ruiz and Morrow (2005) examined a study that was performed on North Carolina police officer (p. 1160). The study found that police officers have an increased risk of cardiovascular disease when compared to the general population. Tharkar el al. (2010) found that police officers reported high levels of alcohol consumption and smoking. Ruiz and Morrow (2005) expressed that unhealthy lifestyles, caused by the job, may lead to cardiovascular disease.

Violanti et al. (2009) linked abnormal work hours to metabolic syndromes. Since law enforcement officers are asked to work abnormal hours they become a higher risk to develop

metabolic syndromes. Officers may work double shifts that require officers to work sixteen hours straight throughout the night and early morning. The shifts were broken up into day shifts (4am-11:59am), afternoon shifts (12pm-7:59pm) and midnight shifts (8pm-3:59am) (Violanti et al., 2009). Officers received a questionnaire that asked them to report their sleep habits. Levels of triglycerides, HDL cholesterol, and glucose were measured through blood specimens. Younger officers were mainly assigned to the afternoon and midnight shifts. Blood specimens showed higher levels of lowered HDL cholesterol. Metabolic syndromes were most prevalent in officers working the midnight shift. Officers working the midnight shift also had an increase in lower HDL levels, waist circumference, and hypertension (Violanti et al., 2009). Sleep duration also had an effect on metabolic syndromes. Officers who reported having less than six hours of sleep had higher metabolic syndromes. Klawe, Laudencka, Miskowiec, and Tafil-klawe (2007) believe that these abnormal work hours affect the sleep of law enforcement officers, which may contribute to health problems, diseases, and injuries.

Benefits of Strength Training and Fitness:

Nabeel, Baker, and McGrail (2007) asked police officers about physical fitness levels, the types of physical fitness they preferred, and injuries that they have experienced. The study not only examined patrol officers but also received information about officers at other levels, such as SWAT. The authors also found a correlation between lower back pain and levels of physical fitness. Officers that were more physically fit and engaged in higher levels of training experienced lower levels of back pain. This finding was also true for other injuries, such as sprains and strains. Physical fitness and exercise were found to be significant predictors of

injuries. Officers that exercised four times per week were less likely to develop injuries and other health problems. Officers that exercised more frequently were more likely to have healthy lifestyles compared to officers that fail to exercise. It can be believed that members of SWAT would have higher levels of physical fitness since most teams require officers to pass an annual fitness test in order to stay on SWAT. There are even competitions that some SWAT teams participate in that require high levels of strength training and physical fitness. Officers within special assignments, like SWAT, were in better shape when compared to patrol officers. These officers also reported that they engaged in higher levels of training. Sorensen et al. (1999) found that police officers that engaged in physical fitness at an early age were more likely to continue with physical fitness throughout their lives. The results showed that officers who most frequently engaged in physical fitness in 1981 were still training in 1996. It can also be determined that these officers remained healthier during the fifteen year span. Lower back pain would also be less frequent.

Demling and Desanti (2000) examined how diet and strength training has an effect on lean mass gains and fat loss among police officers. Mokdad et al (2003) acknowledge that in order to combat obesity, one must exercise regularly and implement a proper diet. Exercise and a proper diet will also prevent risk factors of cardiovascular disease. Demling and Desanti (2000) had police officers decrease their caloric intake while engaging in strength training. One group adopted the hypocaloric diet while two other groups added a protein supplement, casein protein or whey protein. The officers were given a supervised strength training program that was scheduled for four days a week that included chest press, shoulder press, and leg extensions. Police officerôs body compositions were measured prior to the study and throughout the training period (Demling and Desanti 2000). Results found that the diet alone group had a 2% decrease in

body fat and lost 5.5 lbs. The diet, exercise, and casein protein group had greater weight loss and body fat changes than the diet alone group. When the program included whey protein the sample had a significantly greater change in body fat and weight loss. When strength training was included, officers had significantly greater lean body mass when compared to the diet alone group. The authors express how excess body fat can create major health risks. Body composition was measured by using four skin fold sites (lower abdomen, suprailiac area, triceps, and anterior thigh). The nutritional and body composition history showed that officers gained a significant amount of weight since graduating from the academy. Fatouros et al. (2005) found that when older males strength trained, their skinfold thickness and body fat decreased. Also, older males that participated in high levels of strength training improved their mobility, ultimately preventing the risk of injuries. Fatouros et al. (2005) found that older males that participated in high levels of strength training were able to maintain strength levels for longer periods of time. This study provides more evidence that strength training will improve the health of police officers and help prevent injury. Strength training may also allow an officer to rehabilitate properly and effectively from an injury.

