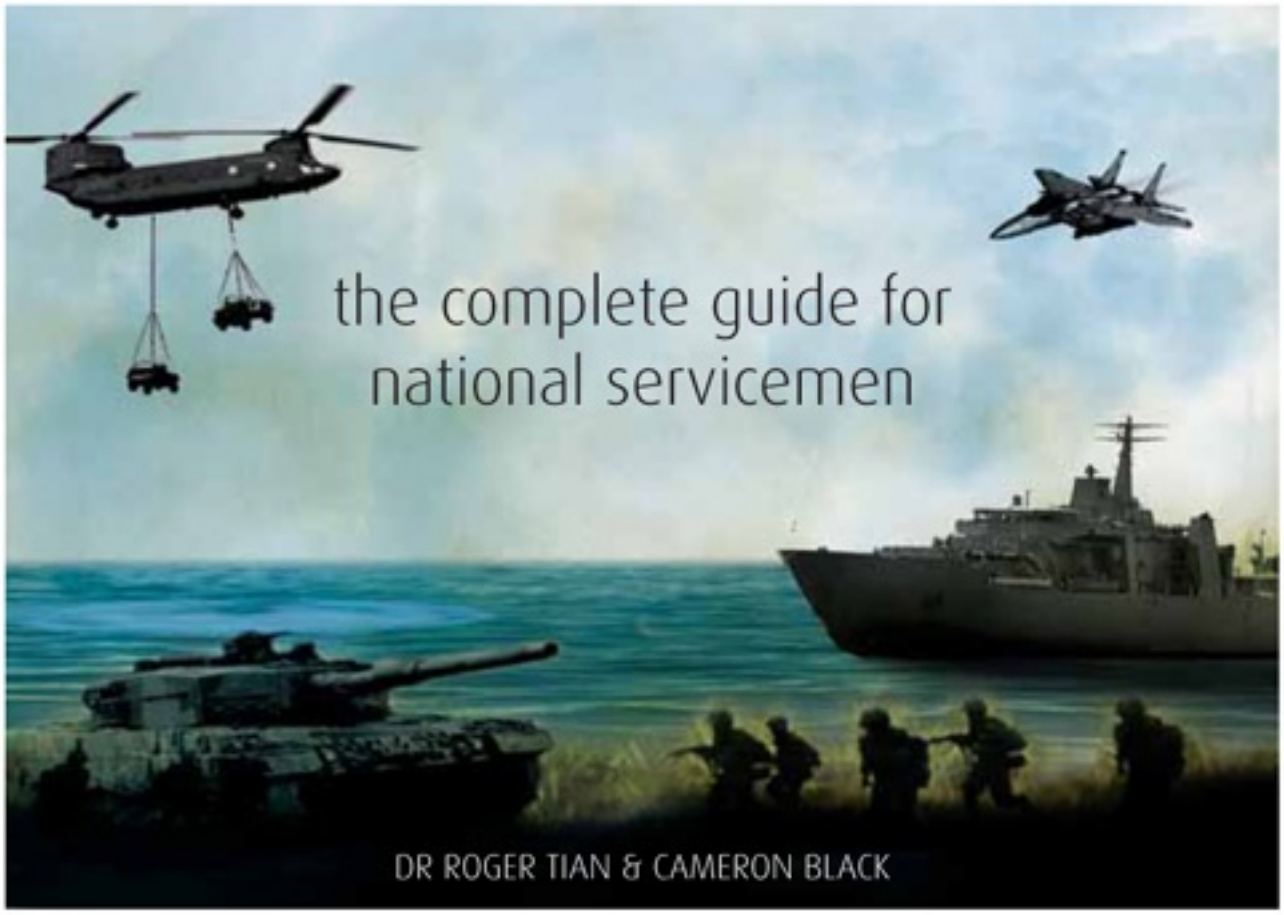
BOYS TO MEN


the complete guide for
national servicemen
DR ROGER TIAN & CAMERON BLACK

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To the past, present and future servicemen of the Singapore Armed Forces — your sacrifice and dedication keep our land safe and ensure that we sleep soundly at night.

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If you have or suspect that you may have any underlying medical conditions, consult your doctor before beginning any new or strenuous exercise or fitness programme. Perform the workouts in a safe environment and observe proper techniques at all times. If in doubt, consult a certified fitness professional for advice. The authors and contributors disclaim any liability, personal or professional, resulting from any of the exercises and workouts in this book.

INTRODUCTION

Every year, about 20,000 young men in their late teens and early twenties don military fatigues and enlist for National Service. For most, the journey begins with Basic Military Training (BMT), a two- to four-month period during which they are taught basic soldiering skills and introduced to life in the military.

This period is often viewed with fear and trepidation by recruits and their parents — many are uncertain about their ability to cope with the demands of training and adapt to the regimentation in the military. However, this need not be so — prior preparation, both physically and mentally, will go a long way in removing this apprehension and enable enlistees to have a smooth transition into military life.

It is with this objective that the authors have assembled a team of experts, including doctors, physiotherapists, strength and conditioning specialists, sports scientists and dietitians to produce this book. These experts come from various institutions and most have been or are still active in the military. They have been selected because of their qualifications, knowledge and experience gained from working with both soldiers and elite athletes, including Olympians. Many have worked with both Full-time National Servicemen and regulars for several years, taking care of their medical and fitness needs. They have also been involved in the design of injury prevention and conditioning programmes for soldiers seeking enlistment into the local and overseas special forces. Their expertise and knowledge are presented in these pages in a clear and concise format.

Regardless of your goal, whether it is to simply survive the two years of compulsory service, to achieve your personal best in the Individual Physical Proficiency Test (IPPT), or to ace your cohort and go to command school, the scientific and evidence-based exercises, programmes and nutrition tips in this book will help you build a solid physical and mental foundation. You will find *Boys to Men* a valuable companion as you undergo your personal transformation from civilian to soldier.

NATIONAL SERVICE IN SINGAPORE

The National Service journey

DR NOREFFENDY BIN ALI

Singapore declared independence from Britain in 1963 and from Malaysia two years later, becoming the Republic of Singapore in 1965. As Britain pulled its military out of Singapore in 1971, we were virtually left with no armed forces of our own — we only had about 1,000 soldiers! This was too small a number to provide effective security for our national interests and our newfound freedom.

The situation prompted our Government to implement a conscription programme for the country's defence. On 14 March 1967 the National Service (NS) (Amendment) Act was passed, and today our military depends on citizen soldiers for its core. NS and Singapore's committed National Servicemen form the backbone of the Singapore Armed Forces (SAF).

Since then, 700,000 personnel have served the nation and more than 300,000 are currently doing their full-time NS, or are active operationally ready National Servicemen being called up annually for in-camp training and standby duties. A further 400,000 have fulfilled their duty and completed their operationally ready NS cycle. Sons now follow in the footsteps of their fathers, as a second generation of Singaporeans serves the country through NS.

WHY WE NEED NS

SMALL POPULATION

With a total population of about 5.3 million and a land area of 714 square km (as of end 2012), Singapore is amongst the 20 smallest countries in the world. An armed forces composed solely of Regulars would be insufficient to defend the country. A conscription force by law that obliges all eligible people to enlist is the only way that we can create a sizeable standing force for security, continued prosperity and ongoing peace.

DETERRENCE AND DIPLOMACY

Singapore's defence is predicated on deterrence, and hence we invest heavily in building a strong and credible force that maintains a high state of operational readiness. This enables us to react swiftly to any threat and at any time to deter a potential enemy from attacking. In today's world, the SAF has to contend with a wider spectrum of threats such as

transnational terrorism, maritime security and unpredictable shifts in the international environment. The critical need for a Singaporean NS is apparent when regional and sub-regional conflicts come to the fore.

Our conscription force serves not only in deterring aggression and in protecting Singapore's sovereignty. It also allows for the pursuit of national interests without yielding to external threats or pressure. The original Act and our Government's strategic posture have given us freedom that allows us to choose our own way of life while safeguarding the homes of our citizens.

NATION BUILDING AND RACIAL HARMONY

Apart from fulfilling military requirements, NS has also played an important role in nation building. By bringing young Singaporeans together, it helps to forge unity and cohesion among those of different racial, religious, linguistic and educational backgrounds. This rite of passage serves as a foundation for the creation of a strong and unique national identity. It is envisaged that the Government will continue to make this a major priority.

"National Service has become a defining part of the Singapore identity."

- Prime Minister Lee Hsien Loong marking 45 years of NS in 2012

TYPES OF BASIC MILITARY TRAINING IN THE SAF

The Basic Military Training (BMT) programme trains recruits in basic military skills, tactics, and prepares them for their post-BMT vocational training. There are several types of BMT conducted on Pulau Tekong, an island off the north-east coast of Singapore, as well as at the various military units that directly accept mono-intake recruits.

9-WEEK BMT

Medically fit Full-time National Servicemen (NSFs) who are deemed suitable for most combat and combat support vocations, and have obtained at least silver for their National Physical Fitness Award (NAPFA) test, undergo a 9-week Enhanced BMT programme at the SAF Basic Military Training Centre (BMTC). At the end of the programme they will be assessed on their eligibility for going to command schools depending on their performance. Command schools include the Specialist Cadet School (SCS) and Officer Cadet School (OCS). NSFs who are accepted directly into operational units will go through a similar BMT programme, but without the assessment for command school. NSFs with medical conditions may have to go through a 9-week Modified BMT.

8-WEEK PHYSICAL TRAINING PHASE (PTP) PRIOR TO BMT

Enlistees who are medically fit, but did not manage to get a silver or gold for their NAPFA test, will have to undergo an additional 8 weeks of physical training to prepare them for BMT.

19-WEEK BMT

NSFs who have a body mass index (BMI) of 27 kgm^{-2} and above will go through a special BMT programme that lasts 19 weeks. The first 10 weeks focus on losing weight and improving overall physical fitness, while the remaining 9 weeks focus on basic military training skills.

4-WEEK BMT

NSFs with certain medical conditions that do not allow them to participate in strenuous physical activities will be put through a 4-week BMT programme that focuses on National Education, SAF core values, regimentation and discipline as well as vocational training to prepare them for combat service support vocations.

IMPORTANCE OF GOOD PHYSICAL AND PSYCHOLOGICAL PREPARATION FOR NS

Life as a recruit will be quite different from the civilian life that most Singaporeans are used to. Being physically and mentally ready for the journey ahead will help make the transition from civilian to military life smoother and more enjoyable.

NS training is also physically rigorous. It is hence important to be fit and adequately prepared, as it will help us to stay injury free and reduce the risk of injury during training. This book will provide information and expert advice for future and current service personnel along with their families on how to safely and effectively prepare for NS. It is never too early to start!

PREPARING FOR NS: PSYCHOLOGICAL READINESS

Mental health strategies
DR CHRISTOPHER CHEOK

Both physical and psychological preparations are required to ensure a smooth transition into NS. In the six months leading up to NS, there should be a gradual increase in physical activity to gain physical endurance and strength. This can be achieved by regular running and following a physical workout routine. If you are able to run 5 km in half an hour and perform at the NAPFA silver or gold standard before entering into BMT, the transition into NS will be easier.

Prior to enlistment, personal issues also need to be discussed and organised. These include romantic relationships, educational goals, personal finances, family finances, family problems and problems with close friends.

PHYSICAL AND PSYCHOLOGICAL PREPARATION

PHYSICAL PREPARATION

- Cardiovascular endurance
- Whole body strength and conditioning

PERSONAL ISSUES

- Romantic relationships
- Educational goals
- Personal and family financial issues
- Family and friendship problems

PHYSICAL PREPARATION — MOTIVATING YOURSELF FOR PHYSICAL FITNESS

There are many benefits of good physical fitness. Physically fit people are usually happier, livelier and more confident. They are able to concentrate on their work better, and generally achieve more in life. Longer-term benefits include better health and longevity.

To get into fitness, you must set goals and aims. This could be in the form of a weight target, with a BMI (weight in kilograms divided by the square of your height in metres) of 18 to 22 kgm^{-2} being ideal. It could also be a fitness target, such as running 2.4 km in 10:30 or doing 10 pull-ups. Motivate yourself with small rewards, for example, getting a new mobile phone, when a target is achieved. It is also useful to get a fitness partner so that both parties can motivate each other. Besides fostering friendships, a fitness partner can help you keep to training schedules and goals.

SIMPLE IDEAS TO MOTIVATE YOURSELF TOWARDS FITNESS

- Know the benefits of fitness
- Set goals
- Get a fitness partner

PERSONAL ISSUES

ROMANTIC RELATIONSHIPS

At the age of entry into NS, romantic relationships are often unstable, and many couples will come together or grow apart regardless of the occurrence of NS. It is important to know that young adults are learning about handling relationships, compatibility and commitment at this age. Consequently, romantic relationships are fragile as people discover more about themselves and their partners. Breakups are thus common, and enlistees should be prepared that when their partners go to work or enter a new school, they may meet other people. While long-lasting and meaningful relationships are possible, romantic relationships at this phase of life also tend to be transient.

EDUCATIONAL GOALS

There is limited time during NS to pursue educational goals, especially in the first year. It is essential to accept that NS is a period of sacrifice for the country. If there is a desire to pursue educational goals during this period, it may be stressful because of the two competing demands of NS and studies. There are many things to learn during NS, such as team work, negotiation skills, time management and planning, which are useful life skills.

PERSONAL FINANCIAL ISSUES

Internet football gambling, overspending and imprudent foreign exchange trading are some of the usual reasons why NSFs face financial difficulty. To prevent personal spending from spiralling out of control, it is important to seek help from family and friends, who can help to curb overspending. Once the sum of money owed exceeds two to three times the monthly allowance, it will be quite difficult to repay the debts. Going to illegal money lenders is definitely not recommended.

FAMILY FINANCIAL ISSUES

Family financial issues can be difficult to manage, especially if a parent is involved in problem gambling or facing unemployment. It is best to inform a superior upon enlistment if there is a family financial issue. During NS, financial assistance schemes are available if the situation meets the organisation's criteria.

FAMILY PROBLEMS

Family problems can be long-lasting with no clear near-term solution, especially when it involves physical abuse, extra-marital affairs or difficult relatives. It is best to inform a superior if there is a family issue that regularly results in crises at home. It is also important to seek help if the family problem becomes difficult to cope. The SAF has a counselling service, and all restructured hospitals have a psychiatric department.

ISSUES IN EACH PHASE OF NS

Common issues that will be encountered by servicemen can be discussed via the phases of NS. There are three phases in general. The first phase is BMT, which lasts about four months. Following that, there is the vocation training phase of about four to six months. Next is the integration phase where soldiers learn to work together as a whole unit. This phase lasts from the end of their vocation training till their Operationally Ready Date (ORD).

PHASE 1: ADAPTING TO BMT

Initial adaptation to the military environment will be the most challenging. Military culture requires you to exercise team work, which means being able to work cohesively and sacrificing some personal needs for the needs of the team. You must learn to try to understand the individual characters and needs of everyone in the team and reach a level of cooperation that all can accept. It is not easily done, and there will be conflict among team members from time to time.

When you succeed as a team, the whole team will be rewarded. Likewise, when you disappoint as a team, the whole team may suffer punishment. This initial process of team building may lead to some stress but with time, most teams will learn to work together

effectively.

The military is also a hierarchical organisation. Orders come from top-down and you are expected to comply with the instructions. There are usually good reasons why certain things have to be done. However, the reasons are not communicated most of the time, and this may leave you wondering why things need to be carried out in a prescribed manner. Nevertheless, you must be prepared for superiors to issues orders that are to be followed with few questions asked.

Living together with others during BMT is the next big challenge. You may have bunkmates who are not as considerate as you would like them to be. If this problem affects the whole group, you can bring it up as a group. Sharing toilet and showering facilities may be an issue to some, but most people eventually get used to it.

PHASE 2: VOCATION TRAINING

In this phase, you will be sent to schools and training institutes to learn specialised crafts. Vocation training phase is manageable for most people, especially if you can accept the jobs that you are assigned to. Some soldiers may have specific difficulties with the jobs. If there is a medical problem which affects your ability to do your work, you should highlight this to the Medical Officer.

PHASE 3: INTEGRATION WITH THE WHOLE UNIT

The third phase can be one of the more challenging periods for you. Most operational units have a high standard of discipline and intensive operational and training schedules. Hence, the transition from BMT or a school to an operational unit can come as a culture shock. Every camp, every unit and every formation will have their own culture based on their history. It is very difficult to predict how one will adapt to a unit. After a period of adjustment, most soldiers will modify their expectations and eventually settle into the new working environment.

MANAGING THE STRESS OF NS

While adapting to NS may be stressful, this challenge can be managed through simple steps. Firstly, prioritise your life. NS is a time for training and if there are competing priorities such as studies or romantic relationships, this can produce additional stress.

Secondly, make new friends in your unit and maintain old friendships. It is important to get emotional support from the people whom you are familiar with. When you are frustrated, talk to someone about it and you are likely to feel better.

Thirdly, have a personal relaxation strategy. This can be in the form of sports, listening to music or relaxation exercises such as deep, slow breathing. If you have a hobby, make use of the weekends or other pockets of free time to do it.

Fourthly, find help. If there is a problem in the camp or an issue you cannot solve, speak

to a superior about it. If your superior cannot solve the problem, you may wish to seek permission to speak to the next level of authority. Usually, a full-time regular soldier may have more experience to help you with your difficulty.

MANAGING STRESS

- Prioritise your life and do the important things first.
- Make and keep friends, and talk to them for emotional support.
- Develop a relaxation strategy.
- Seek help when necessary.

NS can be a time for rich personal growth, or it can be the worst time of your life. Managing your fitness, your mind and your expectations can make a difference to the experience of NS. For many people, it is a memorable period and they enjoy telling old NS stories many years down the road. If you have to do NS, you might as well prepare for it and enjoy it.

PREPARING FOR NS: PHYSICAL PREPARATION

Tips on maximising your strength, power, speed and endurance

OH PAUL WEE

Military operations often require soldiers to travel long distances with heavy equipment under specific time constraints. Physical training in the military aims to equip you with the necessary physical attributes and skills to fulfil these objectives. These attributes include:

CARDIOVASCULAR FITNESS

The heart, lungs and red blood cells within the blood vessels form the cardiovascular system. The role of this system is to provide oxygen-rich blood to the muscles during exercise spanning several minutes to hours in duration (e.g. clearing of obstacles in the Standard Obstacle Course (SOC), 2.4 km run, route march).

ANAEROBIC FITNESS

During highly-intensive, all-out physical effort over a short duration, there is insufficient time for the cardiovascular system to deliver oxygen to the muscles. The body then relies on the enzymes and fuel stores within muscles to generate energy. During BMT, the anaerobic system will be relied upon when practising fire and movement (engaging the enemy while repetitively sprinting short distances of 3 to 10 m for cover). This system is also used during the 4 x 10 m shuttle run in the Individual Physical Proficiency Test (IPPT).

AGILITY

This is the ability to change direction rapidly while on the move (e.g. avoiding obstacles, getting to “cover” as rapidly as possible).

MUSCLE STRENGTH AND ENDURANCE

Strength is the ability of the muscles to lift a load, while endurance is the ability of the muscles to perform a strength activity repetitively. In the military, both attributes are necessary during operations (e.g. carrying equipment, trench digging, filling sand bags), when performing activities such as pull-ups and sit-ups and when clearing obstacles in the SOC.

