CHAPTER 12

Knowledge Review

Q1: What is meant by: i] physical fitness; ii] health-related fitness; iii] skill-related fitness

A1:

i] Physical fitness can be defined as being the ability to comfortably perform particular physical tasks, the ability to carry out daily tasks without undue fatigue, the ability to function well under exercise conditions or the capability of the cardio-respiratory and muscular systems to function at optimum efficiency.

ii] Health-related fitness is the physical fitness achieved through exercising for the main purpose of maintaining and improving aspects of health. The components of health-related fitness include strength, aerobic endurance, muscular endurance, flexibility and body composition.

iii] Skill-related fitness has specific focus and is typically considered in regard to the preparation for performing a certain sport or physical activity well. It includes balance, co-ordination, speed, agility, power and reaction time.

Q2: List 10 beneficial effects of exercise.

A2:

The beneficial effects of exercise include:

1. Promotes good health
2. Prevents ill-health
3. Enhances mental health
4. Encourages feeling's of well-being

5. Maintains and improves fitness
6. Promotes optimal posture, suppleness, strength, endurance and body composition
7. Reduces the severity of certain health disorders
8. Promotes the optimal growth and development of children
9. Minimizes the deleterious effects of the ageing process
10. Helps to improve the performance of activities of daily living
11. Improves athletic performance
12. Helps to offset the negative effects of increasingly sedentary lifestyles
13. Helps to reduce the negative effects of stress.
14. Fully enhances an holistic approach to healthy living

Q3: Describe some of the key safety issues relating to the provision of exercise.

A3:

The main safety consideration in the provision of exercise is the attempted prevention of problems and injuries. This should include:

1. Minimizing the potential for hazards
2. Making the exercise environment as safe as possible
3. Making sure first-aid facilities are available
4. Screening participants for contra-indications [and completion of a PARQ] prior to participation
5. Making sure correct exercise and protective equipment are available and functional
6. Making sure correct training principles are being employed

7. Games and competitions are appropriately officiated
8. Making participants aware of signs and symptoms indicating that they should stop exercising
9. Being aware of the client's medical history, occupation, lifestyle, previous and current involvements with exercise and sports
10. Being alert to the signs of exercise addiction or overtraining
11. Encouraging rest and recovery time

Q4: What is meant by: i] overload; ii] progression; iii] transfer; iv] repetition; v] periodization

A4:

i] A key training principle, overload relates to the increased intensity that is applied to an exercise routine, ie. exercise performed at a greater level or intensity than normal. By overloading the body with particular exercises, beneficial adaptations [improved specific fitness] can occur. Without incorporating specific overload into training, fitness will plateau or simply decline.

ii] Progression is the way in which training programmes are periodically modified or advanced so as to observe or experience continued improvements in fitness. The overload that is placed upon specific body regions and systems is progressively increased. This is progressive overload, and is designed to take the individual on to a higher level of performance or to regain fitness that has been lost.

iii] The principle of transfer implies that one learned practical skill can underline, complement or reinforce another. A transfer of skills can be

experienced when performing similar movements, but in different situations, perhaps with different equipment. It is more relevant in terms of sports, and is another way to keep players fit and motivated.

iv] Repetition relates to the repeating of a movement or action in training. By repetition, the quality of performance of any particular movement [skill] should improve. Crucially, though, it must be performed with correct technique and without fatigue. All forms of exercise require a certain amount of repetitive stress for adaptations and improvements to occur.

v] The principle of periodization explains the way in which training programmes are developed so as to achieve optimal performance in competitions. Given that most competitive sports are comprised of a competitive season, or at least a series of competitive events spread out over a year, the majority of serious athletes take on a programme designed to prepare them for their major events. Periodization typically employs three phases of preparation: a conditioning phase, where the emphasis is on working hard to build-up a strong level of foundational fitness; a transitional phase, where alongside general conditioning, the athlete focuses on intense skill and technique development; a competition phase, where the focus is on peak performance in competition.

Q5: Why is a thorough warm-up important?

A5:

The main reason for a warm-up is to prevent injuries and problems and to prepare for performance. Musculo-skeletal injuries are more likely during exercise if muscles, tendons, joints and neuro-muscular pathways are not

properly warmed-up beforehand. A short warm-up routine helps prepare the body for the more strenuous activities that are to follow and will effectively: increase heart and breathing rates; increase circulation through working muscles; raise core body temperature; help to improve the flow of impulses through neuromuscular pathways; increase lubrication of synovial joints; sufficiently stretch and lengthen muscles.

Q6: Describe some ways in which power training can be performed.

A7:

Muscular power is directly related to strength and speed, and in action is associated with the performance of short bursts of sudden strenuous activity, eg. a sprint, jump, lift, throw, punch or serve. To train power is to incorporate resistance, force, speed and agility. This could involve: performing short sequences of rapid medium to high intensity weighted lifts; a series of short resisted sprints [eg. using harness, parachute or inclined terrain] or plyometric exercises such as bounding or medicine ball tossing.