Jason Shea and Charles Poliquin (2011) wrote an article that focuses on police officers lower back problems while targeting techniques to help relieve lower back pain through strength training and developing a healthy lifestyle. Bullock (2007) describes how a healthy lifestyle is related to police officers morale, sick time used, confidence, work-related injuries, and ability to perform effectively during a violent confrontation. Shea and Poliquin (2011) express that sitting for extended periods of time causes the lower back muscles to weaken and hips to tighten. This process makes the lower back more vulnerable to injury and can cause pain. Building a proper foundation is important to developing structural balance in the body, which will decrease

muscular problems. One technique that Shea and Poliquin (2011) describe is creating a proper ratio between muscle length and tension. In order to develop this ratio one must participate in proper strength training and stretching. Stretching may be one of the easiest ways to develop a proper foundation for the lower back. The three stretches that Shea and Poliquin (2011) recommend are hip flexor stretch, quadratus lumborum stretch, and seated rotational lower backstretch. Brown et al. (1996) found that police officers also reported to engage in moderate and vigorous physical activity, stretching and muscular strengthening programs as well as cardio respiratory fitness to help relieve lower back pain. Officers also tried reliving their lower back pain through physiotherapy, chiropractic care, and massage therapy.

Poliquin and Shea (2011) interviewed Istvan Javorek, who acknowledged that circuit training should be adopted by law enforcement agencies to increase the health and body composition of law enforcement officers. Circuit training will allow officers to increase muscle mass, flexibility, cardiovascular and muscular endurance. Police officers will improve their transition from sitting in a patrol to a full sprint while decreasing the risk of injury. Circuit training as well as other kinds of strength training increases grip strength, which is found to help increasing shooting accuracy. Increasing the strength of the rotator cuffs will also increase shooting accuracy (Shea and Poliquin 2011). By increasing strength in the rotator cuff the shoulder becomes more stable and lessens the amount of recoil that is felt after firing a weapon. This will allow an officer to put more rounds on target accurately. Shea and Poliquin (2011) point out that more law enforcement agencies are increasing the caliber size of handguns that police officers carry. The larger caliper the gun the greater rotator cuff strength an officer will need in order to shoot his or her gun more accurately.

Quigley (2008) acknowledged that police officers could reduce the risk of cardiovascular disease through strength training. Diseases such as diabetes, high blood pressure, and hypertension can also be prevented through strength training. Wannamethee, Shaper, and Walker (2011) found that when men engaged in physical activity they decreased their risk of developing cardiovascular disease. Men that were already diagnosed with cardiovascular disease benefited from physical activity and even reduced their risk of death. Physical activity reduced cardiovascular disease symptoms such as loss of breath and chest pain. Sesso, Paffenbarger, and Lee (2011) had similar findings, where men that were considered to be more physically active had a decreased risk of developing cardiovascular disease. The authors acknowledge that more intense activity, such as strength training, have greater benefits towards cardiovascular disease compared to moderate and light activity.

Kraemer et al (2000) examined how female police officers can improve their job performance by increasing strength levels. The females were put on a strength program that consisted of high intensity strength training three times per week. The results found that women were able to increase their strength levels over time significantly. The authors discovered that upper body strength had the greatest affect on a womenôs job performance. This means that women should perform exercises that are targeted to strengthen the upper body like bench press, pull-ups, and military press. Istvan Javorek (as cited in Poliquin & Shea 2011) also recommends upper body exercises such as pull-ups, bench press, and dips to increase police officer job performance. Collingwood, Hoffman, and Smith (2004) designed physical fitness tests that would relate to job performance. The fitness tests included bench press, 300 meter run, vertical jump, push-ups, and sit-ups. Strength training would greatly improve a recruitôs performance in each test.

Current Programs and Prevalence of Fitness:

Tharkar et al. (2010) acknowledge that when recruits go through the police academy they are under strict rules and are required to enter and leave the academy in great physical shape. The study produced by Tsismenakis et al. (2009) determined the opposite by finding 76.8% of the recruits were considered overweight or obese. Collingwood, Hoffman, and Smith (2004) acknowledged that current standards and programs used by some law enforcement agencies do not accurately determine a recruitôs fitness level. Most academies require recruits to engage in high amounts of endurance training. Shojaei, Farajov, and Jafari (2011) found that endurance training increased inflammation in the body while increasing stress hormones, such as cortisol. Immediately after endurance training inflammatory markers and cortisol increased significantly from normal levels. The authors acknowledged that this process could deteriorate muscle and bone in the body while increasing the risk of cardiovascular disease. Cortisol is also found to increase body fat, especially in the stomach area. Skoluda, Dettenborn, Stalder, and Kirschbaum (2011) found that endurance athletes had elevated cortisol levels when compared to individuals that did not engage in endurance training. Higher cortisol levels were found in individuals that engaged in endurance training more frequently. Police recruits that are preparing themselves for the academy will engage in endurance training because that is how they will be tested. Istvan Javorek (as cited in Poliquin & Shea, 2011) acknowledged that the police academy in Toronto has adopted circuit training to properly train their recruits.