MUSCLE POWER

Also known as explosive strength, this is a measure of the speed at which muscles can generate strength. Power is needed to jump higher, run faster and throw further. Activities which require explosive strength include the standing broad jump and shuttle run stations in the IPPT, clearing the low wall in the SOC, throwing a grenade, as well as fire and movement exercises.

As recruits often have different fitness and sporting backgrounds and abilities, physical training during BMT is progressive and geared towards gradually improving the recruits' fitness. The exercises in this chapter will help you to build a solid foundation before entering NS — not only will that ease the transition from civilian to military life, but it will also reduce your risk of injury and improve your performance.

CARDIOVASCULAR CONDITIONING

Cardiovascular exercises include running, swimming and cycling. The most specific way to train your cardiovascular system for BMT is by running, as you will be using the same muscle groups and enzyme systems during daily Physical Training (PT) sessions and while on operations.

If you are not a regular runner, start off by running for 15 to 30 minutes two to three times per week. The speed should be slower than that of your 2.4 km running pace, and you should be able to speak in complete sentences during the run. Do not worry about how much distance you can cover; your target is to run comfortably and continuously for 30 minutes.

Once you achieve this, or if you are a more experienced runner, increase the pace so that you can cover 3 km, and eventually 5 km, within 30 minutes (run on a 400 m stadium track to accurately measure this distance). To avoid injury, add to the distance slowly (not more than 10 per cent every two weeks). Be sure to run with a proper technique, as this will help you run more efficiently, attain higher speeds and reduce the risk of injury.

SOME TIPS TO REMEMBER WHEN RUNNING

- Lean slightly forward, without crouching.
- Elbows should be at about right angles, with your hands relaxed (thumb just touching the index finger).
- Swing your arms fully — drive your elbows back, and when forward, your hand should reach the level of your shoulders.
- Activate your core while allowing trunk torsion, i.e. the hips and shoulders should rotate in opposite directions.

- Lift your knee high at the end of the forward swing.
- On the downswing of your lower limbs, land with your foot under (not in front of) your centre of gravity (hips).

ANAEROBIC CONDITIONING

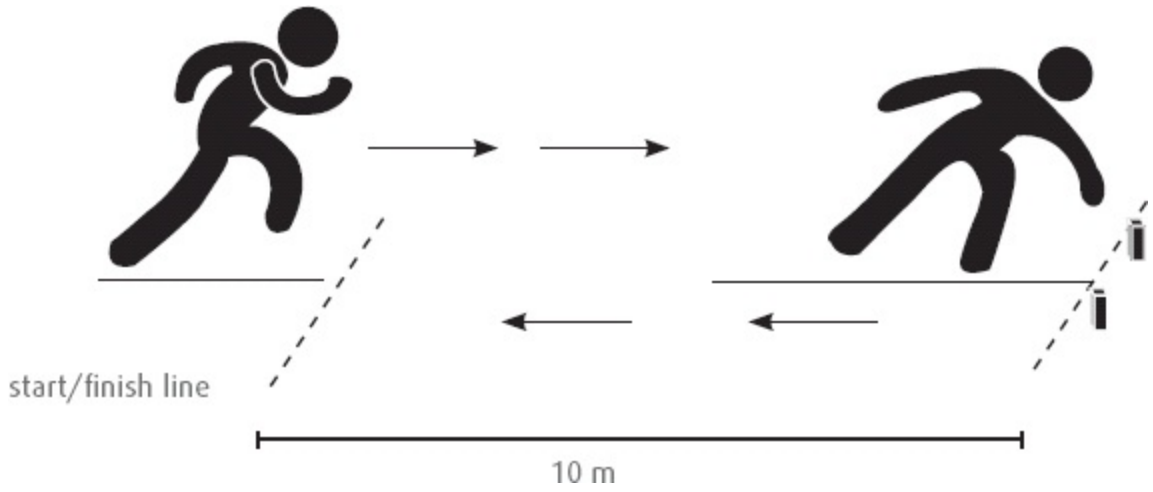
Practise 10 m, 20 m, 30 m, 50 m and 100 m sprint drills at a suitable open area with no obstructions (e.g. a stadium track or open field).

AGILITY TRAINING

Practise the following agility drills (from the same starting position as the sprint drills) at a suitable open area with no obstructions:

4 X 10 M SHUTTLE RUN

See pages 72 to 74.



T-DRILL

Aim: Practise moving sidew ays and backw ards.

Technique: Run from cone A tow ards cone B. Side-shuffle betw een cones B, C & D before back-peddling tow ards cone A.

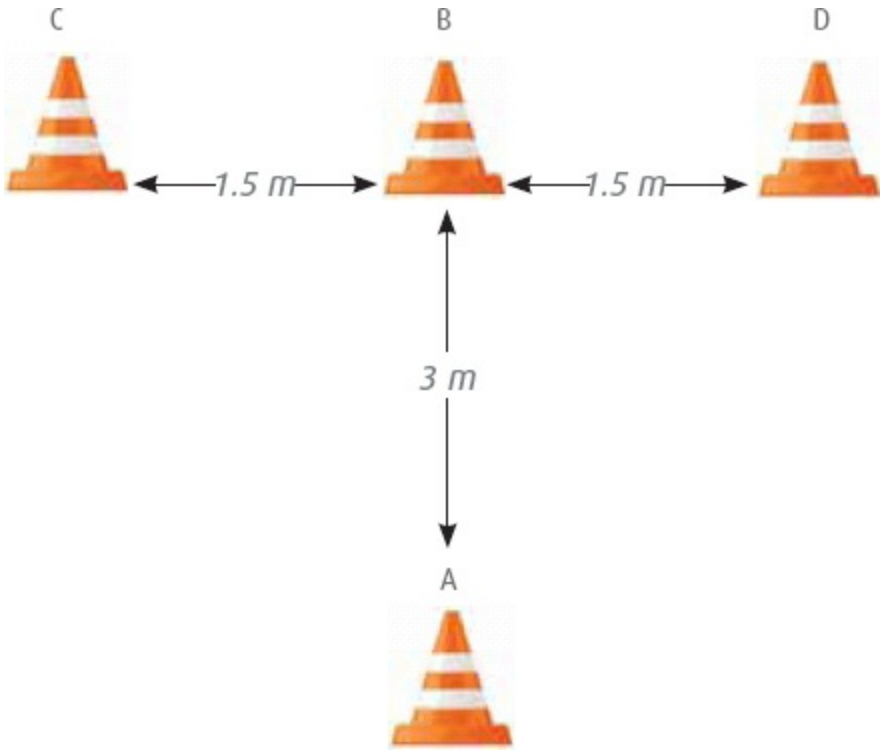
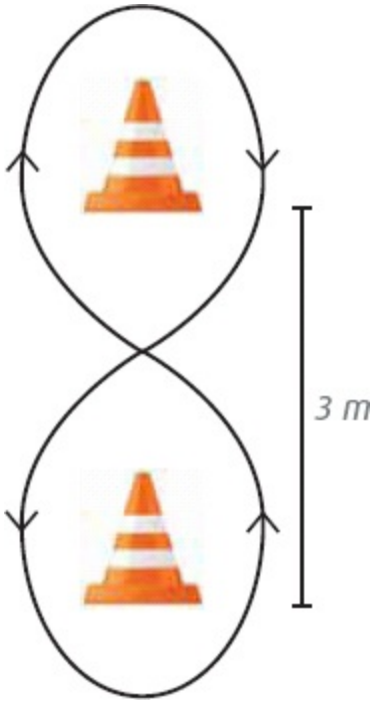


FIGURE-8 CONE DRILL

Aim: Improves rapid sidew ays movement.

Technique: Place tw o cones 3 m apart. Run in a figure-8 pattern around the cones.



MUSCULAR STRENGTH AND ENDURANCE

Strength training exercises should be carried out at least twice per week. This can be performed with either your own body weight (calisthenics) or using equipment (resistance) available in a gym.

CALISTHENICS

PUSH-UP

Aim: Strengthens the chest, shoulder and arm muscles.

Technique: Start with the elbows straight and palms shoulder-width apart. Your back should be in a straight line from the tip of your head down to the ankles. Lower the body as a single unit until your chest touches the ground. Straighten the elbows and return to starting position.

PULL-UP (CHIN-UP)

Aim: Builds upper body (shoulders, arms, chest and back) strength.

Technique: See pages 70 to 72.

SIT-UP

Aim: Strengthens the abdominals and hip flexors.

Technique: See page 64.

SQUAT

Aim:	Strengthens the quadriceps and buttock (gluteal) muscles.
Technique:	Stand tall with feet shoulder-width apart. Begin the movement by bending the hips and knees, until the thighs are parallel to the ground. Return to the starting position and repeat. Throughout the exercise, always ensure that the knees track over the toes and that a neutral spine (no rounding of the lower back) is maintained.

LUNGE

Aim:	Strengthens the quadriceps, hamstrings, gluteal and calf muscles.
Technique:	Stand tall with feet shoulder-width apart. Keeping your body upright, lunge forward until the front thigh is parallel to the floor. The front knee should be directly above the ankle. Return to starting position and repeat with the other leg.

SQUAT

Aim: Strengthens the quadriceps and buttock (gluteal) muscles.

Technique: As w ith squat on page 28, w hile carrying a dumbell w ith a goblet hold.

DEADLIFT

Aim:	Strengthens the quadriceps, hamstrings, gluteals and low er back.
Technique:	Start w ith the knees and hip flexed, feet shoulder-w idth apart. Straighten the hips and knees gradually as you move to the upright position. Keep the elbow s straight and arms relaxed. Maintain a slight arch in the low er back for support. Return to starting position and repeat.

LATS PULLDOWN

Aim:	Strengthens the shoulders, back and latissimus dorsi muscles.
Technique:	Grasp the bar with hands placed shoulder-width apart and elbows fully straightened. Pull the bar towards the front of your chest. Avoid rocking your lower back. Return to starting position and repeat.

LUNGE

Aim: Strengthens the quadriceps, hamstrings, gluteal and calf muscles.

Technique: As w ith lunge on page 28, but w ith a dumbell in each hand.

OVERHEAD PRESS

Aim:	Builds upper body (shoulders, arms, chest and back) strength.
Technique:	Hold a dumbbell in each hand at shoulder height and with the palms facing forward. Straighten the elbows until the weight is overhead. Return to starting position and repeat.

BENCH PRESS

Aim:	Builds upper body (chest, shoulder and arm) strength.
Technique:	Hold the bar with hands placed at the sides of your chest. Slowly extend the elbows until they are fully straightened. Return to starting position and repeat. Choose a weight that you can handle at all times, and have a partner to help you should you encounter difficulties.

CABLE ROW (STANDING)

Aim:	Strengthens the middle and low er back muscles.
Technique:	Stand w ith one leg slightly in front and arms straight. Keeping your back upright, pull the pulley handle until it touches your upper abdomen. Return to starting position and repeat.

CABLE ROW (SEATED)

Aim:	Strengthens the upper and middle back muscles.
Technique:	Sit with arms and knees straight and feet against the foot rest. Keeping the back upright and looking forward, pull the pulley handle until it touches your upper abdomen. Return to starting position and repeat.

For muscular strength training, use a resistance where you can complete 6 to 10 repetitions in good form. Perform 3 to 5 sets per exercise.

For muscular endurance training, use a resistance where you can complete 15 to 25 repetitions in good form. Perform 2 to 4 sets per exercise.

CORE MUSCLE TRAINING

The core muscles form a protective cylinder around the abdomen and lower spine. They provide support and help in generating energy for many of our daily and sports activities. A strong core will also reduce the incidence of low back pain.

Perform the following exercises at least twice weekly: forward plank, side plank, alternate arm-leg lift and superman.

FORWARD PLANK

Aim:	Builds strength and endurance in the core muscles.
Technique:	With the feet together and elbow s bent 90 degrees and placed shoulder-w idth apart, raise your entire body until the back of your head, back, buttocks and heels form a straight line. Hold for 10 to 30 seconds and perform 3 to 5 repetitions.

SIDE PLANK

Aim:	Builds strength and endurance in the core.
Technique:	Lie on one side w ith your body w eight on the forearm and elbow directly below the shoulder. Raise your hips off the ground, keeping the upper shoulder, hips and legs in a straight line. Hold for 10 to 30 seconds and perform 3 to 5 repetitions on each side.

ALTERNATE ARM-LEG LIFT

Aim:	Improves core muscle coordination and control.
Technique:	Begin w ith hands placed shoulder-w idth apart below your shoulders and knees bent below your hips. While keeping the shoulders and back straight, raise the left arm and right leg simultaneously until the elbow and knee are fully straightened. The arm, back, buttock and leg should be in a straight line. Avoid rocking from side to side. Hold for 3 to 5 seconds. Return to starting position and repeat for the other arm and leg. Perform 15 to 30 repetitions.

SUPERMAN

Aim:	Builds strength and endurance in the spine extensors.
Technique:	Lie face down with elbows and knees straight. Lift the hands and feet 20 to 30 cm off the ground. Hold for 3 seconds. Return to starting position and perform 15 to 30 repetitions.

POWER TRAINING

As power training exercises are highly intensive and require maximal effort, do not start power training until you have performed strength training for at least 8 weeks. These high-intensity exercises should not be performed more than once a week.

Exercises to enhance power development include: depth jump, hurdle jump, plyometric push-up, tuck jump, counter-movement jump (see page 68) and box jump (see page 69).

DEPTH JUMP

Aim: Improves lower limb power and landing technique.

Technique:

1. Step off a 30 to 40 cm high box.
2. Land with knees partially bent.
3. Immediately push off and jump up forcefully and vertically.

1

HURDLE JUMP

Aim: Improves the speed of strength generation in the gluteals, quadriceps, hamstrings and calves.

Technique:

1. Place 4 to 6 hurdles (20 to 30 cm high) 1 m apart. Start with knees and hips slightly bent and hands at the sides, feet shoulder-width apart.
2. Push off with both feet, swinging your arms up to face level to assist with power generation.
3. Land lightly on the balls of the feet.
4. Push off immediately to clear the next hurdle.


2


3

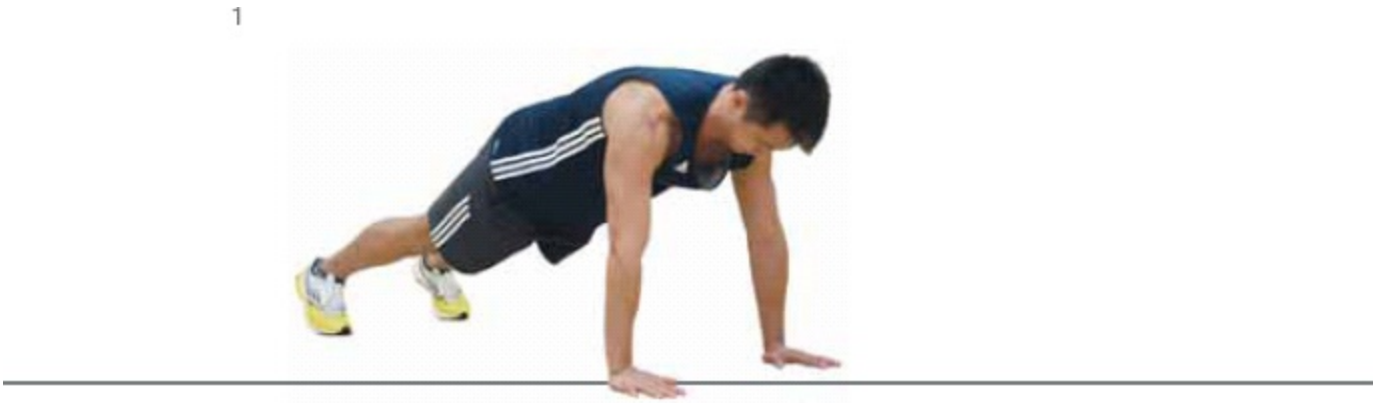

4

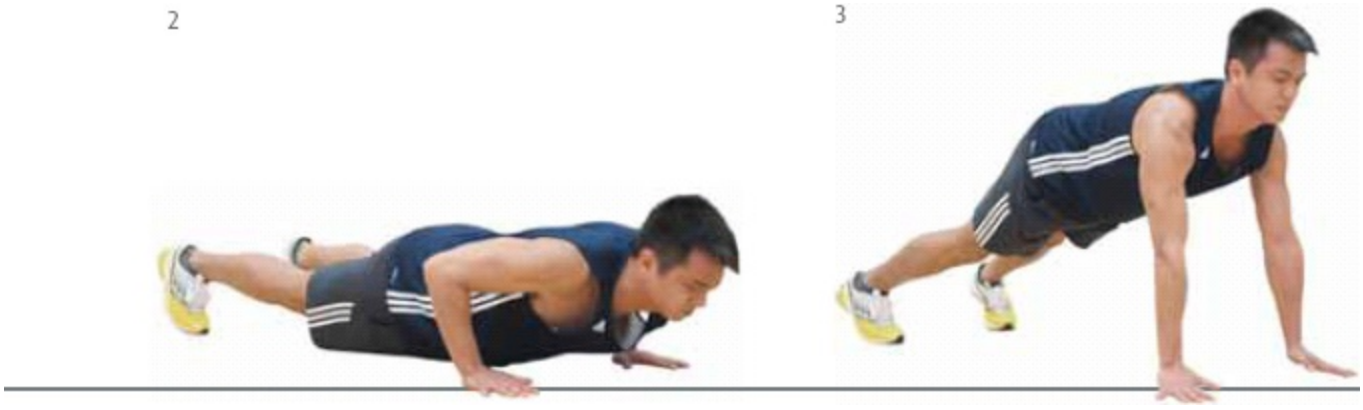
PLYOMETRIC PUSH-UP

Aim: Develops pow er in the arm, chest and shoulder muscles.

Technique:

1. Start with push-up position, elbows straight and arms shoulder-width apart.
2. Lower until the elbows are bent at 90 degrees.
3. Push off explosively from the ground and straighten the elbows.
4. Bringing the hands together in a clapping motion.
5. Finish with hands on the ground and elbows slightly bent to absorb the impact.





TUCK-JUMP

Aim: Develops pow er in the jumping muscles (calf and quadriceps).

Technique: Jump as high as you can, bringing the knees close to your chest at the highest point of the jump.

FLEXIBILITY

Flexibility and range of motion can be increased by stretching, which refers to the process of elongating soft tissues and muscles. This reduces muscle tension and post-exercise soreness, and may help in reducing the risk of injury. Maintaining adequate flexibility also helps to improve muscular and athletic performance.

Static stretching, which is most commonly done, involves stretching to the farthest point and holding the stretch. The stretch should be held for 10 to 30 seconds and repeated 3 to 5 times. Avoid jerky movements, and never stretch a cold muscle as it may tear. Stretch at the end of your warm-up and immediately after the exercise session.

Stretch the following parts of your body before and after an exercise session: wrist flexors, wrist extensors, triceps, biceps, chest, back, lower back, hamstring, glutes, iliotibial band, quads, hip flexors, gastrocnemius and soleus.

WRIST FLEXORS

Aim: Improves w rist flexor flexibility.

Technique: Keeping the elbow straight, turn the left w rist so that the palm faces forw ard and the fingers point upw ards. Use the right hand to pull back on the fingers so that you feel a stretch on the undersurface of the left forearm. Hold for 10 seconds and repeat, alternating w ith the other w rist.

WRIST EXTENSORS

Aim: Improves wrist extensor flexibility.

Technique: Keeping the elbow straight with the palm facing backwards and fingers pointing down, use the right hand to push back on the left so that you feel a stretch on the top of the forearm. Repeat with the other arm.

