Here is Part 2 of Jock Alcock's article on Physical Fitness and the Police Officer. The concluding section, Part 3, will feature in the next edition of *Platypus.*

HOW YOUR BODY WORKS

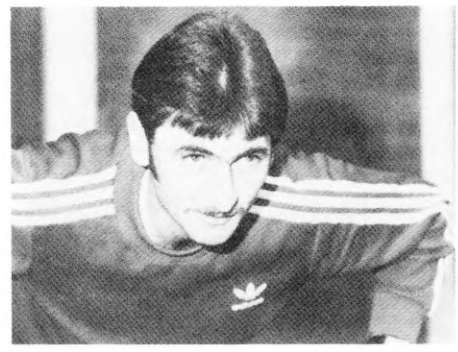
To get a full appreciation of health through physical fitness an understanding of the body functions and the physiological aspects is very important. You should begin by examining the benefits of physical fitness and the quality and quantity of physical activity. The basic principle here is that of atrophy: that which is not used degenerates while that which is used improves in strength, efficiency and durability. The modern life style lacks physical activity to such an extent that virtually every system of the body is in danger of degeneration through atrophy. Obviously then the purpose of exercise is to make up for the lack of physical activity.

The importance of knowing the functions of your cardiovascular/respiratory system, the lungs, the heart and blood, muscular functions and stress factors and how and where they all fit into the program and affect your fitness must be covered in some depth in order for you answer the hows and whys that inevitably will appear.

I will attempt to cover each of these functions as briefly and accurately as I can.

Cardiovascular/respiratory system

Physical activity, like any other biological function, requires energy which is derived from oxidising the food supply. Hence, the ability of the body to supply food and oxygen to a particular area determines how much that area can do. The human body stores enough food in the form of fat, that except under starvation conditions, the availability of food for burning is not a limiting factor. The ability of the body to provide oxygen to an active muscle site, and to remove carbon dioxide, constitutes the principal limiting factor of physical activity. As the rate of physical activity increases, the rate of energy consumption increases, and consequently, the rate at which oxygen is supplied to the tissues and the rate at which carbon dioxide (waste) is removed must be increased. This ability is determined by the efficient capacity of the lungs, the ability of the heart to pump the volume of blood required, the resistance the blood vessels provide to



the blood flow, the extensiveness of the vascular system and of course the ability of the blood to transport oxygen.

The above will become clearer as the lungs, heart and blood vessels are covered in more depth.

The lungs

After delivering oxygen to the body tissues and picking up carbon dioxide, the blood returns to the lungs. The blood at this stage has a low concentration of oxygen and a high concentration of carbon dioxide. The air within the lungs, under normal conditions, is exactly the reverse . . . high oxygen and low carbon dioxide concentrations which forms the existence of a pressure gradient. The two gases move across the membranes of the lungs to equalise the gas concentration on each side of the lungs. Hence, oxygen will move into the blood and carbon dioxide will move out. The longer the air remains in the lungs, the lower the difference between the air in the lungs and the blood in their concentrations of each gas, and hence the less gas will be exchanged.

As the level of physical exertion goes up, more oxygen must be made available for absorption by the blood and more carbon dioxide must be removed from the blood. The increase in the rate and depth of breathing during exercise will accomplish this.

What all this means is that when more air is inhaled with each breath during exercise, the greater volume of air in the lungs means that the pressure gradients will be maintained longer because the oxygen lost to the blood and the carbon dioxide picked up will constitute a smaller proportion of the total amount of each gas present in the air of the lungs. When less air is left in the lungs after exhalation, there is less stale air available to mix with the fresh air coming in. You should not think though, that it is impossible to voluntarily expel all of the air from the lungs, trying to will provide you with the proof!

The ability to change breathing patterns due to physical activity depends largely on the condition of the individual's rib cage and diaphram muscles. A person who is conditioned for physical activity is better able to maintain an increased rate of breathing as the deconditioned person, simply because he can inhale greater volumes of air with each breath and leave smaller volumes of air in the lungs after exhalation effectively providing the same amount of ventilation in fewer breaths. All of this adds up to efficiency of breathing during physical exertion.

The heart

The quantity of oxygen that can reach an active muscle site in a given amount of time is dependent on the volume of blood the heart can pump through the body during that time. The fuel for muscles is oxygen.

The volume of blood the heart can move in a given period of time (cardiac output) is equal to the number of times it beats (heart rate) multiplied by the amount of blood it pumps out with each beat (stroke volume). Heart efficiency is better obtained by increasing the stroke volume rather than the heart rate as an increased heart rate becomes self defeating: the faster the heart beats, the less time there will be available for the heart to refill with blood before the next contraction, thereby cutting down on the stroke volume and cardiac output. The heart of a fit person is more efficient then because it relies on increasing its stroke volume rather than its rate of contraction when it must meet demands for an increased cardiac output. The fit person's heart beats do increase with activity but not to the extent of the heart of the unfit person. The fit person's heart also has a superior recovery rate and is capable of sus-

taining near maximal heart rates for a longer period of time.