Boyce, Robert, Hiatt and Ann (1992) discovered in their study that recruitsô physical fitness is strictly supervised and evaluated throughout the academy but then it becomes the responsibility of the officer to manage his or her own physical fitness throughout their career. Quigley (2008) acknowledged that law enforcement agencies lack fitness programs and

standards for their active-duty officers. Boyce, Robert, Hiatt, and Ann (1992) found three years after completing the academy officers had a significant drop in cardiovascular fitness and increase in body fat. Morioka and Brown (1970) measured skinfolds from time of hiring and after two years of service. Results found that police officers had increased skinfold measurements, ultimately having higher body fat content. Sorensen et al (1996) studied police officers from 1981 to 1996 and found a decrease in strength and power over time. Demling and Desanti (2000) says, ñPrimary reasons considered for overweight status by the participants were poor dietary habits due to varying work schedules with no scheduled meal times, lack of nutrition knowledge, and lack of an organized exercise programò (p.23).

Bullock (2007) blames the overwhelming frequency of injuries, diseases, and premature deaths on a lack of personnel and agency fitness (p.1). Authors in almost all of the literature found that police officers that had injuries, health problems, and diseases lacked in physical fitness (Anderson, Zutz, & Plecas, 2011; Brown et al., 2000; Brown et al., 2001; Gyi & Porter, 1998). Tharkar et al. (2010) acknowledged that police officers lacked in exercise, which greatly affected the health problems reported, increase symptoms of current health problems, and risk of developing new diseases. Ruiz and Morrow (2005) found that police that died from their cardiovascular disease failed to engage in fitness programs therefore had high cholesterol levels, high blood pressure, were overweight, and had elevated body fat. Sorensen et al. (1996) acknowledged that officers who lacked physical fitness were taking medications for certain health problems such as diabetes, heart disease, high blood pressure, and high cholesterol. This shows a relationship between physical fitness and health problems by finding that as physical fitness decreased over time, health problems began to develop. The health problems that police officers were taking medications for were diseases that could be prevented through strength

training. What happens to these police officers once they go further into the profession and their physical fitness is not supervised or evaluated? Brown et al. (1996) found that police officers in their study reported that they exercised regularly (moderate or vigorous physical activity, stretching or muscular strengthening activities). A problem with this finding is that everyone has different opinions on physical activity. One may believe that they are engaging in moderate or vigorous physical activity but actually are not.

THEORETICAL FOUNDATION

The health problems that police officers suffer from are diseases that can be prevented through strength training. Shea and Poliquin (2011) stress that law enforcement officers at all levels, whether federal, state, or local, have different job descriptions but all are vulnerable to lower back pain. Little research has been done about the benefits of strength training on police officers. Also there have not been comparisons on law enforcement agencies that require strength training and physical fitness to agencies that do not. One study found that officers assigned to special assignments, like SWAT, were in better physical shape compared to patrol officers. This is mainly because SWAT officers are required to pass an annual fitness test in order to stay on the team. This requires SWAT officers to train throughout the year so they are able to pass the test. Another issue is that most current physical fitness tests and standards do not correlate to job performance. Many physical fitness tests require recruits or full time officers to finish endurance tests within a specific time. Law enforcement officers are rarely asked to run for an extended period of time while they are on the job; instead they may have to sprint after a suspect at full speed. Also, research has been done on the disadvantages of endurance training, such as long distance running; because of the negative effects endurance training has on the body. This is why individuals that compete in triathlons have multiple injuries, especially to their knees and other

joints. Endurance training is also shown to lower testosterone levels in males while elevating cortisol levels. High cortisol levels also increase body fat, especially in the stomach area.

Charles Poliquinôs biosignature method (2008) examines twelve skinfold sites located on the body. These twelve sites can determine ones hormonal profile. The skinfold located on the triceps determines how much testosterone a male has. The leaner ones triceps are the more testosterone one has. Poliquinôs biosignature method (2008) would determine that police officers in Morioka and Brownôs (1970) study have higher body fat and less testosterone. Poliquin (2008) argues this will have a direct effect on their mood and response to training. An excess in tricep fat means decreased testosterone, ultimately increasing estrogens in the body. Certain cancers, such as breast cancer, develop in the fatty tissues and can be caused by increased estrogens in the body. The subscapular site, located at the upper back, determines the risk of heart attacks, ratio of blood fats, hypertension, and insulin resistance. Police officers should have their subscapular measured for that reason.

The Reasons for an increased risk of heart disease are the stress that police officers have because of their job. Individuals who keep ñnormalò (nine to five) jobs usually have a schedule or routine that they keep throughout the week. Police officers may be asked to work abnormal hours, which makes it extremely difficult for police officers to keep a set schedule or routine that will help them maintain a healthy lifestyle. Studies from past literature also found that police officers tend to smoke and consume alcohol more often, which contributes to an officerôs unhealthy lifestyle. Officers may also choose to smoke and consume alcohol because they suffer from anxiety, depression, or stress. Sardinas et al. (1986) acknowledged that police officers should be in better shape since their job requires them to be, and recruitment is more selective; but this is not true when looking at previous research. The purpose of the current study is to see

the relationship between physical fitness levels and reported health problems. Past research has shown that officers with lower physical fitness levels had a higher prevalence of lower back pain, cardiovascular disease, high cholesterol, high blood pressure, hypertension, and other health problems. The current study will examine the extent to where health problems that law enforcement officers report result from poor physical fitness. Also are lower back problems and injuries the result of poor physical fitness, resulting in poor muscular strength? The expected results are: as physical fitness levels increase, the number of reported/experienced health problems will decrease; officers that engage in higher levels of strength training when compared to endurance training will have lower reported/experienced health problems.