TRICEPS

Aim:	Improves triceps flexibility.
Technique:	Bring the left arm behind the head with the elbow bent. Use the right hand to pull gently on the left elbow towards the midline behind the head. Repeat with the other arm.

BICEPS

Aim:	Improves biceps flexibility.
Technique:	With the left elbow straight and left palm facing forwards, fingers pointing down, use the right hand to push back. The stretch should be felt in the left bicep muscle above the elbow. Repeat with the other arm.

BACK

Aim: Improves flexibility of the back (lumbar muscles).

Technique:

1. Begin with palms directly below the shoulders and the knees bent below the hips.
2. Slowly arch the back upwards, starting the movement from the lower back. Hold for 5 seconds.
3. Gradually return to starting position and repeat.

1

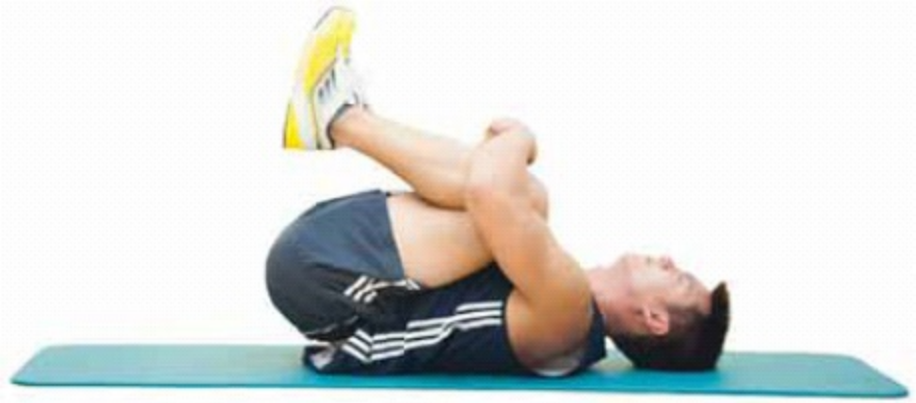
CHEST

Aim: Improves flexibility of the chest (pectoral) muscles.

Technique: With the right arm at shoulder level and elbow straight, push against a wall or pole with the right hand, turning your upper body towards the left. The fingers should be straight with the thumb pointing up. Repeat with the other arm.

LOWER BACK

Aim:	Improves flexibility in the extensor muscles of the back.
Technique:	Lie on the back and bring bent knees towards the chest. Hold the front of both knees and gently pull them down towards the chest. Keep the head and shoulders on the ground throughout. You should feel the stretch in the lower back.



HAMSTRING

Aim:	Improves flexibility in the hamstrings (back of the thigh).
Technique:	Lie on the floor with the knees straight. Hold the back of the left thigh and bring it as close to the chest as possible, keeping the knee straight. Return to starting position and repeat for the other leg. You may increase the intensity of the stretch by keeping the foot parallel to the floor.

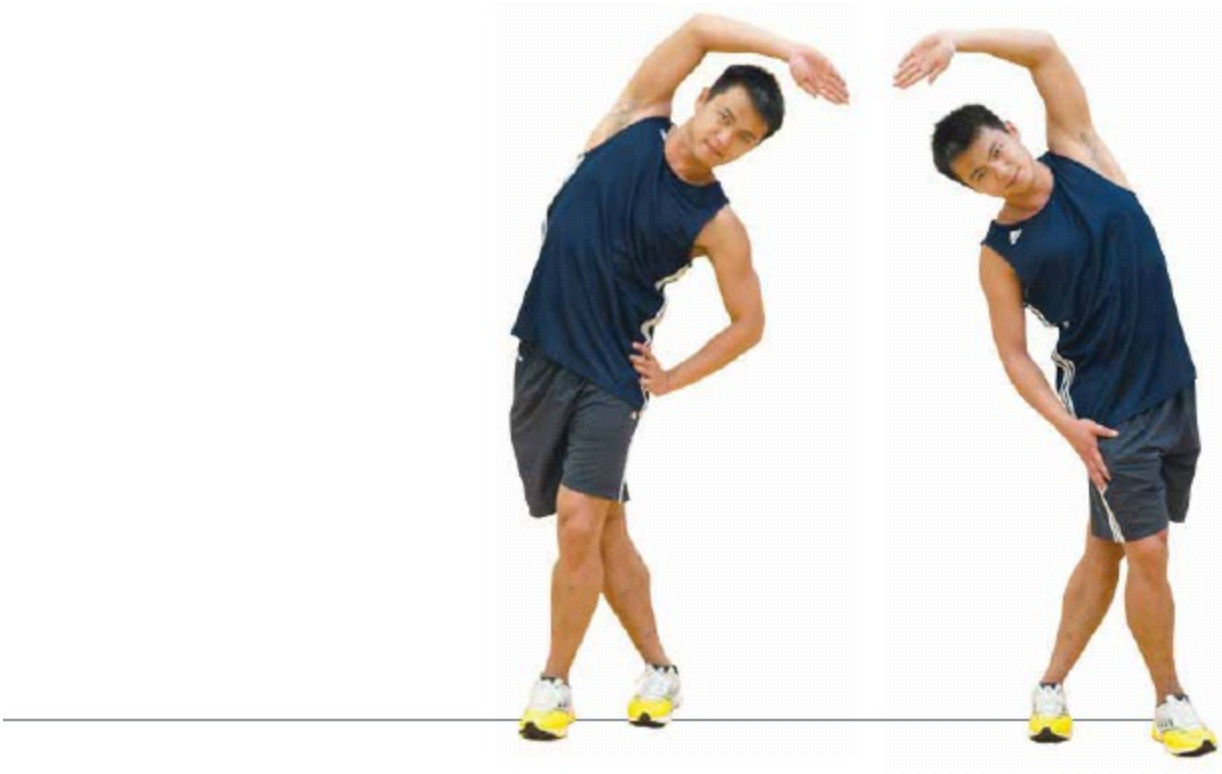
GLUTES

Aim:	Improves flexibility in the buttock (gluteal) muscles.
Technique:	Cross the left leg over the right leg. The right knee should be straight. Use the elbows to pull the left knee towards the chest. You may increase the intensity of the stretch by turning the upper body towards the bent knee. Repeat with the other leg.

ILIOTIBIAL BAND

Aim: Improves iliotibial band (ITB) flexibility.

Technique: Stand upright with the left leg behind the right leg, feet shoulder-width apart. Extend the left arm above the head and tilt towards the opposite side. The stretch should be felt along the outside of the left thigh. Repeat with the right leg.



QUADS

Aim:	Improves flexibility in the quadriceps and hip flexors.
Technique:	Bend the left knee and use the left hand to pull the ankle tow ards the buttocks, keep the body upright and both thighs close together. Repeat for the other leg.

HIP FLEXORS

Aim:	Improves flexibility in the iliopsoas (hip flexor) muscle.
Technique:	Stand upright and and take a large step forw ard w ith the right foot. The right thigh should be parallel to the floor and both knees slightly bent. Tilt the trunk backw ards. You should feel the stretch at the front of the left hip. Return to starting position and repeat w ith the other leg.

GASTROCNEMIUS

Aim:	Improves flexibility in the superficial calf muscles.
Technique:	Take a large step forw ard w ith the right leg, keeping the knee of the back leg straight. Both feet should be flat on the ground and pointing forw ard. The stretch should be felt in the middle and low er part of the back (left) leg. Repeat w ith the other leg.

SOLEUS

Aim:	Improves flexibility in the deep muscles of the calf and Achilles tendon.
Technique:	As with the gastrocnemius stretch above, but with the back knee slightly bent. The stretch should be felt just above the right ankle at the back of the leg. Repeat with the other leg.

PREPARING FOR NS: NUTRITIONAL NEEDS

Evidence-based dietary advice

JOANNA TAN

Physical and mental demands imposed during NS training require appropriate nutritional habits and interventions so that under the most rigorous training conditions, performance is optimised and health is preserved. This chapter serves to provide evidence-based dietary advice that you can utilise during your NS journey.

BALANCING THE ENERGY REQUIREMENT

Energy balance is an important aspect of nutrition. You need to consume enough energy in order to support energy expenditure, maintain strength, endurance, muscle mass and overall health. Energy and nutrient requirements vary with age, weight, height and metabolic rate. It is also influenced by the type, frequency, intensity and duration of training and exercise.

COMPONENTS OF ENERGY EXPENDITURE

The three major components of energy expenditure are:

- Resting Energy Expenditure (REE)
- Physical activity
- Energy for digesting food (or otherwise known as thermic effect of food) The first two components are of interest and will be discussed in detail.

RESTING ENERGY EXPENDITURE

REE is the amount of energy required to maintain life such as breathing, beating of the heart, maintaining body temperature and other life processes. REE can be estimated by using a formula to predict daily energy requirements. The only information required is your weight in kg.

Age (years)	Equation to estimate REE (kcal/day)

15 to 18	17.6W + 656
18 to 30	15.0W + 690
30 to 60	11.4W + 870

W: weight (kg)

Schofield, W (1985) Predicting Basal Metabolic Rate, New Standards and Review of Previous Work. Human Nutrition Clinical Nutrition, 8(7A), pp.1133 to 1152.

For example, if a 19-year-old weighs 70 kg, REE is (15.0 x 70) + 690 = 1,740 kcal/day.

PHYSICAL ACTIVITY

The amount of energy expended during physical activity varies daily, depending on your training. Some days may be very strenuous, involving running, swimming, sleep deprivation and carrying heavy loads, while other days' activities may be lighter. As such, determining the actual energy expended during activity may be challenging, but there are ways to estimate it. You can take your REE and multiply it by a factor based on the expected physical activity, as shown below:

Activity Level	Examples	Activity Factor (x REE)
Very light	Seated and standing activities, driving	1.3
Light	Walking, playing casual table tennis or pool	1.5
Moderate	Carrying a load, jogging, light swimming, biking, moving stores, individual fieldcraft	1.7
Heavy	Carrying a load uphill, climbing, digging, football, basketball, SOC, battle inoculation course (BIC), IPPT	2.1
Exceptional	Running or swimming races, uphill cycling, carrying very heavy loads, route marches above 10	km 2.5

Therefore, if a person's REE is 1,740 kcal/day and the activity factor is 1.3, then the estimated energy requirement is 2,260 kcal/day.

Meeting calorie requirements may be challenging for some individuals. A lack of time or poor planning due to heavy training schedules are some of the barriers in trying to achieve optimal dietary intake. Sufficient energy intake should be consumed to maintain appropriate body weight and body composition. Inadequate energy intake relative to energy expenditure compromises performance and negates the benefits of training. With limited energy intake, fat and lean muscle mass will be used by the body for fuel. Loss of lean muscle mass results in the loss of strength and endurance as well as compromised immune, endocrine and musculoskeletal functions.

MACRONUTRIENTS

Have you ever heard of the saying, "You are what you eat"? Although this statement has not been proven, what is known is that food consumed makes a difference in performance and

quality of life. The caloric content of the main macronutrients are:

- Carbohydrate = 4 kcal/g
- Protein = 4 kcal/g
- Fat = 9 kcal/g

These fuels are called macronutrients as they are consumed in large quantities. Individuals engaging in a general fitness programme can typically meet their macronutrient needs by consuming a normal diet of:

- 50 to 55 per cent of calories from carbohydrates (3 to 5 g/kg of body weight/day);
- 10 to 15 per cent of calories from protein (0.8 to 1 g/kg of body weight/day);
- 25 to 30 per cent of calories from fat.

However, soldiers involved in moderate-to-high volumes of training need greater amounts of carbohydrates and protein to meet macronutrient needs. A minimum intake of at least 50 per cent, but ideally 60 to 70 per cent of total calories (5 to 8 g/kg of body weight/day), should be from carbohydrates. The remaining calories should be obtained from protein (10 to 15 per cent) and fat (20 to 30 per cent).

CARBOHYDRATES

Carbohydrates (CHO) are recommended for both endurance and resistance training, competitive athletic events, mental agility and healthy living. CHO foods are the body's most preferred source of energy, but have often been blamed for weight gain, and too many fad diets promote protein and fat at the expense of CHO. Nevertheless, CHO is a vital energy source and CHO restriction can degrade performance.

CHO exist in many forms, but the two major types of CHO are classified as simple and complex:

- Simple CHO include table sugar, honey, fruit sugars, brown sugar, maple syrup, high-fructose corn syrup and molasses.
- Complex CHO include starches and fibres, wholegrains, fruits, seeds, potatoes, pasta, peas and legumes.

Functions of CHO

CHO are used mainly in the body as:

- Fuel for muscles, brain, heart and other organs, in the form of glucose.
- Building blocks to make chemicals needed by the body.
- Glycogen, which is the stored form of CHO in the liver and skeletal muscle. It is limited to 500 to 600 g and is depleted by three to four hours of heavy exercise. A 24-hour fast will also use up the liver glycogen stores.

PROTEINS

Proteins are made up of amino acids — small building blocks hooked together in various orders. Although there are 20 different amino acids, only 10 are essential because the body cannot produce them and they must be obtained from protein in the diet. Unlike dietary fats, the human body does not store excess amino acids for later use. Inadequate essential amino acid intake may result in the breakdown of muscle protein to provide the essential amino acids.

Functions of proteins

These include:

- Muscle contraction
- Formation of muscle, hair, nails, skin and other tissues
- Direct energy production
- Repair of injured tissues
- Structural roles for every part of the body

Our protein requirements are determined by age, body weight and activity level. Some athletes believe that a higher intake of protein will lead to an increase in the size of their muscles, but this is not true. Excess calories from protein can be converted to and stored as fat. In addition, consuming a large amount of protein can strain the liver and kidneys.

DIETARY FATS

Fats are an important component of the diet, adding taste to food and satisfying hunger. Fat is the most concentrated source of food energy and supplies more than twice as many calories by weight as CHO or protein. A diet high in saturated and trans fat is harmful and has been linked to obesity, atherosclerotic heart disease and certain cancers. It is important to recognise and minimise the intake of these fats.

Type	Examples
Saturated Fats	Butter, lard, ghee, fat/skin on meat, full-cream dairy products, palm kernel oil, non-dairy creamer, coconut oil, coconut milk, cocoa butter
Polyunsaturated Fats	Salmon, mackerel, tuna, sardines, soybean oil, corn oil, safflower oil, sunflower oil
Monounsaturated Fats	Olive oil, canola oil, sesame oil and peanut oil

Definition, composition and classification of dietary fats

Functions of dietary fat in the body

Fat serves a number of critical functions:

- Major form of stored energy — provides energy during exercise, in cold

environments and during starvation
- Insulates the body and protects organs
- Structural role in cells
- Essential transport medium for fat-soluble vitamins
- Role in the maintenance of immune function

Fat is a major fuel for light- to moderate-intensity exercise. Although it is a valuable metabolic fuel for muscle activity during longer aerobic training and performs important functions in the body, total dietary fat intake should not exceed 30 per cent of total energy intake. On the other hand, severe fat restriction, such as 15 per cent or less of total energy intake, may limit performance and is not advised.

Alcohol

Alcohol contains 7 kcal/g (1 can of beer contains around 120 to 150 kcal). Hence, excess consumption of alcoholic beverages (e.g. beer, wine and liquor) can lead to unwanted weight gain. It may also affect physical and mental performance, and the consumption of such beverages should be limited.

MICRONUTRIENTS

Micronutrients include vitamins, minerals and other trace elements required by the body in very small amounts to perform vital metabolic and physiological functions. Consuming too little or too much of these nutrients can interfere with normal body functions.

ROLE OF MICRONUTRIENTS

- Production of energy
- Formation of red blood cells
- Maximise immune function
- Maintenance of healthy muscles and joints
- Provision of oxygen to exercising muscles
- Recovery from exercise

VITAMINS

Vitamins are broadly classified as water- and fat-soluble. Water-soluble vitamins dissolve in water and are not stored in the body but removed via urine. Therefore, a continuous supply is needed in the diet. Fat-soluble vitamins, on the other hand, are not required daily as they

are stored in fat tissue and the liver. Excess consumption of fat-soluble vitamins can be harmful.

Functions of Vitamins

- Production of energy from macronutrients (CHO, fats and protein)
- Repair and growth of tissue
- Maintenance and support of reproductive function
- Development of immune response

MINERALS

Minerals include inorganic substances such as magnesium, calcium, simple salts (e.g. sodium, potassium), or metals such as iron. Numerous minerals are required by the body and may account for up to 4 to 5 per cent of a person's body weight. Typically, minerals are classified as major minerals, which are required in relatively large amounts (>200 mg/day), and trace minerals, which are required in smaller amounts (<200 mg/day).

Functions of Minerals

- Cellular metabolism
- Bone structure and maintenance
- Muscle function and growth
- Energy production
- Haemoglobin (component of red blood cells) synthesis
- Immune function

No single food or food group can provide all the vitamins and minerals that our body needs. Hence, it is important to eat a well-balanced diet containing a wide variety of food, including meat, dairy products and brightly-coloured fruits and vegetables. Most people do not require any vitamin or mineral supplements, unless their intake is inadequate as a result of illness, poor eating habits or prolonged travel in environments where food choices are limited or hygiene is a concern.

ANTIOXIDANTS

Antioxidants are substances in food that neutralise highly reactive, destructive compounds called free radicals. Free radical damage can lead to cancer and heart disease. Some sources of antioxidants include Vitamin E, Beta Carotene, Selenium, Glutathione, Vitamin C, Cysteine and Flavonoids. The best sources of antioxidants are foods rich in these compounds such as oranges, apples, mangoes, berries, spinach and carrots.

Supplementation with antioxidants is not recommended as there is little evidence of benefit, while it is known that over-supplementation can diminish the body's natural defence system.

FUELLING YOUR BODY — NUTRIENT TIMING

Good nutrition will help to optimise pre-exercise energy stores, promote post-exercise recovery and prepare your body for the next session. Over time, it will also help your body adapt to the demands of training and become stronger and fitter. For maximal benefit, the right amount and type of nutrients have to be consumed at the correct time. Think of your body as a race car — it has to receive sufficient amounts of the right kind of fuel for optimal performance.

FATIGUE AND GLYCOGEN DEPLETION

All strenuous exercise — endurance, resistance training or missions — will deplete glycogen. This can cause both physical and mental fatigue, not only affecting exercise performance but also concentration, decision-making and morale. It can also increase the risk of injuries and accidents. The following strategies will help to optimise body glycogen stores pre-exercise, maintain a high level of carbohydrates in the blood during exercise, and replenish depleted stores post-exercise.

- Before exercise, consume a meal providing 4 g CHO/kg of body weight (to provide 200 to 350 g of CHO). This should be composed of easily digested, low fat and low bulk food.
- During exercise or training lasting more than an hour, consume 30 to 60 g CHO per hour (approximately 0.7 g/kg of body weight) — an amount typically provided in sports drinks (6 to 8 per cent CHO concentration). This provides approximately 1 g of CHO per minute to the exercising muscles.
- After exercise, consume an easily-digested, high-CHO drink or food that provides approximately 30 to 60 g CHO and 12 to 15 g of protein within 45 minutes.
- Consume 1 g CHO/kg body weight per hour, at frequent intervals, every 30 minutes until 4 hours after exercise or until the next available meal (whichever is earlier).

The role of the post-exercise recovery meal is to replenish nutrients, fluids and calories that were depleted during the training session. It should include CHO-rich foods, high-quality protein and healthy fats. Some examples of nutrient-dense recovery food are listed in the following table.