Q7: Explain: i] the "Karvonen formula"; ii] the "Borg scale" of perceived exertion

A7:

i] The "Karvonen formula" or heart rate reserve [HRR] formula incorporates the individuals resting heart rate [RHR] into the standard target heart rate THR equation [220 – age x %] for estimating their most appropriate exercising heart rate. A THR determined from this formula will be more personalized but

higher than one determined from THR method. The formula, for 60% of max, is as follows:

220 – age = max HR [bpm]

max HR – RHR = HRR [bpm]

HRR x 60% = A

A + RHR = THR [bpm]

Note: Because of the increased THR produced from the Karvonen formula, it can be recommended that the percentages used to determine exercise intensity are reduced, ie. low intensity 20-39%; moderate intensity 40-59%; high intensity 60-84%.

ii] The “Borg scale” is a subjective “scale of perceived exertion”. Developed in the 1970’s, it is a 15 point scale running from 6-20, where 6 describes the feeling of no exertion, 13 describes the feeling of working somewhat hard, and 19 describes the feeling of working very, very hard. Such a scale helps reduce the possibility of overstressing the cardio-vascular system, especially if exercisers are being encouraged to keep within comfortable levels of exertion. The Borg scale is as follows:

6 no exertion

7 very, very light

8

9 very light

10

11 fairly light

12

13 somewhat hard

14

15 hard

16

17 very hard

18

19 very, very hard

20 maximal exertion

Q8: Describe some methods to develop stability and explain why it is important.

A8:

Stability training is important because: it helps to develop proprioception and coordination;

it helps to make body regions stronger and more able to withstand physical stresses and at less risk of injury; it offers athletes a strong base of support from which to perform strong and powerful movements; it helps to encourage and maintain good posture; it can help to improve the efficiency of powerful movements; it can help to improve the responsiveness of stabilizing muscles, thereby providing dynamic support for injured, weakened, lax or unstable structures; it can play a major part in many rehabilitation programmes.

Stability should be developed in both the core and the periphery, and there are a selection of important factors to consider: awareness of correct body

alignment during the exercise; awareness of “neutral” pelvic alignment; keeping a focus so as to activate the target muscles; movements should be performed in a controlled manner; smooth breathing must be encouraged at all times; development of skill in performing both isometric and isotonic stability work; progression can involve the performance of advanced [functional] exercises where, as the exerciser holds one particular position, they can bring in another movement or series of movements, thereby challenging their performance further. Equipment is not essential for stability training, but such items as the wobble board, stability cushion, fitness ball, resistance bands or free weights can increase the effectiveness and add variety. Classic stability exercises include: abdominal “hollowing”; the “superman” posture; the supine or side-lying “bridge”; the “plank”. Many of these exercises can be adapted to involve 4, 3, 2 or 1 base of support.

Q9: In what ways can sport-specific skills be developed?

A9:

Sport-specific skills are about being able to perform precise actions and sequences of movements, and functionally they combine coordination, timing, agility, balance, reaction, strength, speed, power, endurance and flexibility. Skills training is goal-directed, which means that the athlete knows what they are trying to learn and why. The goals are to initially perform the skill well in practice, and eventually to be able to consistently perform the skill well. When the sports therapist is working with a team, players should be organized into groups and the specific exercises should be demonstrated, practiced, observed and worked on so to achieve improvements. Skill training is always

best performed in the absence of fatigue because fatigue impairs skilled performance.

Examples of sports-specific skills include the passing of a ball in football, the returning of a backhand in tennis and the teeing-off in golf, and these skills are all merely small aspects of the game. To improve the footballer's passing of the ball, presuming there are no injuries and all other components of fitness are being trained separately, the player will, for example:

1. Practice kicking a stationary ball in a specific manner at a set target and distance, for a set number of times.
2. Practice kicking a moving ball in a specific manner at a set target and distance, for a set number of times.
3. Practice kicking a moving ball in a specific manner at a set target and distance, for a set number of times, whilst running.
4. Practice kicking an unpredictable moving ball in a specific manner at a moving target, for a set number of times, whilst running.