METHOD

Participants:

The subjects were thirty-six officers selected from two midsized police departments in a northeastern state. Subjects varied in rank (chief, lieutenants, sergeants, detectives, and patrol officers). The majority of the police officers (47.2%) were ages forty-one through fifty. Only 8.3% were ages twenty-one through thirty, 22.2% were ages thirty-one through forty, and 22.2% were fifty-one or older. The majority of the police officers (52.8%) have been on the force for twenty-one years or more while 27.8% have been on the force for one to ten years, 13.9% for eleven to fifteen years, and 5.6% for sixteen to twenty years. The mean height and weight was 70.3 inches and 209.7 pounds respectively.

The participant for the interview was a statewide Health and Wellness Coordinator for municipal police in a northeastern state. The Health and Wellness Coordinator has extensive knowledge, education, and experience as a strength and conditioning coach training athletes, police officers, and military personnel.

Materials:

The subjects received a survey (see appendix A) that questioned them about exercise levels, type of exercise they engage in, and experience with lower back pain. The survey had the subjects report their age range, years of service, height and weight; to see if these factors play a role in exercise levels and lower back pain. Using the officersô reported height and weight, BMIôs (body mass index) for each subject were obtained. Exercise levels were measured by how many days per week subjects exercised and how long they exercised per session. Type of exercise was defined as either strength training (weight training, resistance training), endurance training (aerobic training, running, biking, swimming), both strength and endurance training, or other. Subjects were also asked what muscle group(s) they trained most frequently (chest, shoulders, legs, arms, etc.). The subjects were then asked about their experience with lower back pain on four five-point likert scales (frequency of lower back pain, felt pain, pain while standing for extended periods of time, and pain while sitting and/or driving for extended periods of time). Subjects were asked about how lower back pain affected their job performance and social life on a five point likert scale. Lastly, the survey asked the subjects to report any other health problems they may experience (high cholesterol, cardiovascular disease, diabetes, other muscle pain, etc.). The last part of the study includes an interview with a Statewide Health and Wellness Coordinator for municipal police. The Health and Wellness Coordinator gave input about his experience with police officer health problems, reasons for the development of health problems, and how strength training can benefit police officers.

Procedure Analysis:

A supervisor at each location signed an authorization form confirming that they knew the nature of the study and the content that the departmentôs employees would be questioned about.

The authorization form also stated that the departments name would not be used in the study. The subjects received and signed informed consent forms before starting the survey, which stated that their results would be anonymous and could not be identified by the researcher or anyone reading the data. The consent forms and surveys were handed out during role call before officers started their shifts. The officers were asked to return the consent forms before they started the surveys so no form could be matched to a completed survey. The qualitative research was conducted in the Health and Wellness Coordinatorôs office

Data Analysis:

After the surveys were completed, the results were entered into a computer program called SPSS, which then processed the data. SPSS gave descriptive statistics, such as frequencies for each variable. Linear regressions and correlations were used to find relationships between variables. Tables and charts were also produced to give a visual aid to individuals looking at the frequencies of certain variables. The responses to the interview questions were then analyzed to get the Health and Wellness Coordinators input about his experience with police officer health problems and exercise.

RESULTS

Police Officer Training Methods and Exercise Levels

The mean BMI was 29.9. Only two officers (5.6%) had a BMI of twenty-five or lower and 36.4% had a BMI of thirty or greater. Officers most frequently trained two to three days per week. Almost a quarter of the officers engaged in exercise four to five days per week and 19.4% only trained one day per week. Exercise sessions lasted either thirty minutes (41.7%) or an hour (47.2%). The rest of the sample reported that they exercised for an hour and thirty minutes per training day. The majority of the police officers (55.6%) engaged in both strength and endurance

training while 25% just engaged in strength training, 13.9% only engaged in endurance training, and 5.6% engaged in a different form of exercise. The different form of exercise that was most popular was walking. While strength training, police officers most frequently used free weights, dumbbells, and/or machines. The most frequently reported forms of endurance training were running and biking. The muscles most frequently trained were legs, arms, chest, and back. Majority of police officers (66.7%) reported that they incorporated stretching into their training regimen.

Prevalence of Lower Back Pain and other Health Problems:

Almost all the police officers (80.6%) reported that they have experience with lower back pain and 20% reported that they have lower back pain frequently or all the time. The majority of police officers (69.4%) reported lower back pain greater than no pain on a five-point scale and 30.6% reported that their lower back pain was significant enough to occasionally or frequently interfere with their job and/or social life. A majority of the police officers (69.4%) reported that they experience lower back pain while standing, sitting, and/or driving for extended periods of time. Table 1 represents the mean values for each five-point likert scale on lower back pain. The most prevalent health problems were high cholesterol, high blood pressure, shoulder pain, and other muscle pain, strains and sprains (see pie chart). Using a Pearson correlation, a moderate positive correlation between felt lower back pain and interference with police officersô job and social life was found (see table 2). There was also a strong positive correlation between lower back pain felt while standing for extended periods of time and sitting and/or driving for extended periods of time (see table 3). Each correlation was statistically significant.