Food/Beverage	CHO (g)	Protein (g)
2 slices of white bread with 2 tbsp peanut butter and jelly	30	12

1 small tub (200 g) of low-fat fruit yoghurt	25	8
1 bowl of cereal with low-fat milk	53	12
2 pieces of *chee cheong fun* with sweet sauce	40	4
1 red bean *pau*	35	4
1 chicken *pau*	25	8
1 bowl of soy bean curd with soy bean milk	60	12
300 ml milkshake (250 ml low-fat milk with 1 fruit and 1 tbsp honey)	27	8

SPORTS FOOD AND SUPPLEMENTS

There are also sports food and supplements that are likely to benefit those undergoing fitness training:

Sports drinks

- Useful for refuelling and rehydrating during prolonged exercise or training regimes.
- Contains some electrolytes to help replace sweat losses and increase voluntary fluid intake.

Sports bars

- Convenient, portable and easy-to-consume source of CHO, protein and micronutrients for pre-training meal or post-exercise recovery.

Multivitamin and mineral supplements

- Supplemental source of micronutrients when food supply is not reliable (e.g. while travelling) or for use during prolonged periods of energy restriction.

Caffeine

- May enhance performance of prolonged high-intensity exercise or endurance events.
- A small to moderate dose (1 to 3 mg/kg of body weight) appears to be effective. However, excess consumption may cause gastrointestinal upset and increase the heart rate.

WEIGHT MANAGEMENT

Individuals may want to gain weight (muscle mass) or more commonly, lose weight (body fat). Weight loss may sometimes be an advantage as it both increases the power-to-weight ratio and reduces the energy needed to carry your weight (e.g. in running). Some individuals

may also desire it for aesthetic reasons.

METHODS FOR WEIGHT LOSS

When energy intake equals energy expenditure, energy balance is maintained. When energy intake is more than energy expenditure, the body will be in positive energy balance, which will lead to weight gain. However, when what is eaten is less than what is used, the body will be in negative balance and weight loss will occur as a result. The recommendation for safe weight loss is 0.5 kg to 1 kg per week. This requires an energy deficit of approximately 500 to 1,000 kcal per day. There are three ways to achieve this deficit: 1) reducing total energy intake; 2) increasing energy expenditure through exercise and incidental daily activities; and 3) a combination of both.

REDUCING ENERGY INTAKE

The most important factor for weight loss is the reduction in total energy intake. Studies have shown that both energy restriction and limiting the consumption of high-fat food result in weight loss. Moderate calorie restriction without compromising CHO or nutrient intake is optimal and best achieved by the implementation of a diet low in fat (15 to 25 per cent of energy) and moderate to high in CHO (6 to 8 g/kg of body weight per day). Reducing dietary fat intake is an effective way of reducing energy intake and promoting weight loss for several reasons:

- Fat is energy-dense, it has twice the amount of energy as the same weight of CHO or protein.
- High-fat foods generally taste good, which may lead to an increased tendency to eat more. Studies reveal that the fat content of the diet increases spontaneous intake of food.
- Fat is efficiently stored and requires very little energy for digestion.

Protein intake should be approximately 1.5 to 2 g/kg of body weight per day. This helps to maintain muscle mass and also increases satiety (the sensation of fullness, thus making you eat less).

Exercise complements dietary approaches to weight loss by increasing energy expenditure and inducing a negative energy balance. This can be in the form of low to moderate intensity cardiovascular exercise, performed daily for at least 60 minutes. High-intensity exercise of between 30 to 60 minutes per day has also been shown to be beneficial for weight loss, but may be associated with a higher risk of musculoskeletal injuries, especially in the overweight or unfit.

METHODS FOR WEIGHT GAIN

Individuals who want to increase their body weight should aim to increase muscle (useful weight) and not fat mass. This is best achieved through a combination of increasing energy intake and a whole-body strength training programme. To achieve this, increase daily caloric

intake by 500 to 1,000 kcal (low-fat, high-CHO and protein diet). At the same time, perform a strength training programme at least 2 to 3 times per week. Choose exercises that work the entire body, especially the large muscles of the trunk and lower limbs.

MEASURING YOUR PERFORMANCE

Understanding fitness tests and how to ace them

JULIAN LIM

The two standard physical tests that are administered during NS are the Individual Physical Proficiency Test (IPPT) and the Standard Obstacle Course (SOC). These aim to measure the physical attributes needed in modern warfare, and form a benchmark of your fitness proficiency as a soldier.

THE INDIVIDUAL PHYSICAL PROFICIENCY TEST (IPPT)

The IPPT is an effective gauge of an individual's overall physical performance. The test consists of five different stations, each assessing a specific fitness attribute. The IPPT standards can be referenced at the end of this chapter. This section aims to provide safe and effective training strategies to help you ace the IPPT stations.

IPPT SIT-UP

Aim: Test of strength endurance of the hip and trunk musculature (hip flexors, abdominals and lower back).

Technique:

- Secure the ankles tightly with foot straps, with the feet hip width apart.
- Ensure that the knees are bent at slightly less than 90 degrees, with the back fully resting on the floor.
- With the hands cupping the ears, raise the trunk with a straight back (neutral spine), till the elbows touch the top of the kneecaps.
- Avoid rounding the lower back.

Training strategies and exercises

Excelling in the sit-up test relies on developing strength endurance of the trunk musculature. Keeping a constant pace for the repetitions throughout the 60-second time frame ensures that one does not fatigue too early in the test.

The following two exercises focus on increasing strength of the hip flexor muscles, while

developing static (isometric) strength of the abdominals and lower back muscles. The hanging leg raise and lying single leg raise help develop hip flexor strength at shortened and lengthened muscle lengths respectively.

HANGING LEG RAISE

1. Hang with straight arms off a pull-up bar.
2. Raise both legs straight out in front of the body till they reach the height of the hips.
3. Slowly lower both legs under control. Perform 3 sets of 10 to 15 repetitions.
4. Avoid rounding of the lower back throughout the whole movement.
5. Keep both knees straight throughout the exercise.

LYING SINGLE LEG RAISE

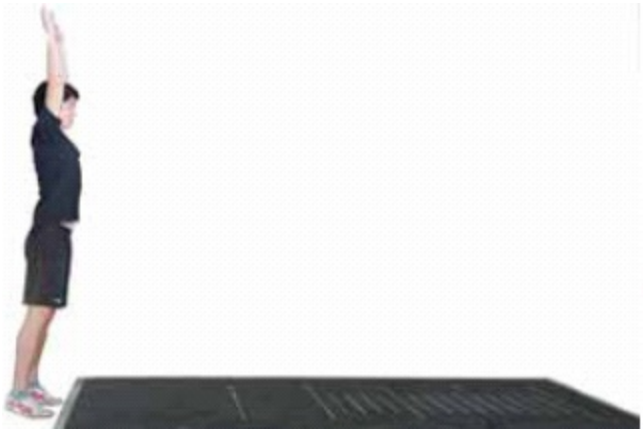
1. Lie on the back with both legs straight up above the hips.
2. Slide one hand (palm down) beneath the arc of the lower back.
3. Slowly lower one leg till the lower back starts to rise above the hand beneath it.
4. Before this point, start to raise the same leg back to the start position. Perform 3 sets of 10 to 15 repetitions.
5. The foot should be parallel with the ground and at 90 degrees to the shin.

IPPT Standing Broad Jump

Aim: Test of lower-body power.

Technique:

- Stand tall with feet hip width apart and toes pointing straight at the starting line.
- Raise both arms overhead and in one motion, quickly flex the lower body (hips, knees and ankles) while swinging both arms backwards, into a quarter squat position. Avoid rounding the lower back.
- Without pausing, use a double-arm swing and aggressively extend the lower body fully to project the body forward at about a 45-degree angle.
- Just before landing, bring the knees towards the chest and cushion the landing by flexing the lower body again.



1. Pre-stretch

2. Push-off

3. Flight

4. Landing

Training strategies and exercises

Excelling in the standing broad jump not only depends on muscular strength and power, but also on the ability to utilise the elastic energy stored in the lower-body musculature in the pre-stretch phase (quarter squat ready position). This is also known as the stretch shortening cycle. The faster the transition from the start to flight position, the greater the utilisation of elastic energy for the lower-body power development.

The counter-movement jump focuses on keeping the pre-stretch phase short and extending the hips, knees and ankles fully at the start of the jump. The box jump teaches you to project the whole body horizontally forward, and land safely on the ground.

COUNTER-MOVEMENT JUMP

1. Stand tall with feet hip width apart and toes pointing straight at the starting line.
2. Raise both arms overhead and in one motion, quickly flex the lower body (hips, knees and ankles) while swinging both arms backwards, into a quarter squat position. Avoid rounding the lower back.
3. Use a double-arm swing and aggressively extend the hips, knees and ankles fully to project the body vertically.
4. Focus on correct sequencing and coordination while attempting to reach the greatest height possible.

1. Pre-stretch 2. Push-off vertically and forcefully 3. Maximal height

BOX JUMP

1. The pre-stretch phase is similar to the standing broad jump.
2. Without pausing, use a double-arm swing and aggressively extend the hips, knees and ankles fully.
3. Project the body high and forward.
4. Land on the top of the box lightly by flexing the hips, knees and ankles upon impact.

1. Pre-stretch

2. Push-off

3. Flight phase

4. Landing

IPPT PULL-UP (CHIN-UP)

Aim: Test of upper-body pulling strength endurance.

Technique:

- Grip the bar with either a supinated grip (palms facing the body) or pronated grip (palms facing away from the body), shoulder-width apart.

- Pack the shoulders by pulling the shoulder blades back and down towards the spine.
- Pull the body as a unit until the chin reaches over the bar.
- Lower the body in a safe and controlled manner.

Pronated (overhand) grip

Supinated (underhand) grip

Training strategies and exercises

The supinated grip (palms facing the body) uses more of the chest and bicep musculature, on top of the back musculature. Grip the pull-up bar tightly and think of pulling through the elbows. This will ensure that the shoulder musculature is engaged during the exercise.

The eccentric pull-up assists in building up strength in the upper-body musculature, especially for individuals who cannot perform a single pull-up. The eccentric phase (lowering of the body) increases time under tension of the involved musculature, aiding muscle growth and strength development.

The assisted pull-up helps to develop strength endurance. The resistance band reduces the overall body weight to be lifted (especially at the start of the lift), and provides support to perform multiple repetitions until voluntary fatigue sets in. An assisted pull-up stack weight machine can also be used to a similar effect.

ECCENTRIC PULL-UP

1. With the chin above the bar, slowly lower the body in a controlled manner.
2. The whole movement should take 10 seconds, from the top-most position till the arms are at full length.
3. Perform 5 to 10 repetitions.

ASSISTED PULL-UP

1. Secure both knees around a thick resistance band that is strapped to the pull-up bar.
2. Perform as many repetitions of pull-ups as possible until voluntary fatigue.
3. Reduce the thickness of the band as your performance improves.

IPPT 4 x 10 m Shuttle Run

Aim: Test of lower-body sprint acceleration, deceleration and change-of-direction mechanics.

Technique:

- Adopt a two-point crouch start position, with the foot of the dominant leg in front.
- Push quickly off the front leg and accelerate towards the 10 m mark.
- When approaching the 10 m mark, lower the hips and plant the non-dominant foot on the line.
- Upon pivoting, grab the block and quickly push off from the dominant foot to propel the body away from the line.
- Push off firmly on the first few strides after the pivot and accelerate quickly towards the other end line.
- Repeat to retrieve the second block.
- Accelerate towards the finish line, aiming for a point that is 2 to 3 m beyond it.

Training strategies and exercises

Always sprint towards the 10 m mark in a straight line, as this is the shortest distance between both points. Practice is the key in perfecting the sprinting acceleration and change-of-direction skills needed to ace the shuttle run test.

The acceleration drill focuses on the sprint mechanics from the start position, while the change-of-direction drill focuses on the skills needed to effectively pivot 180 degrees at the 10 m mark.

ACCELERATION DRILL

1. Adopt a two-point crouch start position, with foot of the dominant leg placed in front.
2. Adopt a slight lean from the hips, with most of the body weight on the front foot.
3. When ready, quickly explode off the mark by driving through the front foot and aggressively swinging the opposite arm.
4. Maintain a slight forward lean and attempt to get into top speed before the 10 m mark.

Crouch start with body weight over front (dominant) foot

CHANGE-OF-DIRECTION DRILL

1. Sprint at medium speed towards a line.
2. Upon reaching the mark, lower the hips and plant the non-dominant foot on the line, oriented sideways with the toe and heel aligned with the line.
3. Keep the body weight on the dominant foot (farthest away from the mark) and lean towards the opposite direction.
4. Upon pivoting, quickly push off from dominant foot to propel the body away from the line.

Pivot and push-off with the dominant foot

IPPT 2.4 km Run

Aim: Test of aerobic and anaerobic endurance. A sound running technique will improve running efficiency and economy.

Technique:

- Keep the shoulders relaxed and squared to the front. Swing the arms back and forth from the shoulder joint (arms at about a 90-degree angle)
- "Run tall" by maintaining an upright torso with a slight forward body lean.
- Adopt a quick stride frequency by having a slight knee lift with fast leg turnover.
- Adopt a short stride length and have the feet land directly under the body.
- Land on the mid-foot and roll through to the front of the toes.

Training strategies and exercises

Check your pace at regular intervals. If the target is to run the 2.4 km under 9 min 45 sec, each 400 m should be covered in under 1 min 37 sec. Long slow distance running aids in developing an aerobic base and improving both endurance and maximum oxygen uptake in individuals who are under or moderately trained. Interval training helps to develop anaerobic endurance by increasing tolerance towards lactate buildup (lactate threshold). This increases the ability to maintain a fast pace over short distances.

PREPARING FOR THE 2.4 KM RUN

The 2.4 km run station is perhaps the most challenging station for many individuals. It entails a combination of endurance and speed in order to excel in it. No other forms of exercise can help to improve your performance in the 2.4 km run, other than running itself.

For beginners, start by jogging at a comfortable pace at least 3 times a week. The distance covered should be at least 2 km per session, increasing to about 6 km progressively. Once able to run about 6 km continuously, start increasing the pace progressively. Each training session should end with you feeling tired, but not exhausted or spent. Do a time trial every 3 weeks to test fitness levels. You should start training at least 3 months prior to the test date to allow for the necessary neuromuscular adaptations to kick in.

Dr Mohammad Ashik
Orthopaedic Surgeon
KK Women's & Children's Hospital
Personal best for 2.4 km as an NSman — 8 min 30 sec

SLOW LONG DISTANCE RUNNING

1. Run at a constant pace at low to moderate intensity (70 to 80 per cent of maximum heart rate), for example covering 5 to 10 km in 45 to 60 minutes. Your maximum heart rate can be estimated by subtracting your age from 220. (E.g. for a 20-year-old, maximum heart rate will be 220 – 20 = 200 beats per minute. Running at 70 to 80 per cent of this equates a heart rate of 140 to 160 beats per minute.)
2. Gradually increase the time and/or distance covered.

INTERVAL TRAINING

1. Involves a series of high-intensity (>90 per cent of maximum heart rate) runs, interspersed with rest periods.
2. Commence with a 400 m run with a run-recovery ratio of 1:2. (E.g. run 400 m at 1.5 minute pace and rest for 3 minutes before performing the next repetition.) Perform 6 to 8 repetitions.
3. As you get fitter, increase the intensity by reducing the rest period.

RUNNING DRILLS

Running drills help improve our movement patterns. Often, certain movements are exaggerated in such drills to help acquire a certain habit (e.g. knee lifts), activate specific muscles (e.g. hamstrings), and work secondary muscles to achieve better muscle balance (e.g. side strides crossover). These drills are demonstrated in the following pages.

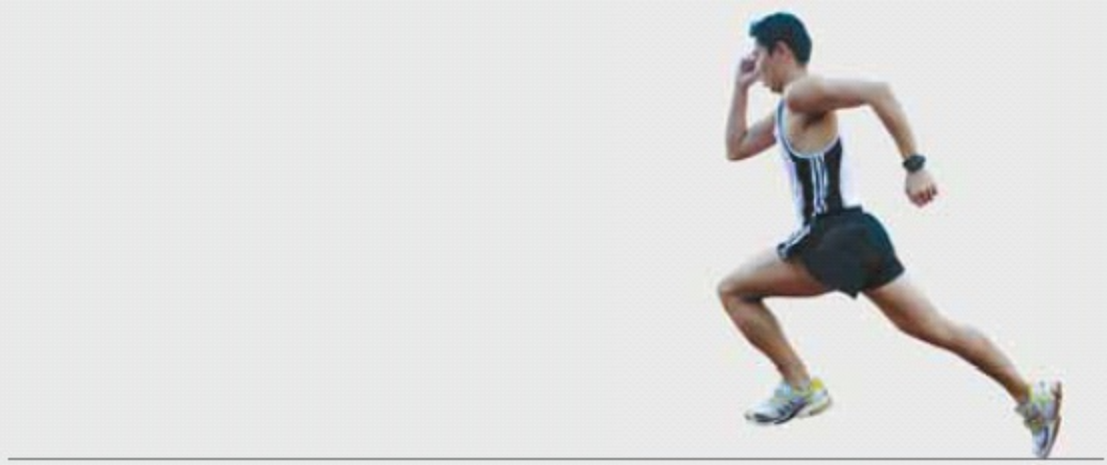
These drills are usually practiced before a training session, in order to fire the muscles up and get the body into a better running form for the subsequent workout. They should certainly be done before an intensive workout, such as aerobic or speed intervals, but can also be done before all training sessions. Do them at least once a week.

Before doing the drills, warm up with a slow five to 10 minute easy run, followed by stretches. Over a straight 50 m

stretch that is either flat or slightly uphill, do the drills in the following sequence, jogging slowly back to the starting point to commence the next drill.

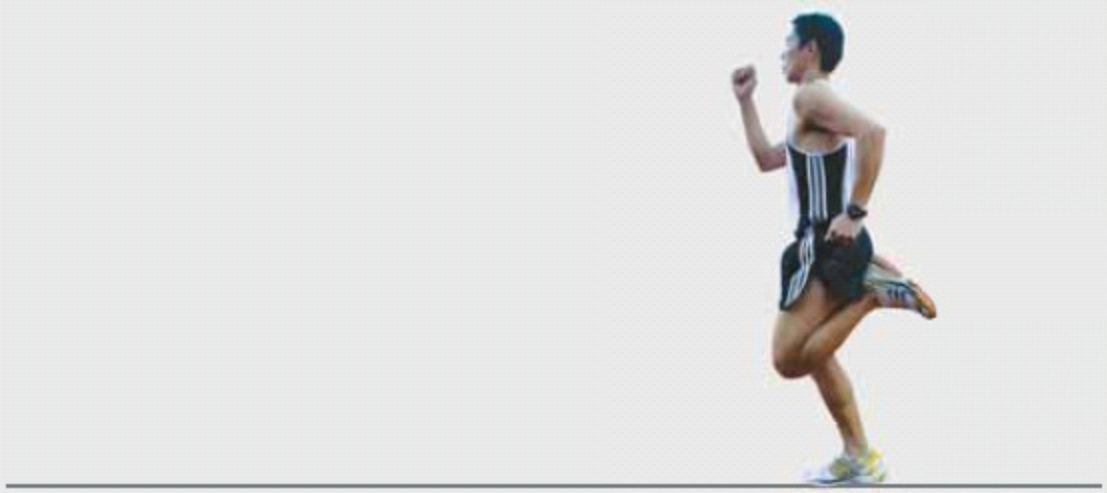
PUSH OFF

Aim:	To activate calf muscles for toe-off
Technique:	While running, push off maximally.



