Methods of Training and Effects of Exercises: Analytical Essay

In this report, I am going to investigate the different training methods of each fitness component in order to evaluate the most effective training methods to meet the physical requirements of the physical fitness tests for entry into the Uniformed Protective Services. My data has been collected through personal observation and research.

When training, it is important to take into consideration the 5 physical components of fitness, including; muscular endurance, muscular strength, cardiovascular endurance, flexibility and speed, alongside the 5 skill related components; agility, power, coordination, reaction time and balance.

- Muscular endurance: the ability to remain active for an extended period of time as the muscles contract against a force repetitively
- Muscular strength: the measure of force produced in a single effort by a muscle
- Cardiovascular endurance: the ability of the cardiovascular system and respiratory system to deliver oxygenated blood to the working muscles for a prolonged period of time
- Flexibility: the extent of the ability of a joint or muscles to move through an unrestricted full range of motion
- Speed: the ability to move part of the body as fast as possible
- Agility: the ability to move the whole body in response to a stimulus with a change of direction/velocity
- Power: the ability to exert a maximum force instantly from a muscular contraction
- Coordination: the ability to perform and combine multiple movements efficiently and smoothly
- Reaction time: the time it takes to respond to a stimulus
- Balance: the ability to maintain posture or control of body movement

Training methods

Muscular Endurance and Strength Training:

The best way to improve muscular endurance is to perform many sets of repeated exercises with low weights and a high number of repetitions such as using free weights, sit-ups, squats, squat thrusts and circuit training. This contrasts to the training method for muscular strength, which you should perform repeated exercises using high weights but with a low number of repetitions. In order to stay healthy and improve muscular strength and endurance, you should take part in strengthening activities at least 2 times a week. This can include tai chi, yoga, Pilates, using resistance bands or performing exercises using body weight. (Exercise, 2019) This affects the body system as muscles grow through stimulation and repair. As muscles are overloaded, micro-tears in the muscle fibres occur. Satellite cells, which are usually dormant, are activated by the damage or injury to a muscle which can be caused due to the stress of weight training, triggering a response in the immune system. This causes inflammation, which is

a repair process. At the same time, the growth hormones cortisol and testosterone are released, regulating cell activity. Protein synthesis is increased by the release of testosterone and satellite cells multiply and fuse with skeletal muscle fibres which helps them thicken and grow. This results in larger muscles with a better tolerance of larger loads.

Cardiovascular Endurance Training:

Cardiovascular endurance can be improved through interval training, Fartlek training and continuous training. Continuous training consists of a 5-minute warmup, exercising continuously at a moderate pace for a set period of time (e.g. 30 minutes), and then a 5-minute cool down. However, during interval training and Fartlek training the pace and intensity of the exercise will vary throughout the training session. During interval training, you will perform an exercise at an intense pace for a set distance/time (e.g. 50m or 2 minutes) and then perform that exercise at a low pace for a set distance/time, giving the body a chance to recover before repeating the process. Fartlek training is very similar to interval training, but it is less structured. During fartlek training, you will use the environment to vary the intensity of the exercise such as running up/down a hill or changing the terrain you are running on (e.g. changing from running on the road to running on the grass). Regular cardiovascular endurance training will result in cardiac hypertrophy, meaning that the heart will increase in size and become stronger. The left ventricle wall thickens due to exercise which enables the heart to pump out more blood with each contraction, increasing the stoke volume. Due to the increased stroke volume, the resting heart rate decreases and there is an increased cardiac output. In addition to this, new capillaries are produced in the alveoli and skeletal muscles through capillarisation. This increases the volume of oxygen being transferred to the working muscles and removes more CO_2 which is a waste product of aerobic respiration. Due to cardiac hypertrophy taking place, stamina will increase.

Speed Training:

Training methods for speed is similar to cardiovascular endurance training methods, including interval training, Fartlek training, hill running and resistance-based training. Resistance-based training includes parachute training, sled training and using resistance bands. Parachutes have been shown to improve 0-20m acceleration by 3.3% making them a useful training method for improving speed and acceleration. However, there are many variables which can decrease the effectiveness of the use of parachutes. A major example of this is the wind as its strength and direction can impact the intensity of the training e.g. running against the wind is more difficult than running in the same direction of the wind.

Sled training is practiced by either pushing a sled in front of you or dragging it behind you as you run. Various studies have shown that heavier sled towing improves 5m and 10m acceleration while lighter sleds improves acceleration within the first 20m. Therefore, it has been shown that varying weights when sled training is extremely effective for improving acceleration.

Hill running is a safer way to train at maximal velocities as the slope will shorten the distance that your legs have to land, reducing the stress. In addition to this, the incline of hills encourages better sprinting techniques, improving overall speed and efficiency. This becomes valuable in speed training as it builds maximal velocity and acceleration. (Get Faster, 2016)

Power is a very important skill when it comes to speed as it enables you to increase your

acceleration, and should be taken into consideration when training to improve speed. In order to train to improve power, you can use resistance-based training, weight-based training (using medium weights and a medium number of repetitions performed quickly) and plyometric exercises. Plyometric training involves exerting a maximum force rapidly in short time intervals, such as jumping exercises. Recent studies have shown that plyometric training can increase lean muscle mass by 2% and that performing plyometric exercises twice a week for a month and a half can also improve your change-of-direction ability.