Table 1

		BackPain	FeltPain	Interfere	StandingPain	SittingDriving
N	Valid	36	36	36	36	36

	Missing	0	0	0	0	0
Mean		2.56	2.17	2.00	2.08	2.11

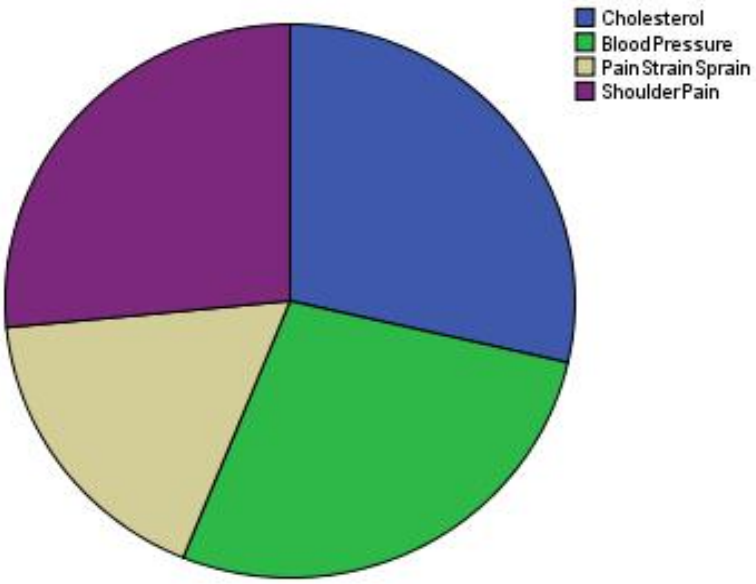
Table 2

		FeltPain	Interfere
FeltPain	Pearson Correlation	1	.679**
	Sig. (2-tailed)		.000
	N	36	36
Interfere	Pearson Correlation	.679**	1
	Sig. (2-tailed)	.000	
	N	36	36

Table 3

		StandingPain	SittingDriving
StandingPain	Pearson Correlation	1	.876**
	Sig. (2-tailed)		.000
	N	36	36
SittingDriving	Pearson Correlation	.876**	1
	Sig. (2-tailed)	.000	
	N	36	36

Chart I



Lower Back Pain Related to Training Methods

There was a moderate positive correlation between endurance training and prevalence of lower back pain although it was not statistically significant (see table 4). There was a moderate positive correlation between endurance training and felt lower back pain that was statistically significant (see table 5). A Pearson correlation also showed that there was a moderate negative correlation between strength training and prevalence of lower back pain and felt pain (see table 6 and 7). This found that officers that only engaged in strength training had decreased levels of lower back pain. Police officers that only engaged in endurance training scored higher on all five-point lower back pain likert scales when compared to police officers that only engaged in strength training (see Appendix C for more correlations). Police officers that engaged in only endurance training reported higher levels of lower back pain, felt pain, job/social life interference, standing pain, and sitting/driving pain on the five-point likert scales. Police officers that only engaged in endurance training also reported higher levels of cardiovascular risk factors than police officers that only engaged in strength training. Injuries that were most prevalent in

police officers that only engaged in strength training were shoulder pain and other muscle pain, strains, and sprains. Police officers that reported to engage in exercise other than endurance training, strength training, or both reported to have cardiovascular risk factors and other health problems. There was no relationship between police officers that engaged in both training methods and lower back pain. There was also no relationship found between how many days per week police officers trained and lower back pain.

Table 4

		EnduranceOnly	BackPain
EnduranceTraining	Pearson Correlation	1	.304
	Sig. (2-tailed)		.072
	N	36	36
BackPain	Pearson Correlation	.304	1
	Sig. (2-tailed)	.072	
	N	36	36

Table 5

		EnduranceOnly	FeltPain
EnduranceTraining	Pearson Correlation	1	.421*
	Sig. (2-tailed)		.011
	N	36	36
FeltPain	Pearson Correlation	.421*	1
	Sig. (2-tailed)	.011	
	N	36	36

Table 6

		StrengthTrain	BackPain
StrengthTrain	Pearson Correlation	1	-.517**
	Sig. (2-tailed)		.001
	N	36	36
BackPain	Pearson Correlation	-.517**	1
	Sig. (2-tailed)	.001	
	N	36	36

Table 7

		StrengthTrain	FeltPain
StrengthTrain	Pearson Correlation	1	-.488**
	Sig. (2-tailed)		.003
	N	36	36
FeltPain	Pearson Correlation	-.488**	1
	Sig. (2-tailed)	.003	
	N	36	36

Insight from a Statewide Health and Wellness Coordinator and Strength Coach:

Police officers develop cardiovascular risk factors, high blood pressure, insulin sensitivity, adrenal gland issues, soft tissue problems, fatigue, obesity, and weight gain. Other issues include neck problems, shoulder pain, tight hip flexors that associate with lower back pain and piriformis issues. Police officers will also develop pelvic imbalances that cause further lower back problems. Due to the nature of police work, officers will experience changes in their testosterone to cortisol ratios; which will result in adding body fat, especially in the midsection.