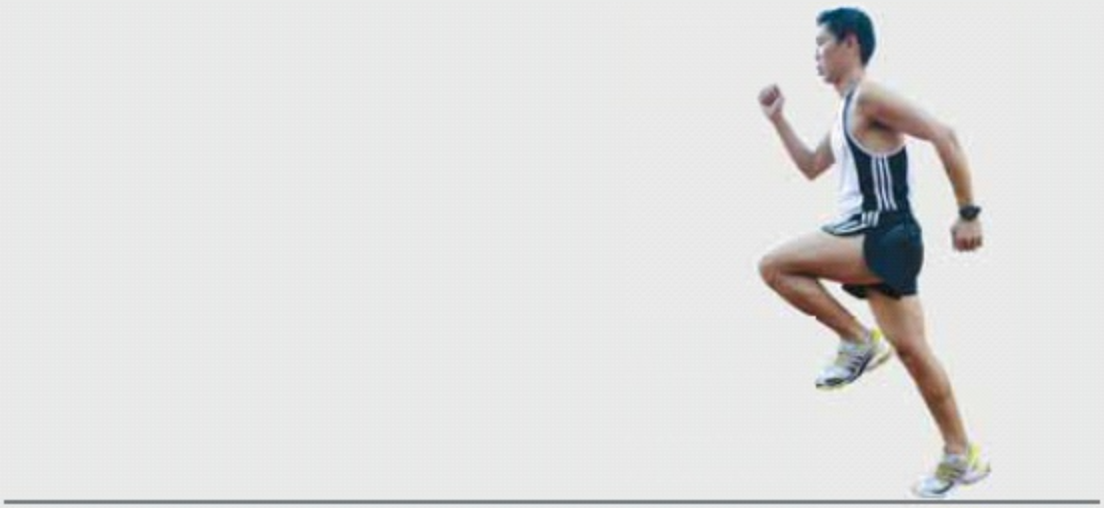
BUTT KICKS

Aim:	To activate the hamstrings
Technique:	As with “push off”, plus bring the back of the heels towards the buttocks.



KNEE LIFTS (SKIPPING)

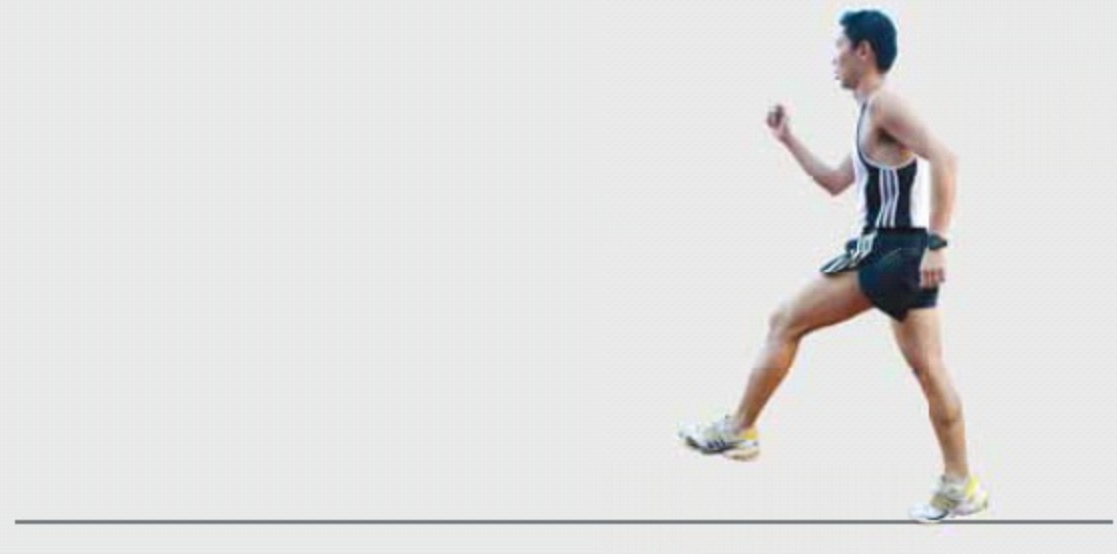
Aim:	To activate the hip flexors and promote a high knee lift and therefore better foot strike
Technique:	As with “push off”, plus lift the knees high enough such that at the end of the forward swing, the thighs are parallel to the ground, keeping the lower leg vertical and ankles dorsiflexed.



CLAW BACK

Aim: To activate the hamstrings further

Technique: As with “push off”, but extend the knee during the forward swing and pull the foot back before it strikes the ground.



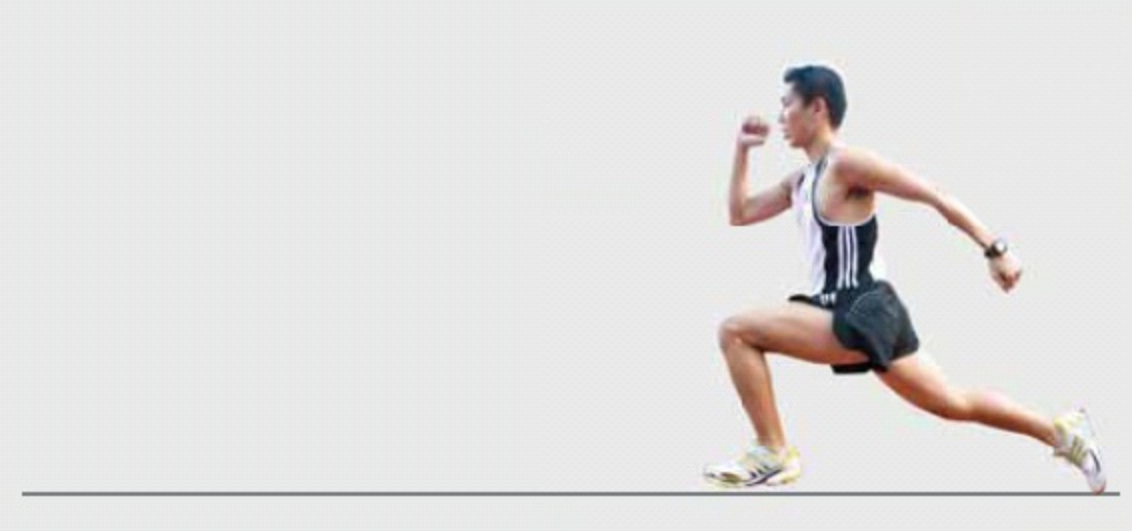
SIDE CROSSOVER

Aim: To activate the hip adductors and abductors, and the trunk rotators

Technique: While jogging sideways on the balls of your feet towards your right, bring your left foot across the front of your right leg; take a step towards your right with your right foot then cross your left foot behind your right leg towards your right, and repeat this sequence. Do one repeat to your right and the next one to your left.

JUMPING STRIDES

Aim:	To activate all the running muscles
Technique:	Stride forw ard, aiming to stride longer and higher, w hile bringing the thighs up to the horizontal.



ACCELERATION

Aim:	To activate all the running muscles in a more natural gait
Technique:	Finish off, accelerate gradually over the 50 m stretch.

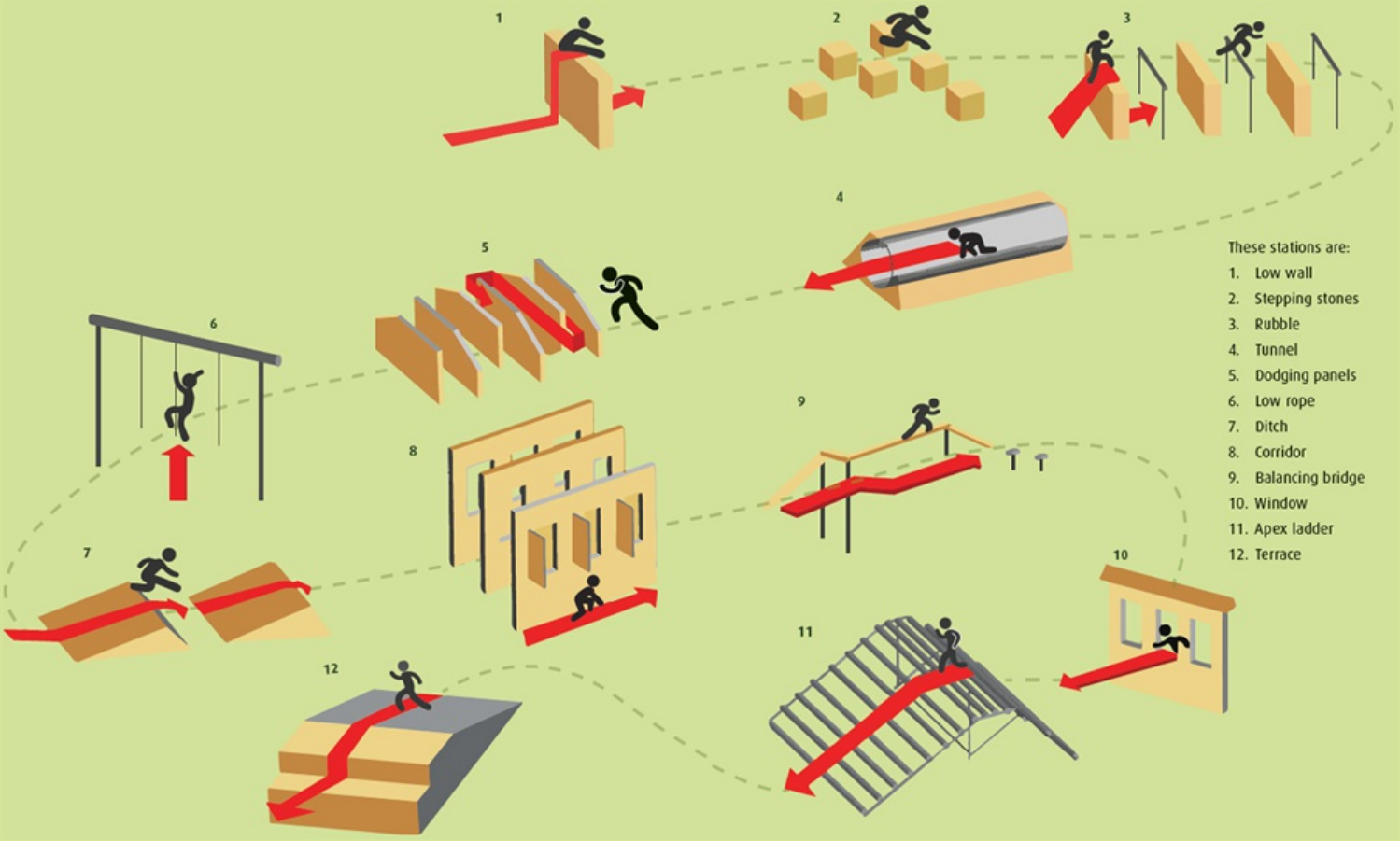
Adapted from *Run for Your Life*, Dr Ben Tan

OTHER CONSIDERATIONS

The above techniques, training strategies and exercises are aimed at providing an insight into passing the different stations of the IPPT well. On top of that, improving the various fitness attributes being tested will also improve your overall health and fitness. Train hard and train smart!

THE STANDARD OBSTACLE COURSE (SOC)

The SOC is designed to test an individual soldier's physical competency in the skills required for manoeuvring in the combat environment. These include attributes such as jumping, vaulting, balance and scaling. The obstacle course was redesigned and updated in 2010 to better match the skills needed in urban warfare combat. The current SOC consists of 12 stations that must be completed within 5.5 minutes.



The following section provides tips to ace all the SOC obstacles. These include safe and effective training strategies to overcome each obstacle efficiently.

SOC LOW WALL, RUBBLE AND WINDOW

Aims: Test of jumping, scaling and vaulting skills

Fitness attributes needed: Lower-body power, upper-body pulling and pushing strength

Training strategies and exercises

COUNTER-MOVEMENT JUMP

See page 68.

PUSH-UP

See photographs on page 26.

1. Place the hands on the floor, shoulder-width apart.
2. Pack the shoulders and engage the gluteal and core muscles. This ensures that a neutral spine is maintained throughout the movement.
3. Lower the body as a unit in controlled manner.
4. Keeping the spine neutral and without jerking, straighten the elbows and return to the starting position.

SOC STEPPING STONES, BALANCING BRIDGE, APEX LADDER

Aims: Test of leaping, balancing and coordination skills

Fitness attributes needed: Lower-body strength, power and dexterity

Training strategies and exercises

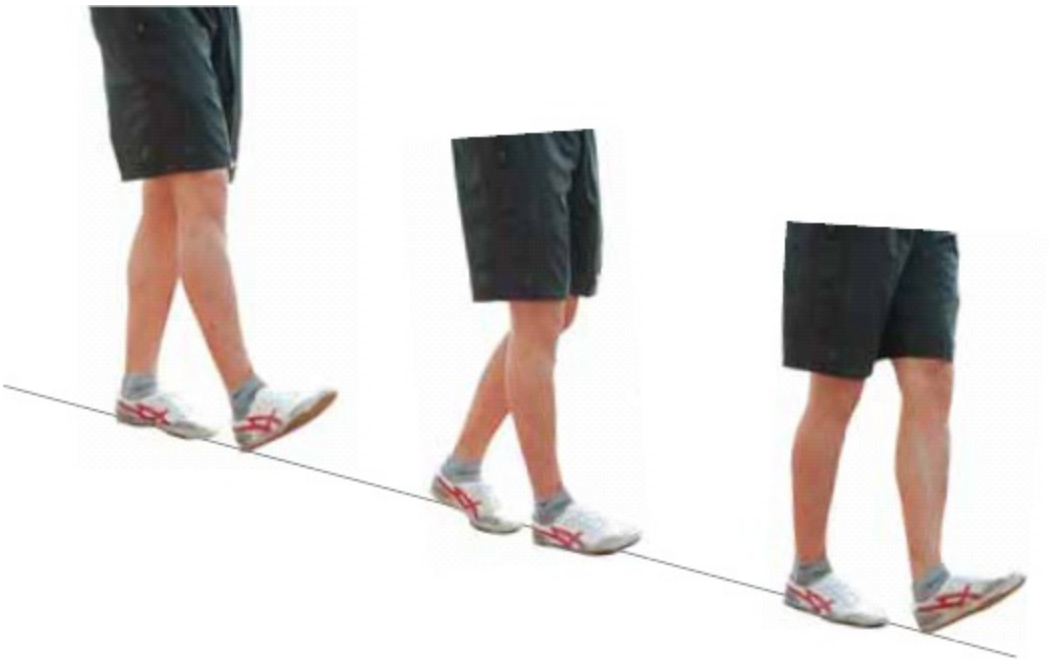
LADDER DRILL

This drill teaches coordination and agility of the lower-body.

1. Place two agility ladders side by side in a staggered fashion.
2. Plant each foot in each square space and alternate the feet movement down the ladder.
3. While performing the drill, keep the knees slightly bent and body weight on the balls of the feet (heels slightly off the ground).
4. Raise the difficulty by moving the ladders further apart from each other and/or only planting the feet on alternate square spaces.

STRAIGHT LINE WALK (HEEL TO TOE WALK)

1. Use a 30 m straight line marking for reference (e.g. stadium track lanes).
2. Walk along the straight line, with the heel of the front foot touching the toes of the back foot in an alternating fashion.
3. Raise the difficulty by increasing the walking pace.



DUMBBELL STEP-UP

1. Grip a dumbbell with a goblet hold.
2. Step up with one leg to place the entire foot on a higher step or on the top of a box.
3. Extend the lead hip and knee to move the body to a standing position on the higher platform.
4. Maintain a tall posture (do not lean forward) throughout the whole movement.
5. Repeat for both legs.
6. Raise the difficulty by increasing the exercise speed and/or carrying a heavier dumbbell.

SOC RUBBLE, TUNNEL, DODGING PANELS, CORRIDOR

Aims: Test of vaulting, ducking, crawling and lateral dodging skills

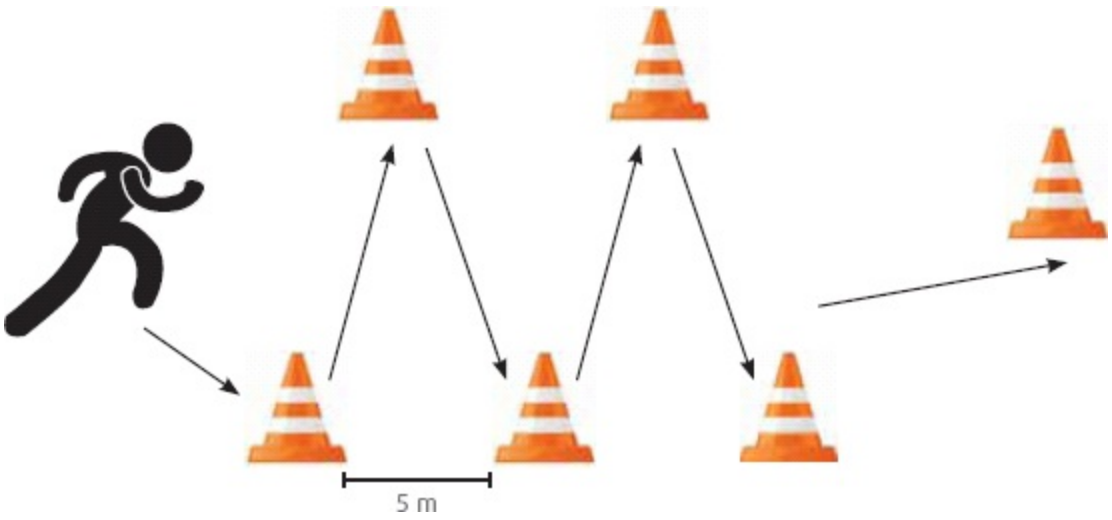
Fitness attributes needed: Lower-body agility and mobility

Training strategies and exercises

DUCKING DRILL

1. Use a hurdle or rope to set as a referenced height to duck under.
2. Perform a deep lunge under and across the set height.
3. Maintain a straight back throughout the whole movement.
4. Raise the difficulty by increasing the speed of the drill and/or lowering the target height to duck under.

ZIG-ZAG SHUFFLE



1. Arrange the cones 5 m apart as shown in the figure above.
2. Standing at the starting cone, shuffle laterally for 3 to 4 strides to the opposite cone.
3. Throughout the whole movement, keep the knees slightly bent, and maintain a low centre of gravity to move quickly from cone to cone.
4. Repeat the shuffle, leading from both the left and right sides.
5. Raise the difficulty by increasing the speed of the movement and/or increasing the distance between cones (more strides).

PIGEON STRETCH

This focuses on increasing hip mobility (flexibility of the hip flexors and gluteal musculature) to enhance the efficiency of ducking and crawling.

1. Place one limb in front of the body, with the knee bent at 90 degrees.
2. Position the other limb straight behind the body.
3. Keep the hips square to the front throughout the stretch.
4. Hold the stretch for 15 to 20 seconds and repeat for the other side.

SOC LOW ROPE

Aims: Test of ascending and climbing a rope with correct technique

Fitness attributes needed: Upper- and lower-body strength endurance

Training strategies and exercises

PULL-UP

See pages 70 to 72.

SQUAT

See pages 28 to 29.