Flexibility Training:

Flexibility can be improved by carrying out PNF stretching, dynamic stretching, static stretching, yoga and pilates.

PNF stretching was originally developed as a form of rehabilitation and therefore is extremely effective for targeting specific muscle groups, improving muscular strength alongside flexibility. It is most effective when the aim is to increase R.O.M (Range of Motion). However, PNF stretches can put additional stress on the targeted muscle group, increasing the risk of injury to the soft tissue. In order to prevent this, it is important to warm up prior to stretching and ensure that you do not exceed a stretch intensity and contraction force of about 50-60%. (Walker, 2004)

Dynamic stretching is when you stretch to your full range of motion and then return to the starting position before repeating. Dynamic stretching before exercise has been shown to improve performance and reduce the rate of injuries. Some examples of dynamic stretches include; side lunges, knee huggers, high knees, skipping, butt kicks, lunges etc.

Static stretching is when you maintain a position elongating a muscle for a prolonged period of time (e.g. 30 secs) and this should be carried out after exercising in order to reduce the risk of injury.

Yoga enables the muscles to become leaner and stronger, and the joints to become more flexible as it combines strength training with flexibility training. It is important to start at a beginner level to avoid injury.

Pilates, like yoga, also combines flexibility with strength training. It requires lots of stretching and movement, an is also useful to tone the muscles and for weight loss.

Effects of exercises

Short-Term Effects of Exercise:

During exercise, the cardiovascular, muscular, respiratory and energy systems all work together to supply the working muscles with energy and remove waste products, such as CO2. As the muscles start to work, they need more oxygen for respiration, therefore the heart pumps more oxygenated blood to the rest of the body. Breathing rate increases as the intercostal and diaphragm increase expansion of the thoracic cavity, bringing in more air in order to re-oxygenate the working muscles as the body needs more oxygen for aerobic respiration.

As the muscles warm up, they increase in pliability. The rate of muscle contraction also increases which begins to diminish energy stores, stimulating a higher rate of energy metabolism. Myoglobin, which is an oxygen-binding protein primarily located within the muscles, is released to use in aerobic respiration. O2 is now able to diffuse into the muscle from the capillaries more quickly due to the steep concentration gradient between the capillaries and the muscles.

Micro-tears in the muscle tissue are also formed due to stress and overload on the muscles.

Sweating and skin redness also occurs during exercise in order to control the body's temperature. Exercise requires aerobic respiration, which is an exothermic reaction, increasing your body temperature. Thermoregulation is helped by an increase of blood flow to the skin's surface (causing skin redness), creating more heat on the skin's surface but maintaining core body temperature. Red skin is caused by vasodilation in the capillaries to allow more blood to flow through, carrying more oxygen around the body. Blood vessels become closer to the skin's surface allowing thermal energy to escape. Sweating allows the body to cool down as the sweat evaporates from the skin's surface. Skin redness and sweating work together to cool off the skin which allows skin redness to be effective in preventing your body from overheating.

The production of synovial fluid increases after exercise. Synovial joints are an essential part of exercise as they allow a range of movement within the body, providing cushioning and lubrication to tissues and bones as you exercise. Regular exercise ensures that the health of synovial joints is maintained. Synovial membrane cells secrete lubricin and hyaluronan, which increases the cartilage density and elasticity. In addition to this, synovial fluid has been shown to protect the body from inflammation and infection as well as help manage osteoarthritis and arthritis.

As I have been exercising, I have noticed some of the short-term effects of exercise and physical changes. These have included an increase in my heart rate and breathing rate, redness in my skin, sweating, tiredness/aching in my muscles and a side-stitch (ETAP). For example, when running during continuous training, my heart rate had increased from 61bpm (my resting heart rate) to 163 bpm.

Long-Term Effects of Exercise:

After regular exercise and training, cardiac hypertrophy and skeletal hypertrophy will begin to take place, allowing the heart to pump more blood around the body and the skeletal muscles to tolerate heavier weights as the muscles thicken and grow. The body systems will also adapt to become more efficient after regular training/exercise around three times a week for six weeks and performance in that particular type of exercise or sport will begin to improve.

Another effect of exercise is increased bone density. Bone forms after a stress has been placed upon it during exercise as bone cells move to the stressed area. The bone is strengthened when proteins such as collagen are deposited between the bone cells, giving bone its rigidity as these proteins mineralize. Therefore, the principle of progressive overload applies to bone as well as muscles whilst training.

In addition, overall health and everyday life will benefit from regular exercise.

Benefits of Exercise:

Regular exercise can have many benefits on your lifestyle and overall health, including maintaining healthy muscles and joints. This is because exercise increases the production of synovial fluid, which in turn increases the cartilage density and elasticity, reducing the risk of osteoarthritis. In addition, regular exercise helps you to maintain a healthy weight as it increases the number of calories you burn each day.

Regular exercise can also reduce the risk of osteoporosis (as bone density increases after stress has been applied to it), coronary heart disease up to 35%, certain types of cancer (e.g. breast cancer and colon cancer) and type 2 diabetes up to 50%. (Benefits of Physical Activity, 2015)

Exercise can also help mental well-being, reducing the risk of developing dementia and reduce depression up to 30% as well as relieve stress and reduce anxiety. This is because exercise releases chemicals from the brain such as dopamine and serotonin. (Mayfield-Blake, 2019) Furthermore, exercise can help improve social skills and enhance self-esteem if you take part in sport or physical activity as part of a team.