Weight gain can be caused by hormone fluctuations from sleep deprivation, usually caused by overnight shift work and stress tolerance. Obesity is also due to a high glycemic carbohydrate intake, which can also cause insulin issues and vitamin and mineral deficiencies. Sleep deprivation can also cause insulin sensitivity and changes in testosterone to cortisol ratios.

Long periods of sitting, mainly in patrol cars, causes the hip flexors to tighten and gluteus muscles to weaken, ultimately producing lower back pain. Wearing a duty belt is associated with pelvic imbalances. Neck and shoulder pain is developed when the shoulder becomes rounded and forward. The adrenal gland is affected when an officer has a high caffeine intake due to lack of sleep. Soft tissue problems are associated with dehydration, toxicity, poor dietary choices, inflammatory foods, and inability to tolerate stress. Due to the nature of police work, systemic tightness/rigidity develops, resulting in the nervous system to become tight, making it extremely difficult to relax.

Police officers that suffer from lower back pain, cardiovascular disease, and other muscle pain tend to have lower fitness levels as well as engaging in poor training methods. This is also found in the general population as a whole. Poor fitness levels are also often associated with poor dietary choices and depression. The combination of the three can be quite inflammation inducing, leading to physiological changes; including soft tissue rigidity, increased inflammatory biomarkers, high serum triglycerides, and hormonal imbalances among others. An example of a poor training method is excessive endurance training. The disadvantages of excessive endurance training are decreased testosterone, increased cortisol, increased oxidative stress or damage from free radicals, and decreased insulin sensitivity post workout. Structural issues include overuse injuries such as valgus knee stress, piriformis issues, lower back issues, shin splints, and foot/ankle issues.

Due to poor fitness levels and training methods, police officers will develop structural imbalances. The structural imbalances include pelvic imbalances leading to valgus ñknock-kneeò posture (knees angle inward), improper landing mechanics during running, which can lead to shin splints and lower back pain. Other imbalances include rounded shoulders leading to

aggravation during training, elbow and wrist issues, and anterior shoulder pain. Police officers tend to have weak VMO musculature leading to caving of the knees during squat, running, and lunging movements. Tight hip flexors leading to lower back pain, gluteal amnesia (lack of glute activation), overstess on the hamstrings and piriformis musculature. Since police officers are usually asked to go from a sitting position to a full sprint, the combination of tight hip flexors, gluteal amnesia, and overstress on the hamstrings, and piriformis can cause the hamstrings to strain or pull. Through proper strength training methods, police officers can correct structural imbalances while improving job performance and overall health. Police officers who are assigned to special assignments, such as SWAT, tend to have better training habits and usually have higher exercise levels and better overall health. SWAT teams also partake in team training days throughout the year.

Currently the academies use the cooper standards to measure overall fitness of recruits while in the academy. It would be useful for the academies to measure the body compositions of recruits. Another test that would be useful is the overhead squat test. The overhead squat test is is able to reveal structural imbalances across a broad spectrum. If police officers know what their structural imbalances are then they can work at correcting the imbalances before they cause further problems.

DISCUSSION

The results were similar to those in previous research. The majority of the police officers in the current study have had experience with lower back pain. Also, for 30.6% of the sample the pain was significant enough to occasionally or frequently interfere with their job and/or social life. This is similar to Brown et al. (1996), which found that lower back pain was severe enough to cause sick leave for a quarter of police officers. If lower back pain occasionally or frequently

interfered with police officerôs job performance in the current study then they may have sought out sick time and/or another remedy. Previous research also found that officers sought out professional help from a physician and/or massage therapist (Brown et al. 1996; Anderson et al. 2011; Gyi and Porter 1998). Officers also took painkillers and/or NSAIDs (Non-steriodal anti-inflammatory drugs). Under the question related to lower back pain and job/social life interference, one officer in the current study wrote, ñwalk through the painò. This officer probably took one of the many popular NSAIDs to help with the pain during his or her shift. This officer may have also taken something to relieve pain outside of work. Poliquin (2011) acknowledged that NSAIDs have multiple negative effects. They may temporarily relieve pain but actually can cause further damage to the affected area and other parts of the body. Poliquin (2011) points out that NSAID intake can have negative effects on the liver, stomach, eyesight, and produce blood disorders. Shea and Poliquin (2011) acknowledged that vitamin D3 intake could help relieve lower back pain and even reduce inflammation. There are also other natural supplements and anti-inflammatory foods that will help. Poliquin (2012) recommends ART or Active Release Techniques to treat pain caused by injuries.