SOC DITCH, TERRACE

Aims: Test of leaping, jumping and landing skills

Fitness attributes needed: Lower-body power and eccentric strength

COUNTER-MOVEMENT JUMP

See page 68.

DEPTH JUMP

See photographs on pages 36 to 37.

1. Stand to the edge of a higher platform, with feet shoulder-width apart.
2. Step off the platform with one foot and land on the floor with both feet, quickly absorbing the impact upon landing.
3. Step back on the platform and repeat.
4. Raise the difficulty by increasing the height of the platform.

OTHER CONSIDERATIONS

LANDING TECHNIQUE

Many of the obstacles require you to jump or leap and land from a height. Sound landing mechanics are crucial to avoid injuries. The centre of gravity should always be above the base of support (your lower body) when landing. This can be achieved by keeping the shoulders directly positioned over the knees, while flexing the hip, knees and ankles to absorb the impact.

AEROBIC FITNESS

A good level of aerobic endurance is needed to clear the obstacle course within 5.5 minutes. A high aerobic base will assist you in recovering from fatigue between stations, leading to greater ease in completing the SOC. This can be achieved by carrying out long slow distance running. A high anaerobic fitness will assist you in the last 300 m run, where you have to sprint all-out in a fatigued state after clearing the 12 obstacles. This can be achieved through interval training (page 76).

IPPT STANDARDS FOR SERVICEMEN <25 YEARS OF AGE

Grade	Points	Sit-up (reps)	Standing Broad Jump (cm)	Pull-up (reps)	4 x 10 m Shuttle Run (sec)	2.4 km Run (min:sec)
A	5	>39	>242	>11	<10.2	<10:21
B	4	37 to 39	234 to 242	10 to 11	10.2 to 10.3	10:21 to 11:00
C	3	34 to 36	225 to 233	8 to 9	10.4 to 10.5	11:01 to 11:40
D	2	31 to 33	216 to 224	6 to 7	10.6 to 10.7	11:41 to 12:20
E	1	28 to 30	207 to 215	4 to 5	10.8 to 10.9	12:21 to 13:00

VOCATION CATEGORICAL AWARD

Combat			
	Gold	**Silver**	**Pass**
	B-grade for all stations	C-grade for all stations	D-grade for all stations
Total Points	21	18	15
2.4 km Run (min:sec)	<9:45		

Commando/Guards/Divers			
	Gold	**Silver**	**Pass**
	B-grade for all stations	C-grade for all stations	D-grade for all stations
Total Points	25	23	20
2.4 km Run (min:sec)	<9:15		

http://www.mindef.gov.sg/imindef/mindef_websites/atozlistings/army/microsites/asn/info_guide/IPPT.html

References

1. Army Fitness Centre, Ministry of Defense, Singapore (n.d). Website: www.mindef.gov.sg/army/afc/
2. Baechle, T. R., & Earle, R. W. (2000). *Essentials of strength training and conditioning: National strength and conditioning association.* Human Kinetics.
3. Thompson, P. (2009). *RUN! JUMP! THROW! The Official IAAF Guide to Teaching Athletics.* International Association of Athletic Federations.

COMMON INJURIES IN THE MILITARY

Musculoskeletal injuries, why they happen and how to avoid them

GRACE HENG, DR IVY LIM, BERNARD LIEW

The musculoskeletal system consists of the muscles, tendons, ligaments, bones and joints. These structures are used for movement during everyday activities and sports. Exposure to a large force such as a tackle, or unaccustomed strenuous activities (e.g. when smaller forces are applied repetitively over weeks or months) may give rise to acute or overuse injuries respectively.

Healthcare professionals often use these terms to describe musculoskeletal injuries:

STRAIN

This is a muscle tear. Muscles are connected to bones, and their contraction (shortening) produces movement. A tear may be partial or complete. Weak, fatigued or tight muscles, as well as inadequate warm-up before intensive training increase the risk of a muscle strain.

SPRAIN

This refers to a tear of a ligament. Ligaments are structures that connect bones and provide stability at joints. Torn ligaments may give rise to joint instability.

TENDINOSIS (TENDINITIS)

This involves the tendons, which connect muscles to bones. Overuse may give rise to degeneration or tears of the fibres inside the tendon.

FRACTURE

This describes a broken bone. It can result from a large force that is suddenly applied to

the bone (e.g. falling from height) or from a small force that is applied repetitively over a period of time (e.g. stress fractures from running in boots).

DISLOCATION (SUBLUXATION)

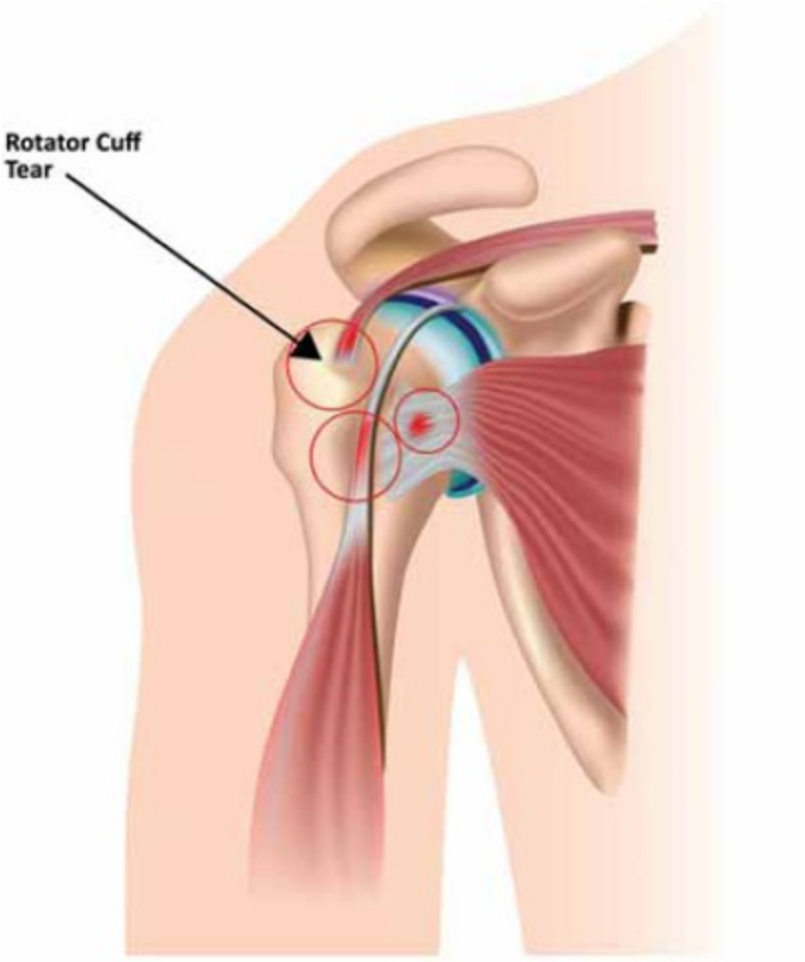
This is used to describe a joint that has moved out of its usual position.

Worldwide, musculoskeletal injuries account for between one-third and half of all non-battle injuries in the military. The most commonly encountered injuries involve the knee, shin, foot and ankle, lower back and shoulder. Awareness and understanding of these common injuries will enable the soldier to seek early medical attention as well as develop skills to minimise the risk of getting injured.

SHOULDER

The shoulder is the joint between the arm and the chest wall. It is shallow and depends on the rotator cuff muscles and ligaments for stability. The shoulder may sustain injury during activities involving repetitive overhead arm movements (e.g. pull-ups, swimming, lifting loads) or during a fall. Common shoulder injuries include rotator cuff tendinosis, rotator cuff tears, labral tears and dislocations. Injuries to these structures cause pain during overhead movements, when reaching behind for an object and when lying on the affected shoulder. There may also be a sensation of instability and weakness.

Anatomy of the shoulder

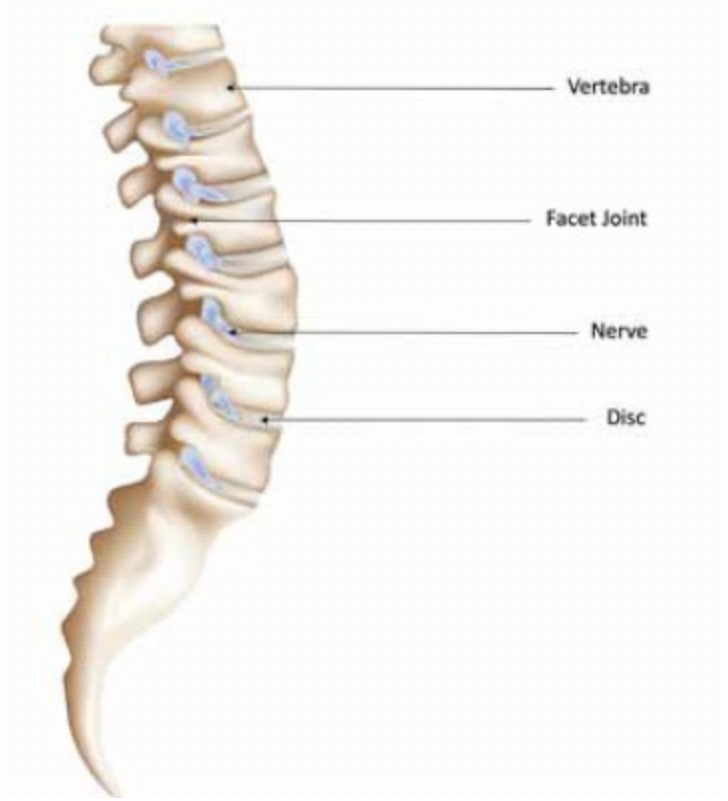


Rotator cuff tendinosis and tears

LOW BACK

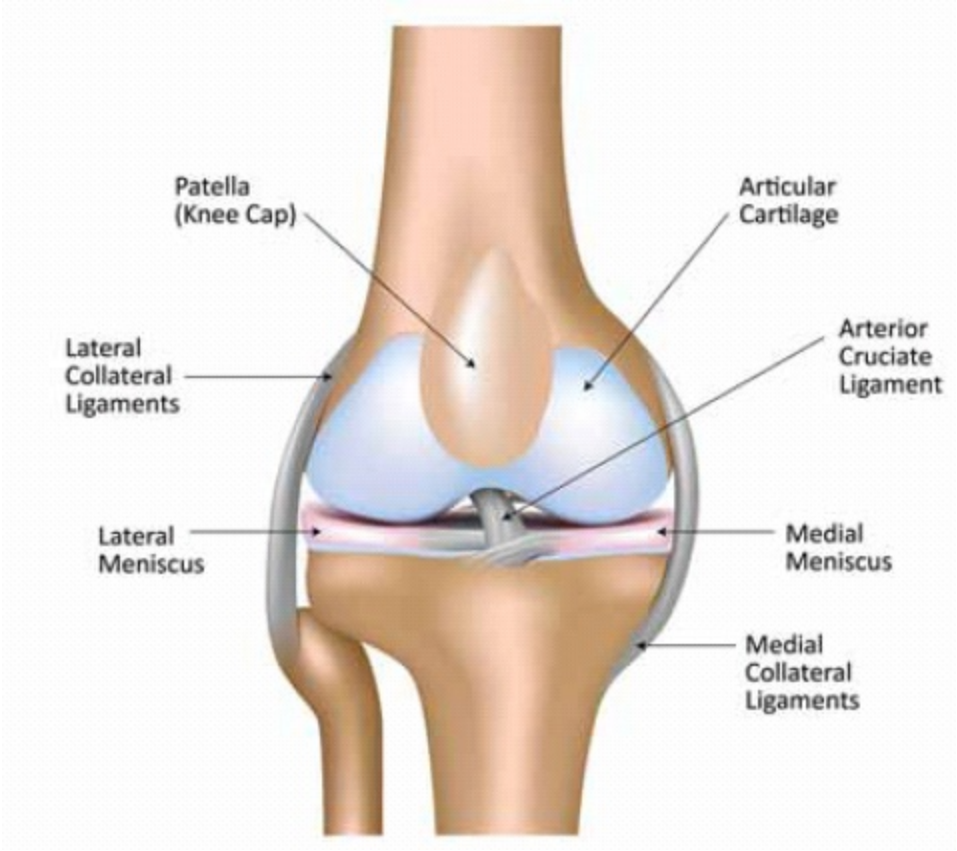
This region includes the lumbar spine and its supporting ligaments and muscles. Injuries may be due to internal factors (e.g. poor posture) and external factors (e.g. improper carrying of heavy loads). In the military, the majority of low back pain involving the muscles is the result of sudden awkward movements (e.g. twisting when lifting a heavy object) or overuse (e.g. prolonged standing or carrying of heavy backpacks.) The muscles may attempt to protect the spine by tightening or going into spasms. This creates pain and stiffness if the situation persists.

Another common back injury seen in the military is discogenic back pain. Discs act as shock absorbers between the bones in the spine. They can tear when exposed to sudden compression or rotation forces. They are also subjected to wear and tear over time. Pain arising from the discs is usually most severe upon sitting or bending forward (flexion). Coughing or sneezing may also be painful. The pain may be confined to the back, or travel down the buttock or leg.



Anatomy of the lumbosacral spine

The facet joints and ligaments link each segment of the spine. They may become injured as a result of poor posture or activities that require repetitive backward bending (extension). Occasionally, these joints may also be involved in a stress fracture. Pain from such injuries is usually worse during extension.



KNEE

The knee bears the brunt of the impact forces during activities such as running and jumping. Common conditions affecting the knees include the patellofemoral pain syndrome (runner's knee), iliotibial band friction syndrome, patellar tendinosis and Osgood Schlatter's disease. Occasionally, serious injuries such as tears of the menisci or ligaments may occur.

The patellofemoral pain syndrome is due to increased pressure on the kneecap (patella) resulting from muscle imbalance or direct impact from a fall. Pain or instability may be present during activities that require the knee to bend while supporting the body weight, such as running, squatting and climbing stairs. A cracking sound is also frequently present when bending or straightening the knees.

The iliotibial band (ITB) is a group of fibres running from the buttocks along the outer side of the thigh to the knee. It is often tight, and running or walking long distances can give rise to friction between the ITB and the lower end of the thigh bone (femur). This presents as pain on the outer part of the knee that usually occurs after running or walking a specific distance. The pain is worse during downhill running and on uneven or cambered surfaces.

The patellar tendon connects the quadriceps muscle in front of the thigh to the leg bone (tibia) via the kneecap (patella). Like the patella itself, it is exposed to stress during jumping, squatting and running. If the quadriceps, hamstrings or calf muscles are excessively tight, this stress can weaken the fibres of the tendon and give rise to a painful condition known as patellar tendinosis or jumper's knee.

The junction between the patellar tendon and tibia is affected in Osgood Schlatter's disease. A lump is often seen at the upper end of the leg, causing pain when pressure is applied, or more commonly, during kneeling. The condition occurs when large traction forces act on the tendon-bone junction due to tight muscles.

The menisci are C-shaped pieces of fibrocartilage that act as shock absorbers inside the knee. There are two pieces in each knee, and they may be torn during falls involving twisting forces. Similarly, the major ligaments in the knee may also tear during falls or awkward movements. These injuries may lead to instability, and often require surgical repair. Both menisci tears and major ligament injuries usually give rise to swelling within the knee, which is rarely present in the other forms of knee injuries described above.

SHIN

The shin is the front of the leg between the knee and ankle. Besides the commonly known shin splints (medial tibial stress syndrome), due to traction and tension causing inflammation at the junction between the muscles and leg bone, pain in this region can also result from stress fractures or raised pressure within the muscles associated with prolonged exercise (chronic exertional compartment syndrome). Muscle tightness, poor strength, as well as abnormal foot biomechanics (e.g. excessively low or high arches) that affect the foot and ankle during running often contribute to the development of shin injuries.

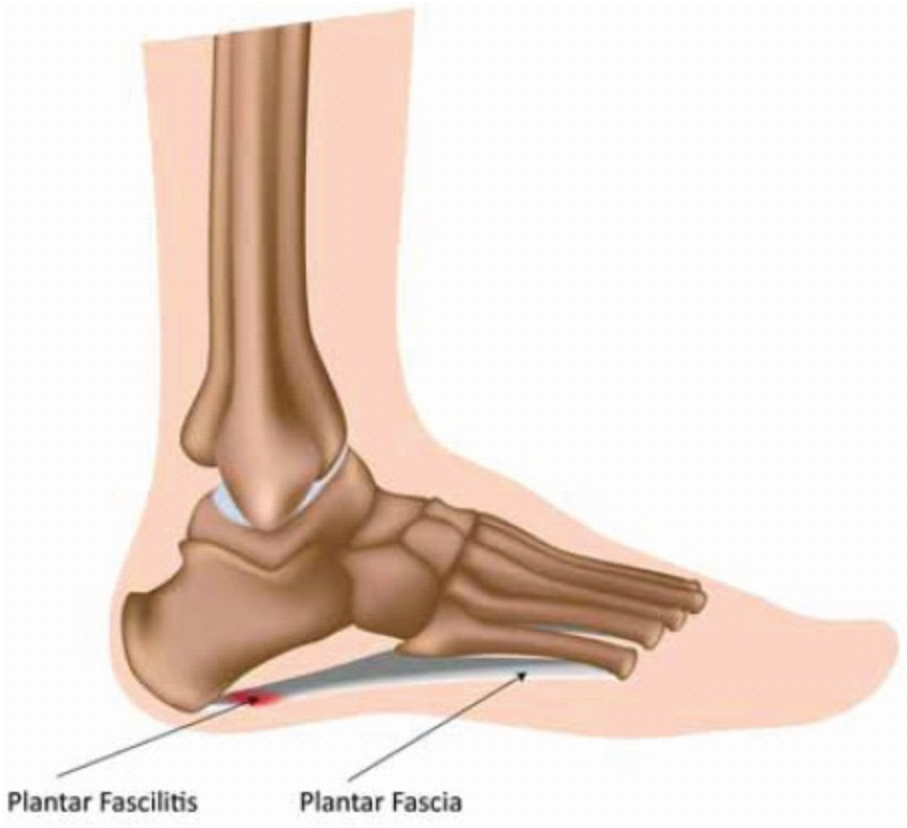
Ankle sprains

ANKLE

The ankle may be twisted when running or walking on uneven terrain. The most commonly affected ligaments are on the outer part of the ankle; they may be partially or completely torn. This makes the joint unstable, and hence recurrent sprains are not uncommon. The frequency of recurrent sprains may be reduced through a proper course of physiotherapy, followed by the use of protective braces or taping during high-risk activities (e.g. sports requiring sudden direction changes, travelling across uneven ground).

PLANTAR FASCIITIS

The plantar fascia is a tough triangular band of tissue that runs on the bottom of the foot from the heel towards the toes. It maintains the arches of the foot, helping to generate and conserve energy during walking and running. Excessive walking or running, especially in unsuitable or poorly-cushioned footwear, leads to swelling and pain of the plantar fascia. Tight calf muscles, stiffness of the foot and ankle, flat feet or high arches, improper running technique and excess body weight increase the risk of developing this condition.



Plantar fasciitis

STRESS FRACTURES

Bone is a living structure — it becomes stronger and denser when exposed to stress. However, if this stress is applied rapidly with insufficient time for the bone to adapt, stress fractures develop. The metatarsals (small long bones in the feet), tibia, femur and pelvis are commonly involved, as they are exposed to high loads during running, jumping and force marches. In the early stages, pain is felt only during high-impact activities; in the later stages, even walking will be painful.