This basic but progressive approach can be adapted for other sports and can easily be intensified or made more complex. The "specific manner" in which the ball is kicked can be varied to suit the area of skill that is being honed, ie. using instep, top of foot or outer side of foot; using left or right foot; "trapping" the ball before it is kicked; varying the way in which the ball reaches its target. All sports skills training should gradually progress to the forces and speeds [functional demands] that are likely to occur in the sport. In a sport where all fitness components are obviously important, methods of incorporating these

into a specific training context need to be developed. Sports drills are repetitious skills-related training exercises that are employed to develop skilled performance. Examples of speed and agility drills include:

- Short series of sprints [the "pick-up speed" technique is useful], with short recovery periods.
- Varied distance and pace figure of 8 running.
- Short series of sprints with sudden changes of direction [zig-zag pattern].
- Repetition of acceleration and deceleration patterns.
- Resisted sprints using a weighted vest, wrist or ankle weights.
- Resisted sprints, utilizing a harness held by a partner.
- Resisted sprints pulling a weighted sledge or wind chute.
- Fast paced, short distance hurdling [rapid knee lifts] over low hurdles.
- Dribbling a ball around a short circuit of organized cones.
- Running, hopping and jumping in structured patterns over a floor ladder or set of agility squares.

Q10: What factors influence the planning of an injury rehabilitation programme?

A10:

Rehabilitation exercise incorporates all the basic principles of fitness training, but in a very specific context: that of effectively strengthening an injured body part, helping to make it functional again and restoring the player's confidence in using the affected region, whilst at the same time maintaining a good level

of general fitness. In order for exercise to be effective in restoring function to an injured area, it must be carefully planned and progressed. The remedial exercise cannot be planned effectively if a thorough physical assessment has not first been performed, and the actual rate of exercise progression relates directly to the way in which the injury is responding to its treatment and rehabilitation. There are three basic phases of healing, the acute inflammatory phase, the cellular proliferation phase and the remodelling and maturation phase, and when prescribing rehabilitation exercise, it is crucial to consider these and not to overstress the injured tissues any more than they can realistically cope with. Rehabilitation is classically broken down into 5 stages: early stage; intermediate stage; late stage; functional stage; return to full participation stage. Aims and objectives for each stage of rehabilitation must be formulated, this might include:

1. Early stage exercise: The key objective is to minimize worsening and to encourage fast resolution of inflammation. Any recommended exercise must not aggravate the injury. Early mobility work must be performed within safe and comfortable limits. Strength, endurance, power, flexibility and cardio-vascular exercise can be encouraged in unaffected body parts, if they pose no problems.
2. Intermediate stage exercise: Mobility work must be maintained, developmental flexibility exercises begun, and isometric strength work is often incorporated at this stage. If full weight-bearing is not possible, partial weight-bearing should be encouraged if it is considered appropriate. Stability training also may be recommended if the injured person is able, and this would include proprioceptive exercise. Again,

all other areas of fitness should be maintained as much as is possible, and in some instances activities such as cycling or hydrotherapy can be included.

3. Later stage exercise: Mobility, flexibility, proprioception and strengthening should all be progressively increased in this stage. Isotonic exercises are usually begun at this stage. It can be very effective to separate and develop the concentric and eccentric components of the isotonic exercise. Open-chain strengthening can be used to isolate muscle groups for specific strengthening. All other areas of fitness should be maintained as much as is possible. Machine and free weights, resistance bands, wobble board, medicine balls, fitness balls, treadmill, elliptical trainers, cycling, swimming and light running can all be considered for incorporation at this stage.
4. Functional stage exercise: This stage involves developing a more vigorous regime, but without overstressing the injured region. Supportive taping or strapping may be used, and correct biomechanical uncompensated movements must be encouraged. The emphasis is upon regaining pre-injury levels of fitness and preparing the player for a full return to sport. Strength, proprioception, stability, mobility and flexibility, speed, power, endurance, coordination, agility, balance and skills training should all be incorporated and developed at this stage.
5. Return to full participation: The athlete should not go back to full competitive activity until they have completed a sports-related fitness test. Match fitness should be developed once general fitness has been regained, and this may involve participation in practice matches, and

possibly playing the role of substitute [in team games] prior to being ready to start a full game.

Not all injuries respond quickly to even the most careful of rehabilitation programmes, and if the sports therapist suspects that there may be underlying complications they should recommend a more detailed medical assessment. If the athlete experiences any exacerbation of symptoms then acute intervention should be applied, and a reduction in the level of activities must be encouraged. The sports therapist should familiarize themselves with all main regional rehabilitation strategies. Whether the injury is to the leg, trunk or arm, ankle, hip or elbow, the rehabilitation fundamentals remain the same; it is only the individual and regional adaptations that are different. There are many ways in which the rehabilitation process can become complicated, but by working with logic, caution and reservation, with explanation and feedback, and with communication or referral to other professionals when appropriate, the end result will hopefully see the outlined objectives achieved.

Rehabilitation or remedial exercise must be focused on the immediate problem, and whether minor injury or functional cardiac rehabilitation, correct principles and close monitoring must be always employed. The eventual objectives of a rehabilitation programme can vary from a return to full match fitness, to being able to get back to or begin a general fitness routine, or to simply improve function and maintain performance of activities of daily living.