Results were similar to previous research about lower back pain associated with standing, sitting, and driving for extended periods of time (Brown et al. 1996; Anderson et al. 2011; Gyi and Porter 1998). Previous research stated that officers blamed the duty belt, standing for extended periods of time, and sitting in patrol cars as the cause of lower back pain (Brown et al. 1996; Anderson et al. 2011; Gyi and Porter 1998). Results from the current study found that 69.4% of the officers reported that they experienced pain while standing, sitting, and/or driving for extended periods of time. The interview with the Health and Wellness Coordinator also found that wearing a duty belt causes pelvic imbalances, which is related to lower back pain. Sitting for

extended periods of time could cause the hip flexors to tighten and glute muscles to weaken, increasing the risk of lower back pain and potential injuries. If the glute muscles become inactive then the lower back can become overworked and prone to injuries, especially during pulling and pushing exercises, such as deadlifts and squats. Police officers may be asked to perform duties similar to these exercises while they are on the job, which may lead to injuries. While officers were filling out the surveys for the current study many spoke out and believed that wearing a duty belt and driving in the patrol cars were the reasons for their lower back pain. One officer also explained that the duty belt becomes extremely uncomfortable while driving because tools constantly dig into their backs.

There was a relationship found between officers who only engaged in strength training and officers who only engaged in endurance training. A negative correlation was found between officers who only engaged in strength training and lower back pain. Officers who only engaged in strength training had a decreased prevalence of lower back pain and scored lower on all five-point scales when compared to officers who only engaged in endurance training. Officers who only engaged in endurance training not only scored higher on all five-point scales but reported higher levels of cardiovascular risk factors. Previous research (Shojaei et al. 2011; Skoluda et al. 2011) has found the negative effects of excessive endurance training, especially in distance runners and bikers, which was found to be the most popular form of endurance training in the current study. Excessive endurance training could cause inflammation in the body and increase the risk of cardiovascular disease. Previous research also found that cortisol levels were higher in endurance athletes when compared to individuals that do not engage in endurance training (Shojaei et al. 2011; Skoluda et al. 2011). Shojaei et al. (2011) acknowledge that the process of inflammation and increased cortisol can deteriorate muscle and bone. Police officers who already

have existing injuries, such as lower back pain, can cause further problems by having more inflammation in the body. The Health and Wellness Coordinator stated that police officers already experience changes in their testosterone to cortisol ratios due to the nature of police work; mainly caused by sleep deprivation. Endurance training will cause further changes to this ratio. The Health and Wellness Coordinator acknowledged that endurance training is associated with increased oxidative stress or damage from free radicals, decreased insulin sensitivity post workout; and structural issues and overuse injuries such as valgus knee stress, piriformis issues, low back issues, shin splints, and foot/ankle issues.

The majority of officers in the current study engaged in both strength and endurance training. Poliquin (2012) acknowledges that incorporating strength training into endurance training regimens will not only increase performance but also help prevent injuries. Strength training will help cure current injuries and prevent future injuries by creating structural balance in the body. Weak VMOs and calves often cause shin splits in endurance athletes. Strength training can help fix these structural imbalances. Poliquin (2012) also found that strength training could reverse other negative effects of endurance training, such as oxidative stress, inflammation, increased cortisol levels, and muscle deterioration. Strength training has also been found to decrease body fat by increasing lean muscle mass. A majority of the officers in the current study had elevated BMIôs and could benefit from a strength training program. Someone who is obese or overweight becomes more prone to certain diseases, especially cancers that develop in the fatty body tissue. Obese law enforcement officers will be vulnerable to more health problems and injuries. Certain duties, such as running after a suspect, become more difficult. The Health and Wellness Coordinator also agreed that police officers could correct structural imbalances and improve their overall health through strength training.

The results and findings state that lower back pain is caused by muscular imbalances. Excessive endurance training, poor fitness levels, and problems resulting from wearing a duty belt and sitting for extended periods of time can cause these muscular imbalances; therefore the hypothesis was confirmed. An expected outcome was also verified, finding that police officers who engaged in higher levels of strength training compared to endurance training would have less reported health problems. The current study found that exercise levels, in terms of days per week and time per session, were not good predictors of lower back pain and/or other health problems. One limitation is that the majority of the officers were ages forty-one through fifty with twenty or more years of service. Anderson et al. (2011) already found that officers who were employed the longest had higher levels of lower back pain. It would be beneficial to do a longitudinal study on police recruits who graduate the academy and then work on the job for a certain amount of years. The Health and Wellness Coordinator stated that sleep deprivation from overnight shift work could cause police officers to develop certain health problems. More research should be done on police officers working night shifts and compare them to officers who primarily work the day shifts. Research should also be done on law enforcement agencies that require officers to pass an annual fitness test and compare them to officers from agencies that do not require fitness tests.

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Appendix A- Survey

Police Officer Exercise and Lower Back Survey

This survey seeks your input about the relationship between fitness levels and back pain. Please answer each question as accurately as possible by filling in the must appropriate bubble. If you do not feel comfortable answering a question just leave it blank.