Simply defined, the heart is a muscle and can be strengthened accordingly. Physiological changes that take place with regular aerobic (with oxygen) exercising account for the differences in performance and bring about an enlargening of the heart: the ventricular cavities will become larger and allow the heart to fill with more blood before each contraction. As the heart is used more (being a muscle) it increases the amount of muscle tissue making it stronger and more capable of emptying completely each time it contracts. Together these changes mean that the heart can now considerably increase its output without appreciably increasing its rate and will account for the lower resting pulse rate in the conditioned person.

Blood and blood vessels

The blood and its vessels are extremely important factors to consider. A conditioned person's blood is improved because the number of red blood cells increases with conditioning and there is a higher haemoglobin count in each red blood cell. Haemoglobin is the substance responsible for storing the oxygen in the red cells for transportation to the muscle tissue. The amount of blood plasma is also increased. This means that the conditioned body is more able to transport oxygen and remove wastes owing to a healthier blood formation.

For the blood to move throughout the body it must have some form of momentum which is provided by the heart pumping initially. However, this movement is restricted, logically, by the amount of healthy blood vessels through which the blood must pass. This restriction is an unavoidable fact of mechanics which the cardiovascular system is designed to take into account. Problems arise however when the resistance provided by a degenerating vascular system increases too much. The resistance increases by the constriction of the smaller branches of the arteries, the hardening of the arteries and the depositing of fat along the artery walls. The tell tale sign of all this of course is high blood pressure . . . a greater pressure due to a greater resistance.

Physical conditioning leads to the lowering of blood pressure simply by reversing the degenerating process of the blood vessels. The resistance to the blood is lessened by increasing the number, size and elasticity of the blood vessels and by decreasing the build up of fats along the walls of the vessels. The latter could be likened to a water hose that has been constantly running at a trickle for years and has a build up of mud on the inner walls of the hose. When the hose is used more often and at greater pressures, the mud will slowly be forced away from the walls allowing for greater volumes of water to flow.

It should be conclusive then that the conditioned person's blood vessels are more efficient because there is a regular demand placed on them to circulate at extended rates. The blood vessels supplying the heart become more elastic and larger and so are less susceptible to blockage. Fatalities caused by heart attack are reduced owing to the increased number of blood vessels mitigating to some extent the effects of the blockage.

"FREEDOM" FOR JOHN JOHNSON

by Dani Rogers

Many an interesting story to tell his children has Assistant Commissioner John Johnson who recently returned from a six month course at Bramshill Police College, England.

Possibly the most exciting story is that of his presentation to the Royal Family and his admission to the Freedom of the City of London.

John and his wife, Pat, were presented to the Queen and Prince Phillip at a Garden Party at Buckingham Palace.

Mr Johnson, in the uniform of Assistant Commissioner of the Australian Federal Police, was presented along with three other distinguished Australians by Sir James Plimsoll, High Commissioner for Australia, in front of a large crowd of diplomats and other invited guests attending the Royal Garden Party.

A few weeks later, Mr Johnson was given the Freedom of the City of London at a ceremony conducted by the Chamberlain in his Court at the Guildhall in the City.

The ceremony was attended by the Right Honourable The Lord Mayor Sir Peter Gadsden, G.B.E., M.A., B.Sc., F.Eng., the Lady Mayoress, Senior officers of the City of London Police Force and other senior officers of the City of London Corporation.

Assistant Commissioner (Personnel), Mr John Johnson (centre) receives the Freedom of the City of London. Mr Johnson has spent six months in the United Kingdom attending a senior command course at Bramshill College.

"It was most impressive", Mr Johnson said. "The admission was bestowed with due ceremony with all the officials dressed in their ancient robes of office."

He added: "The Freedom of the City of London dates back to medieval England and the earliest evidence of its existence is a register of freemen and apprentices in 1275."

Recent recipients of the Freedom include the Duke of Gloucester, Edward Heath, Lord Feather, Morecambe and Wise, and Lord Goodman.

Among other living recipients of the Honorary Freedom are the Queen and the Duke of Edinburgh, the Prince of Wales, Princess Anne, Harold Macmillan, Pierre Trudeau, and Sir Harold Wilson.

The roll of past Honorary Freeman is a very distinguised one with people like Nelson, Wellington, Disraeli, Florence Nightingale, Baden-Powell, Churchill, Nehru and Montgomery of Alamein to name but a few.

"My admission to the Freedom of the City was not only an honour for me and my family, but also an honour for the Australian Federal Police," Mr Johnson said.

After leaving England, Mr Johnson visited Police officials in Toronto and Ottowa before moving on to Washington and the F.B.I. Academy at Quantico where he spent some time. He is now back at his desk in Canberra.