HAND AND WRIST

The hand and wrist are made up of multiple small bones linked by ligaments. The bones may fracture during a fall, or more frequently, the ligaments can be torn. Awkward wrist positions while lifting loads can also injure the ligaments. Commonly affected ligaments are the scapholunate ligaments and the triangular fibrocartilage complex. Pain is usually felt when putting weight on the wrist (e.g. push-ups) or when trying to push oneself off the ground from a sitting position. Wrist rotation also becomes painful, and there may be weakness while gripping objects.

SIGNS AND SYMPTOMS OF INJURY

The following, if present during or within hours after an activity, may indicate that an injury has been sustained:

- pain
- swelling
- bruising
- weakness
- numbness
- deformity
- movement limitation

WHAT TO DO IF YOU SUSPECT THAT YOU HAVE AN INJURY

Inform your conducting officer or superior as soon as possible. During field training, there is often a medic on site to provide advice and first aid. Early management of injuries is crucial to speedy recovery. One of the simplest and yet highly effective first aid measure that can be carried out within the first 48 hours of injury is PRICE therapy, which has been proven to significantly minimise pain and swelling:

PROTECTION FROM FURTHER DAMAGE

Use a sling, splint or crutches to support the injured area and minimise further movement.

REST

Stop the activity causing pain immediately.

ICE

Apply a cold pack or crushed ice for 10 to 15 minutes every 2 to 3 hours, completing a minimum of three cycles. The cold decreases the size of blood vessels in the injured area, thus reducing bleeding and swelling. DO NOT apply ice directly to the skin for longer than 15 minutes, as excessive cold can damage the skin and tissues.

COMPRESSION

Wrap a crepe bandage (available in first aid kits or medic pouches) snugly around the injured region. The pressure helps to minimise swelling.

ELEVATION

Keep the injured part lifted high (above heart level if lying down). This helps in removing fluid from the swollen tissue.

Further management of musculoskeletal injuries depends on their type and severity. Your medical officer may prescribe a course of anti-inflammatory medication or painkillers, which are used to reduce pain and swelling. Examinations such as X-Rays, ultrasound or MRI scans may also be necessary for an accurate diagnosis and treatment planning. Rehabilitation and physiotherapy to help the soldier regain strength and function of the injured region is often necessary. This is often accompanied by a reduction in training load or even complete rest.

PREVENTION OF MUSCULOSKELETAL INJURIES

Exercise, including sports and military training, is stressful for the body. However, if this stress is increased progressively, the human body will adapt and become stronger, thus not only reducing the risk of injury but also improving physical performance.

There are generally three injury peaks: during BMT, during specialist selection and training, and finally, in older soldiers preparing for annual fitness tests. Situations that place the soldier at risk include running, jumping, outfield training and obstacle courses. Overweight soldiers, those with inadequately treated past injuries and those with strength and flexibility deficits or biomechanical abnormalities (e.g. flat feet, high arches) are more prone to injury. These factors should be identified and corrected before starting on demanding training.

Preparing your body for the rigours of military training will go a long way in keeping you injury free. This is the principle behind prehabilitation, or preventing injuries before they occur. It can be achieved through a programme that progressively increases the strength, endurance and stability of the muscles and joints. The exercises in Chapter 3 should form part of a prehabilitation and conditioning programme before you enlist.

TOO HEAVY TO HANDLE?

Low back pain is a common complaint amongst military personnel over the world. A common stimulus for the development of low back injuries includes the repetitive nature of lifting and carrying of heavy combat loads. It is not uncommon for the average load of an average active combatant to be in the range of 15 to 20 kg. Those who handle heavy weaponry can expect the cumulative load to be around 30 to 35 kg. As such, knowledge and technique in lifting loads may help in preventing low back injuries.

What increases the chances of low back injuries?

- The weight of the load

- The distance between the load and the body
- The speed of trunk movement/lifting
- Asymmetrical trunk position and motion (i.e. being twisted and bent to the side)

What is in keeping the low back straight?
“Bend the knees, not the back” is what one often hears when it comes to safe load lifting. However, several problems exist with this over-generalised recommendation. Firstly, bending the knees often requires greater energy usage and imposes a high compressive load to the kneecap. This is a deterrent to using the “squat method”

Second is the concept of a “straight back”, which is often thought of as keeping the trunk and head vertical. Yet, keeping the trunk vertical often results in bending of the low back (lumbar spine) at the bottom of a squat. It is almost physically impossible to keep the low back “straight” whilst keeping the trunk vertical. The third problem is that such advice on lifting never takes into account the weight of the load, the size of the load, the size of the lifter and the impact of fatigue on lifting style.

When physiotherapists, sports scientists and other experts talk about “keeping the back straight”, what this really means is to keep the low back in its natural inward curved posture, or what is called a neutral spine posture. This posture has several benefits:

- Allowing the structures of the low back to be more tolerant to compressive and shear forces, thus increasing resistance to injuries;
- Positioning the muscles that protect the spine in a better alignment to do so; and
- Avoiding repetitive bending and straightening of the spine.

LIFTING PRINCIPLES

- Bend the hips, not the knees — the only way to reach a load on the floor without bending the knee excessively and still keep the low back “neutral” is by bending the hips.

✗ The “squat” lift — excessive bending of the knees increases stress to the joint.

✗ The “stoop” lift — lifting with the lower back rounded increases stress to the lumbar spine.

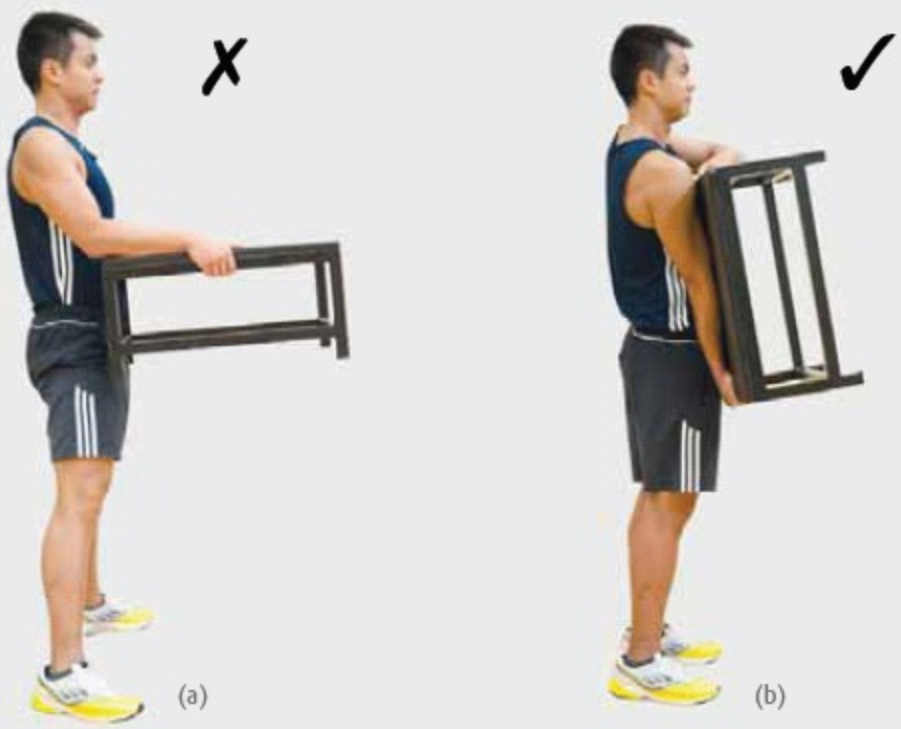
✓ The “weightlifter’s lift” — bending the hips with the lower back neutral is the correct way to lift a load.

- Redirect forces away from the back — resting the load on the thighs redirects some of the force directly into the ground, leaving less to pass through the back.

Rest the load on your thigh.

Rest your elbows on your knees.

- Keep the load close to you — change the orientation of the load to keep the narrowest sides towards you.



Change the orientation of the load (a) to keep it closer to the body (b).

- Lift from a higher starting point.

Elevate the object before lifting it.

MANAGING FATIGUE IN THE HEAT

How to train safely in hot environments

DR JASON LEE

The human body generates heat during all muscular activity, including exercise. Under normal circumstances, it is able to cool itself by removing excess heat via three mechanisms — evaporation of sweat, convection (e.g. air circulation around the body), and conduction (e.g. when immersed in water). However, when the surrounding humidity and temperature is high, these mechanisms may be impaired, which can lead to the accumulation of excess heat, a condition known as hyperthermia. Military uniforms and equipment such as body armour, while essential for survival and mission success, also interfere with the body's ability to lose heat.

Hyperthermia is a potentially dangerous condition. It not only imposes a severe strain on the physiological systems in the body, which impairs physical performance, but if prolonged, can lead to dehydration, heat exhaustion, heat stroke and collapse. Various body organs including the gastrointestinal system, kidneys, liver and brain may be damaged.

The following strategies can help you to better tolerate physical training in the heat and reduce the risk of succumbing to a heat-related injury.

IMPROVING CARDIOVASCULAR FITNESS

Repeated exposure to the high rates of metabolic heat produced during cardiovascular exercise has been demonstrated to improve the efficiency of the body's heat loss mechanisms. Thus, you should aim to be as fit as possible before enlisting.

ACCLIMATISATION

This involves getting the body used to exercising in the heat. Acclimatised individuals start sweating earlier when exposed to heat, thus enabling the body to kick-start the process of heat loss. Exercise heart rates and effort are also much lower in someone who is used to exercising in the heat. To acclimatise, start with 10 to 15 minutes of easy exercise in the heat and gradually increase the intensity and duration over a period of 8 to 14 days.

ADEQUATE FLUID INTAKE

Water is essential for life, and nearly 60 per cent of the human body is made up of water. Humans can lose up to 2.5 litres of sweat per hour during intense exercise. Dehydration occurs when sweat rates exceed the rate of fluid consumed by the soldier. Not only does it impair endurance capacity and performance (both physical and mental), dehydration also affects your body's ability to produce sweat.

Drinking before, during and after exercise will reduce the risk of dehydration. However, do note that consuming excessive amounts of fluid can lead to a dangerous condition known as hyponatremia or "water intoxication". This can cause confusion, disorientation, coma and death. To avoid "under-" or "over-drinking", you can use the colour of your urine as a guide — the urine of an adequately hydrated person should be pale yellow in colour. Urine that carries the colour of tea is an indicator of dehydration; conversely, urine that looks like tap water usually signifies excessive hydration.

HAVE APPROPRIATE WORK-REST CYCLES

Take regular breaks in the shade during prolonged activities in the heat. This is known as a "work-rest cycle" and it allows your body to remove any excess heat accumulated during activity.

WEAR APPROPRIATE CLOTHING

Wearing open-weave, light-coloured, light-weight and loose clothing during exercise allows air to circulate and encourages heat loss through convection and evaporation. These should be your attire of choice during physical exercise in hot conditions.

THE 9-MONTHS-TO-BMT PROGRAMME

Putting it all together

OH PAUL WEE

The exercises described in this book have been incorporated into the 9-months-to-BMT programme, which is suitable for students preparing to enlist as well as operationally-ready NSmen who want to maintain their fitness and excel in the IPPT. The exercises in this programme may also be tailored to your specific needs and fitness level.

If you are unsure about your fitness or health, or suspect that you may have a medical condition that may be aggravated by exercise, always check with a medical professional before starting on any exercise programme.

Some good habits to adopt:

- Warm-up for 10 to 15 minutes (e.g. light jogging) before beginning intense exercise. This helps to prevent muscle cramps and strains, and also serves as a mental and physical rehearsal for the upcoming activity. You should be perspiring mildly without any breathlessness or fatigue at the end of the warm-up.
- Stretch at the end of warm-ups and after exercise.
- Use proper techniques, especially during resistance training and stretching. If you are unsure about the correct method of performing an exercise, always check with a qualified fitness professional.
- Use proper footwear during exercise. Shoes play an important role in shock absorption, providing foot and ankle support as well as injury prevention. Always use shoes that are designed for the specific activity (e.g. do not use basketball or court shoes for running), and replace running shoes after every 500 to 600 km of wear.
- Train in safe environments — run at the stadium track, on an even field or at well-lit areas that are free of traffic and physical obstacles such as potholes and rocks. When doing sprint and power training, make sure that the ground is even and that there is no risk of collision between yourself and other people.
- Dehydration and heat stress — avoid training outdoors between 10 am and 3 pm. Drink sufficient fluids to avoid dehydration.
- Give your body time to recover and adapt. Do not train every day, as this often does more harm than good and it is a sure way of developing an overuse injury. If a particular exercise or routine is difficult, allow yourself more time to complete it before progressing to the next stage. You can also cross-train by replacing one

running session each week with a swimming or cycling session.

PREVENTING INJURIES

“Sports injuries or musculoskeletal injuries are common amongst those who undergo rigorous training for a sport or physical activity. To help my patients stay injury-free, I often recommend five injury prevention strategies: a proper set of warm-up and cool-down exercises, a progressive training programme, a well-balanced diet, adequate rest and sleep (7 to 8 hours a day on average) and donning appropriate sports gear. Prevention of injuries is always more effective and more beneficial to your body than sustaining an injury and having to treat it. These injury prevention strategies have been found to reduce the risk of sustaining an injury and I would advise you to adhere to these principles when exercising or training for a sport or physical activity.”

Dr Noreffendy bin Ali
Resident Physician
Changi Sports Medicine Centre

BEGINNERS' 36-WEEK (9-MONTH) TRAINING PROGRAMME

Week	Mon			Tue			Wed			Thu			Fri			Sat			Sun		
	C	SP	SA	C	SP	SA	C	SP	SA	C	SP	SA	C	SP	SA	C	SP	SA	C	SP	SA
1	X	X					X	X	X				X	X							
2	X	X					X	X	X				X	X							
3	X	X					X	X	X				X	X							
4	X	X					X	X	X				X	X							
5	X	X					X	X	X				X	X							
6	X	X					X	X	X				X	X							
7	X	X					X	X	X				X	X							
8	X	X					X	X	X				X	X							
9	X	X	X				X	X					X	X	X						
10	X	X	X				X	X					X	X	X						
11	X	X	X				X	X					X	X	X						
12	X	X	X				X	X					X	X	X						
13	X	X	X				X	X					X	X	X						
14	X	X	X				X	X					X	X	X						
15	X	X	X				X	X					X	X	X						
16	X	X	X				X	X					X	X	X						
17		X		X		X					X		X		X						
18		X		X		X					X		X		X						
19		X		X		X					X		X		X						
20		X		X		X					X		X		X						
21		X		X		X					X		X		X						
22		X		X		X					X		X		X						
23		X		X		X					X		X		X						
24		X		X		X					X		X		X						
25		X				X	X				X				X	X					
26		X				X	X				X				X	X					
27		X				X	X				X				X	X					
28		X				X	X				X				X	X					
29		X				X	X				X				X	X					
30		X				X	X				X				X	X					
31		X				X	X				X				X	X					
32		X				X	X				X				X	X					
33		X				X	X				X				X	X					
34		X				X	X				X				X	X					
35		X				X	X				X				X	X					
36		X				X	X				X				X	X					

C: Cardiovascular SP: Strength and Power SA: Speed and Agility

WEEK 1 TO 8

Mondays and Fridays

	Exercises	Sets x Repetitions	Remarks
1	Squat	3 x 15	1 min rest between sets
2	Push-up	3 x 10 to 20	1 min rest between sets
3	Lats pulldown	3 x 15	1 min rest between sets
4	Sit-up	3 x 20 to 30	1 min rest between sets
5	10 to 20 min run	1 x 1	Pace: Able to talk comfortably while running

Wednesdays

	Exercises	Sets x Repetitions	Remarks
1	Step-up	3 x 15	1 min rest between sets
2	Narrow push-up	3 x 10 to 15	- Place hands next to each other with fingers touching - 1 min rest between sets
3	Lunge	3 x 16	1 min rest between sets
4	Seated cable row	3 x 5 to 10	1 min rest between sets
5	4 x 10 m shuttle run (standing start)	3 x 3	- Mark 2 lines on the ground 10 m apart - Sprint off one line and touch the other line with foot before sprinting back to the first line - Complete 3 repetitions with 10 sec rest between each repetition; this will be 1 set - 2 min rest between sets

WEEK 9 TO 16

Mondays and Fridays

	Exercises	Sets x Repetitions	Remarks
1	4 x 10 m shuttle run (standing start)	2 x (3 x 3)	- Perform 2 sets of the shuttle run programme as per Week 1 to 8 - Rest 5 min between sets
2	5-cone drill	5 x 1	- Place 4 cones 5 m apart to create a square pattern - Place 1 cone in the middle of the square - Start at the middle cone, run and touch each corner cone as quickly as possible, always returning to the middle after each touch - Rest 30 sec between sets
3	4-cone bodyweight circuit: - Push-up - Squat - Sit-up - Lunge	5 x 1	- Place 4 cones 10 m apart to create a square pattern - Start at one corner of the square and perform 15 push-ups, immediately run to the next cone and perform 15 squats, run to the next cone and perform 20 sit-ups and finally perform 20 lunges at the final cone - Rest 1 min between sets

Wednesdays

	Exercises	Sets x Repetitions	Remarks
1	Barbell/dumbbell squat	3 x 10	1 min rest between sets
2	Barbell/dumbbell bench press	3 x 10	1 min rest between sets
3	Barbell/dumbbell lunge	3 x 16	1 min rest between sets
4	Assisted or unassisted pull-up	3 x 1	- Perform as many as you can (good form with chin above the bar) - Once you cannot get your chin above the bar, stop and rest - 1 to 2 min rest between sets
5	Leg raises	3 x 20 to 30	1 min rest between sets

WEEK 17 TO 24

Mondays and Thursdays

	Exercises	Sets x Repetitions	Remarks
1	Counter-movement jump	5 x 10	30 sec rest between sets
2	Barbell bench press	4 x 10	1 min rest between sets
3	Barbell deadlift	4 x 10	1 min rest between sets
4	Close-grip assisted pull-up (hands next to each other), or unassisted pull-up	3 x 1	- Perform as many as you can (good form with chin above the bar) - Once you cannot get your chin above the bar, stop and rest - 1 to 2 min rest between sets
4	Sit-up	3 x 20 to 30	1 min rest between sets

Tuesdays and Fridays

	Exercises	Sets x Repetitions	Remarks
1	Lateral shuffles	6 x 20 m	- Mark a course of 20 m - Mark 2 continuous lines with a width of 1.5 m between them for the length of 20 m - Lateral shuffle between these 2 lines - Using a stadium track for this drill is recommended - 1 min rest between sets
2	4 x 10 m shuttle run (prone start — start from push-up position, feet facing finish line)	2 x (3 x 3)	- Same drill as Week 1 to 8, except to start from push-up position - 1 min rest between repetitions - 2 min rest between sets
3	Lateral shuffle (backwards)	3 x 10 m	- Same layout as with item 1 above - Perform this drill while shuffling backwards - 1 min rest between sets
4	Run	1 x 3 km	Complete in 15 to 20 min

WEEK 25 TO 32

Mondays and Thursdays

	Exercises	Sets x Repetitions	Remarks
1	Tuck jump	5 x 10	30 sec rest between sets
2	Dumbbell/barbell Romanian deadlift	5 x 20 m	1 min rest between sets
3	Barbell incline bench press	4 x 6 to 8	2 min rest between sets
4	Barbell squat	4 x 6 to 8	2 min rest between sets
5	Supinated-grip shoulder-width assisted or unassisted pull-up	4 x 1	- Perform as many as you can per set - 1.5 min rest between sets
6	Dumbbell walking lunge	4 x 12	- Lunge 12 steps with a dumbbell in each hand - 1 min rest between sets
7	Hanging leg raises	3 x 15 to 20	1 min rest between sets
8	Dumbbell/barbell Romanian deadlift	3 x 12	1 min rest between sets