1. What is your age range?

- 21-30
- 31-40
- 41-50
- 51+

2. How many years have you been working as a police officer?

- 1-10
- 11-15
- 16-20
- 21+

3. What is your estimated Height and Weight?

*Height*_____ *Weight*_____

4. On average, how many days per week do you exercise?

- 1
- 2-3
- 4-5
- 6+

5. On average, how much time do you spend exercising at a time?

- 30 minutes
- 1 hour
- 1 hour and 30 minutes
- 2+ hours

6. What best describes the type of exercise you engage in?

- Strength training (weight training/resistance training)
- Endurance training (aerobic training, running, biking swimming)
- Both strength and endurance training
- Other (please specify)_____

7. What best describes the equipment you use while strength training? *Check all that apply*

- Free weights and Dumbbells
- Machines
- Resistance bands
- Other (please specify)_____
- I do not engage in strength training

8. What best describes the type of endurance training you engage in? *Check all that apply*

- Running
- Biking
- Swimming
- Other (please specify)_____
- I do not engage in endurance training

9. What muscles do you most frequently train? Check all that apply.

- Arms (biceps, triceps, forearms)
- Chest
- Back
- Lower back
- Shoulders
- Legs (quads, hamstrings, calves)
- Hips and Glutes

10. Do you incorporate flexibility and stretching into your training regimen?

- Yes
- No

11. How often do you experience lower back pain?

- Never
- Rarely
- Occasionally
- Frequently
- All of the time

12. How much pain do you feel in your lower back?

1 (no pain) 2 3 4 5 (extreme pain)

13. How much does lower back pain interfere with your job and social life?

- Never
- Rarely
- Occasionally
- Frequently
- All of the time

14. On a 1-5 scale rate how much pain you feel while standing for extended periods of time

1 (no pain) 2 3 4 5 (extreme pain)

15. On a 1-5 scale rate how much pain you feel while sitting and/or driving for extended periods of time

1 (no pain) 2 3 4 5 (extreme pain)

16. Have you experienced or been diagnosed with other health related problems? Check all that apply.

- Shortness of breath
- High cholesterol
- High blood pressure
- Hypertension
- Shoulder pain
- Cardiovascular disease
- Diabetes
- Other muscle pain, strains, or sprains

Appendix B-Interview Questions

1. While working with police officers and through your research what have you found to be the most prevalent health problems?

2. Why do police officers develop these health problems?

3. While doing my research I found that officers that suffered from muscle pain, especially in their lower back, and cardiovascular disease had lower fitness levels. Do you find this to be true?

4. While training police officers what have you noticed to be their structural imbalances and how does this affect them?

5. Can a police officer correct his or her structural imbalances, overall health, and job performance through strength training?

6. I found that officers who were assigned to special assignments, such as SWAT, reported to have higher fitness levels and better overall health. Do you find this to be true?

7. ***I have noticed that many police departments require recruits to pass endurance tests before they are hired. What are the disadvantages of this?***

8. What tests do you find to be important that would result in better job performance,

ultimately having officers engage in better training methods?

Appendix C- Charts and Tables

Correlation between strength training and standing pain

		StrengthTrain	StandingPain
StrengthTrain	Pearson Correlation	1	-.485**
	Sig. (2-tailed)		.003
	N	36	36
StandingPain	Pearson Correlation	-.485**	1
	Sig. (2-tailed)	.003	
	N	36	36

Correlation between strength training and sitting/driving pain

		StrengthTrain	SittingDriving
StrengthTrain	Pearson Correlation	1	-.440**
	Sig. (2-tailed)		.007
	N	36	36
SittingDriving	Pearson Correlation	-.440**	1
	Sig. (2-tailed)	.007	
	N	36	36

Correlation between strength training and job/social life interference

		StrengthTrain	Interfere
StrengthTrain	Pearson Correlation	1	-.351*
	Sig. (2-tailed)		.036
	N	36	36
Interfere	Pearson Correlation	-.351*	1
	Sig. (2-tailed)	.036	
	N	36	36

Correlation between endurance training and job/social life interference

		EnduranceOnly	Interfere
EnduranceTraining	Pearson Correlation	1	.528**
	Sig. (2-tailed)		.001
	N	36	36
Interfere	Pearson Correlation	.528**	1
	Sig. (2-tailed)	.001	
	N	36	36

Correlation between endurance training and standing pain

		EnduranceOnly	StandingPain
EnduranceTraining	Pearson Correlation	1	.322
	Sig. (2-tailed)		.055
	N	36	36
StandingPain	Pearson Correlation	.322	1
	Sig. (2-tailed)	.055	
	N	36	36

Correlation between endurance training and sitting/driving pain

		EnduranceOnly	SittingDriving
EnduranceTraining	Pearson Correlation	1	.316
	Sig. (2-tailed)		.060
	N	36	36
SittingDriving	Pearson Correlation	.316	1
	Sig. (2-tailed)	.060	
	N	36	36

Time per lifting session

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	30 minutes	15	41.7	41.7	41.7
	1 hour	17	47.2	47.2	88.9
	1 hour 30 minutes	4	11.1	11.1	100.0
	Total	36	100.0	100.0	

Exercise days per week

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	7	19.4	19.4	19.4
	2-3	20	55.6	55.6	75.0
	4-5	8	22.2	22.2	97.2
	6+	1	2.8	2.8	100.0
	Total	36	100.0	100.0