Tuesdays and Fridays

	Exercises	Sets x Repetitions	Remarks
1	30 m sprints (prone start — start from push-up position, feet facing finish line)	4 x 1	- Walk back recovery - Start again upon reaching starting line
2	4 x 10 m shuttle run (sitting start back — sit facing away from the starting line)	2 x (3 x 3)	- 1 min rest between repetitions - 2 min rest between sets
3	Side-crossover + sprint 10 m	5 x 1	- Perform side-crossover over 10 m - Immediately sprint another 10 m to finish line - Walk back recovery - Start again upon reaching starting line
4	Lateral shuffle (forward + backward)	6 x 10 m	- Perform lateral shuffle as per Week 17 to 24 - Upon reaching the end of 10 m, immediately shuffle backwards to starting line - 1 min rest between sets

Wednesdays

	Exercises	Sets x Repetitions	Remarks
1	Interval run	3 x 800 m	- Complete each 800 m in 4 to 5 min - 2 min rest between sets

Saturdays

	Exercises	Sets x Repetitions	Remarks
1	Long run	1 x 4 to 5 km	- Complete 4 to 5 km in 30 mins

WEEK 33 TO 36

Mondays and Thursdays

	Exercises	Sets x Repetitions	Remarks
1	Invisible hurdle jump	4 x 10	- Perform 10 jumps over imaginary knee-height hurdles - Walk back recovery
2	Jumping strides	5 x 20 m	- Walk back recovery
3	Barbell bench press	4 x 6 to 8	2 min rest between sets
4	Barbell squat	4 x 6 to 8	2 min rest between sets
5	Wide-grip assisted or unassisted pull-up	4 x 1	- Grip the bar slightly wider than shoulder-width - Perform as many as you can per set - 1.5 min rest between sets
6	Barbell walking lunge	4 x 12	- Lunge 12 steps with a barbell on shoulders - 1 min rest between sets
7	Barbell Romanian deadlift	4 x 12	1 min rest between sets

Tuesdays and Fridays

	Exercises	Sets x Repetitions	Remarks
1	30 m sprints (prone start — start from push-up position, feet facing finish line)	5 x 1	- Walk back recovery - Start again upon reaching starting line
2	4 x 10 m shuttle run (prone start — start from push-up position, feet facing finish line)	3 x (3 x 3)	- 1 min rest between repetitions - 2 min rest between sets
3	Tuck jump + side-crossover + sprint 10 m	4 x 1	- Perform 5 tuck jumps before performing side-crossover over 10 m - Immediately sprint another 10 m to finish line - Walk back recovery - Start again upon reaching starting line
4	Lateral shuffle (forward + backward) + sprint 10 m	5 x 10 m	- Perform lateral shuffle as per Week 17 to 24 - Upon reaching the end of 10 m, immediately shuffle backwards to starting line - Immediately turn and sprint 10 m - 1 min rest between sets

Wednesdays

	Exercises	Sets x Repetitions	Remarks
1	Interval run	2 x (4 X 400 m)	- Complete each 400 m in 2 min - 1 min rest between repetitions - 3 min rest between sets

Saturdays

	Exercises	Sets x Repetitions	Remarks
1	Long run	1 x 6 km	- Complete 6 km in 40 min

BEYOND ORD

The benefits of regular exercise

DR BEN TAN

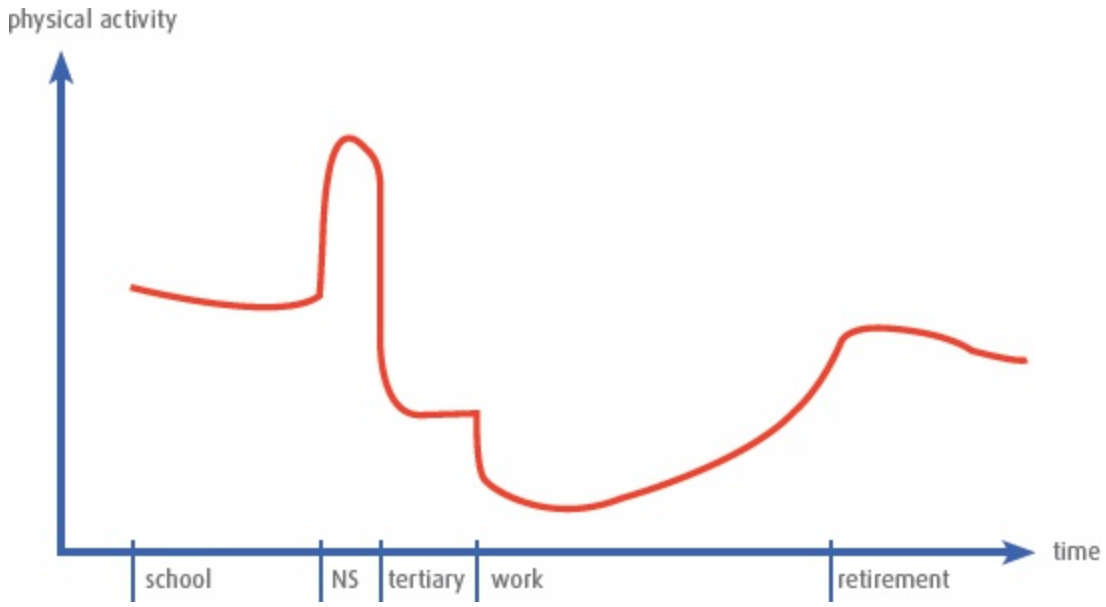
INTRODUCTION

During NS, we gain not only vocational skills, but we come out of it fitter and stronger. By maintaining or even improving on our fitness beyond ORD, not only do we remain operationally ready, it also benefits our health. NSmen who adhere to a regular exercise and fitness routine after ORD will also have less problems passing the annual IPPT.

PHYSICAL ACTIVITY AND HEALTH

In general, all of us are physically active during our school-going years, thanks to compulsory Physical Education (PE) classes. This continues during NS for those whose Physical Employment Status (PES) are between A and C. However, when we enter tertiary education after NS, there tends to be a drop in physical activity levels, while there is typically an ever bigger plunge when we join the workforce and start our families. Physical activity levels may stay in the doldrums until our families and careers are established, usually in our forties when they gradually increase, with another rise post-retirement (at least for some who are still capable of physical activity).

PHYSICAL ACTIVITY LEVELS ACROSS A LIFESPAN



Physical inactivity or sedentarism is the number four cause of premature death in the world. Poor cardiorespiratory fitness has a higher relative risk of premature death than smoking, obesity, dyslipidemia or hypertension. It has been shown that those who are physically active not only live longer, but also enjoy a higher quality of life.

The onset of chronic diseases usually occurs beyond the age of 35 years, and there is ample evidence that physical activity is effective in managing such diseases. As the maxim goes, prevention is better than cure, and if we remain active throughout our lives, rather than allowing activity levels to dip after the completion of NS, we can significantly reduce the risk of developing such diseases.

PHYSICAL ACTIVITY GUIDELINES

What are the minimum physical activity levels needed to keep us relatively healthy? The current National Physical Activity Guidelines prescribe:

Cardiovascular activity	150 minutes of moderate-intensity aerobic exercise per week, or 75 minutes of high-intensity aerobic exercise per week
Strength	Resistance training twice a week
Daily living	Walking 10,000 steps per day Housework, gardening, etc.

MAINTAINING THE EXERCISE HABIT

The above recommendations are a cinch to maintain if we continue to be active after NS. It

is easier to maintain rather than to pick up. Here are a few tips:

KEEP IT FUN

No one said that it only counts if you pound the treadmill for a whole hour. There is a huge variety of physical activities — choose whatever appeals to you, be it badminton, swimming, in-line skating or football.

CHALLENGE YOURSELF

Set targets to keep yourself going, such as signing up for a 10 km race or preparing to climb Mount Kinabalu on your next holiday.

EXERCISE WITH FRIENDS

Some enjoy exercising alone, and some prefer company. Set up a regular workout session, such as a game of tennis, with a group of friends.

REGULAR EXERCISE

The keyword is *regular*. Once a week is not enough. A habit is something we do daily or at least on most days of the week. Make exercise a habit.

TIME MANAGEMENT

Fix your exercise schedule for the whole week, and stick to the routine. Let the routine be the solid anchor in your life, and build your work, family, and social routines around it. To make this possible, you will need to pick an exercise time that is within your control, e.g. 6 to 7 am every weekday morning. There is no point aiming to exercise during lunch time if the nature of your work does not offer you a regular lunch time.

Authors

DR ROGER TIAN
MBBS, MRCSEd, MMed (Surgery), MSpMed

Sports Physician

Dr Roger Tian obtained postgraduate qualifications in Surgery and Sports Medicine after graduating from the National University of Singapore in 1996. He is the first sports physician in Singapore to complete the advanced subspecialty training programme. He currently practices at the Changi Sports Medicine Centre and as Deputy Medical Director of the Singapore Sports Medicine Centre. His clinical interests include musculoskeletal injury management and prevention, sports nutrition, strength and conditioning. He has participated in the care of the country's elite athletes while working at the Sports Medicine Research Centre of the Singapore Sports Council. He has also contributed his expertise as a resource member of the MCYS Sports Safety Committee and in the Ministry of Education's Healthy Youth Committee. He is currently a member of the SAF Fitness Advisory Board.

Dr Tian served as Medical Director for the OSIM International Triathlon in 2007 and 2008, and has also provided medical cover for sports such as S-League/national team matches, triathlons, netball, HSBC Wakeboard World Cup, as well as the Aviva Singapore Open Badminton Championships. He served as a sports physician during the inaugural 2010 Summer Youth Olympics and the Asia Youth Games in 2009.

Dr Tian is also a Senior Lecturer with the Yong Loo Lin School of Medicine. He is active in both undergraduate and postgraduate education, and has published his work in both local and international peer reviewed journals. He has published a guide on the prevention of sports injuries for the Ministry of Education, and has previously contributed a chapter on running injuries in the book *Run For Your Life*.

CAMERON BLACK
BSc (Hons) Physiotherapy

Physiotherapist

Military preparedness and athleticism go hand-in-hand and Cameron Black has a wealth of experience and knowledge in both. Educated at the Royal Belfast Academical Institution (RBAI), Cameron was an active member of the Combined Cadet Force (CCF) Army Section at school. He regularly represented the CCF at Annual Events in March and Shoot Competitions and internationally at the National Shooting Centre, Bisley, United Kingdom. In 2003 he performed at such a high level that he finished third in the 7.62 mm (full bore rifle) pairs competition during the National Schools Meet.

Cameron is a fully certified physiotherapist, graduating in 2009 from the University of Ulster, UK. He supervised a variety of University, National and International sporting events including soccer, rugby and field hockey. After serving three years with the Territorial Army (UK) during his University years, Cameron developed a strong clinical interest in Military Medicine. In 2010, he completed his rotations in Geriatrics, Orthopaedics and Outpatient Orthopaedics at Changi General Hospital, Singapore. Cameron also worked in the Medical and Surgical Intensive Care units, Prison Ward, Neurological Rehabilitation and Respiratory wards. For two years, he treated elite and recreational athletes at Changi Sports Medicine Centre, Singapore and assisted with clinical research, public talks and media articles.

Cameron is an accomplished athlete, gaining national recognition in cricket and field hockey. He participates in a variety of team sports and enjoys cycling, swimming, waterskiing and diving. He is a marathoner and triathlete, using these activities to raise money for local charities. Moreover, he has backpacked through the rugged terrains of Mongolia, Nepal and Tibet.

Contributors

DR NOREFFENDY BIN ALI
MBBS, MScSEM
Resident Physician

Dr Noreffendy graduated with a Bachelor of Medicine and Bachelor of Surgery from the Yong Loo Lin School of Medicine, National University of Singapore, in 2006. He then furthered his studies at the University of Exeter, United Kingdom, and graduated with a MSc (Sports and Exercise Medicine) with distinction in 2010. He is also Head Soldier Performance Centre of HQ Army Medical Services since returning from the UK in 2010. He believes in providing a holistic and multi-disciplinary approach in the management of his patients. He is often in consultation with the physiotherapists, podiatrists, sports trainers, dieticians or any other members of the Changi Sports Medicine Centre team — either giving input or receiving feedback with regard to the management of athletes with acute or chronic sports injuries. Dr Noreffendy also has a great interest in prevention of sports injuries. Besides clinical work, he is also actively participating in clinical research in the prevention of sports injuries and obesity.

DR CHRISTOPHER CHEOK CHENG SOON
MBBS, MMed (Psychiatry)
Psychiatrist

Dr Christopher Cheok is the Deputy Chairman, Medical Board; Head and Senior Consultant of the Department of Psychological Medicine at Khoo Teck Puat Hospital. He is a visiting consultant to the Singapore Armed Forces (SAF) and an adviser to the Juvenile and Family Court of Singapore. During his career with the SAF, Dr Cheok was the Commanding Officer of the Medical Classification Centre, the Deputy Commander of the Military Medicine Institute and the Head of the Psychological Care Centre. He has served in peacekeeping missions in East Timor and in humanitarian relief missions during the Asian Tsunami.

OH PAUL WEE
BSc (Sports Science), MESc (Strength & Conditioning),
ACSM-HFS, NSCA-CSCS
Senior Lecturer

Paul is currently a Senior Lecturer at the Singapore Polytechnic School of Chemical and Life Sciences, where he teaches exercise physiology and other health-related modules for the Diploma in Nutrition, Health and Wellness. Before joining Singapore Polytechnic, Paul was the Head and Senior Strength and Conditioning Coach at the Singapore Sports Institute. He has experience in preparing elite national athletes across multiple sports for various major competitions, including the SEA Games, ASEAN Games, World Championships and Olympic Games. Paul holds a Master's degree in Strength and Conditioning and a Bachelor's degree in Sports Science.

BERNARD LIEW
BSc (Physiotherapy)
Physiotherapist

Bernard is a physiotherapist working in Changi Sports Medicine Centre. He holds a Bachelor's with First Class Honours from Curtin University, Perth, Australia. He carries an interest in the research and management of individuals with muscle and tendon injuries and spinal pain. Amidst his working schedule, Bernard still finds time to lead a physically active lifestyle, swimming competitively (and winning) in the Inter-ministry swimming competition. Bernard values the role of young Singaporean men to National Service, hence his enthusiasm in contributing a piece to this excellent book that aims to prevent injuries to our servicemen.

JULIAN LIM
MSc, CSCS
Strength & Conditioning Coach

Julian is a strength and conditioning coach at the Singapore Sports Institute, where he implements sport-specific training programmes for the national and elite-level athletes. His current portfolio includes athletes competing in badminton, basketball, bowling, shooting and track-and-field. He endeavours to research and utilise evidence-based strength training principles to enhance an athlete's sporting performance. Julian received his Master Degree in Research from the National Institute of Education, Nanyang Technological University. His thesis focused on the application of post-activation potentiation in enhancing the performance of the national sprinters. Previously, Julian graduated from Edith Cowan University in Perth, Australia, with a Degree in Sports Science, majoring in Human Performance. Other than being an NSCA Certified Strength and Conditioning Specialist (CSCS), Julian is also an AWF Level 1 Club Weightlifting and Sports Power Coach and an IAAF Level 1 Youth Track & Field Coach.

JOANNA TAN
MSc (Sport & Exercise Nutrition), BND
Senior Dietitian

Joanna graduated from Flinders University in Adelaide, South Australia, with a Bachelor of Nutrition and Dietetics in 2007 and has been working at Changi General Hospital since January 2008. She is an Accredited Practicing Dietitian with the Dietetics Association of Australia as well as an Accredited Dietitian of Singapore with the Singapore Nutrition and Dietetics Association. Her job includes providing dietary consultations to patients with lifestyle diseases such as diabetes, heart disease, weight management advice for patients who are overweight and obese, as well as providing nutrition support for athletes. In 2012, she graduated with a Masters in Sports and Exercise Nutrition from Leeds Metropolitan University, United Kingdom. Her dissertation title was *Nutrition Knowledge and Dietary Practices: A Case Study from Race Walking.* Apart from providing nutrition support to patients, she also provides nutrition talks and conducts group workshops to the public.

GRACE HENG
MErgo, BHSc (Physiotherapy)
Head Physiotherapist

With her interest in sports medicine, Grace joined the Singapore Armed Forces (SAF) upon graduation in 2000. Since then she has been providing routine physiotherapy services for injured SAF personnel to allow a quick return to their duties. In addition, she has conducted projects that preserve and enhance soldiers' performance, such as the conditioning of candidates for Basic Underwater Demolition SEALs in the United States and musculoskeletal screenings for Special Forces Qualification Course. As Head Physiotherapist at the Soldier Performance Centre, HQ Army Medical Services, she continues to contribute her expertise in the field of military sports medicine to ensure a better and fitter soldier.

DR IVY LIM
MBBS, MMed (Family Medicine)
Registrar

Dr Ivy Lim has been working as a registrar in the Changi Sports Medicine Centre since obtaining her Masters degree in Family Medicine. She served in the secretariat of the MCYS Sports Safety Committee in 2007, and is currently sitting on the inter-agency Healthy Youth Committee spearheaded by the Ministry of Education, as well as the Sports Medicine Association of Singapore committee. In addition, she is research director for the Exercise Is Medicine Singapore Task Force. She has provided medical coverage for several local sports events over the years. Her interests are in sports safety and chronic disease management.

DR JASON LEE
PhD, FACSM
Head Physiologist

Dr Jason Lee graduated top of his cohort with a First Class Honours from Loughborough University, United Kingdom. He pursued a PhD in Exercise Physiology under sponsorship from the UK Overseas Research Scholarship. Dr Lee is a Fellow of the American College of Sports Medicine. He is currently a principal member of the technical staff and the group head for physiology at the Defence Medical & Environmental Research Institute, DSO National Laboratories. His main research interests are in extreme and thermal physiology. Capitalising on his experience as a Commando Officer in the Singapore Armed Forces, Dr Lee applies his academic knowledge to his work by functioning as the Lead Physiologist in DSO. He serves as Adjunct Assistant Professor at the medical schools in the National University of Singapore and Nanyang Technological University.

DR BENEDICT TAN
MBBS, MSpMed
Sports Physician

Dr Ben Tan graduated in 1991 with a medical degree and obtained his Masters in Sports Medicine in 1997 from the world-renowned Australian Institute of Sport. His Master's thesis, published in the *Journal of Strength and Conditioning Research*, was on manipulating resistance training programme variables to optimise maximum strength in men. Dr Tan is presently the Chief of the Department of Sports Medicine, Changi General Hospital. The Department encompasses the Changi Sports Medicine Centre and the Singapore Sports Medicine Centre. A three-time Sportsman of the Year, Dr Tan served his National Service as the Diving Physiology Medical Officer at the Naval Diving Unit. During his Medical Officers' Cadet Course, he set his personal best of 1,001 push-ups and 31 pull-ups. His marathon personal best is 2 hours 56 minutes. Dr Tan is currently a member of the SAF Fitness Advisory Board and SAF Fitness Science Expert Panel. He is the Chairman of the Exercise Is Medicine Singapore National Task Force and Council Member of the National Institute of Education.