Prevention is better than cure

Safe dance practice has become a hot topic during the last few years. You can learn how to dance safely, in practice and performance, by understanding how to apply preventative practice. This chapter will help you to understand how to prevent injury and stay healthy. Everyone’s body has limitations and strengths. Learning the names of bones, joints, muscles and about the basic physiology of how the body works will help you to dance more safely and to recognise your strengths and weaknesses. An applied working knowledge of the body, based on anatomical and physiological principles, is most useful in preventing injury. This chapter names individual parts of the body in the context of how they may arise in class or in performance. For a dancer or a choreographer, an active awareness of safe practice can serve to explain both how to execute a certain movement and why a particular phrase is giving difficulty. Unsafe practice and how to deal with injury are also examined.

Don’t say, ‘Oh well, we did that, and I kicked my leg five inches higher than she did.’ Who cares? Did you understand the movement? That is what matters.  

*(Hanya Holm in The Vision of Modern Dance, 1980)*

The body of a dancer is like the piano of a musician: it is a working tool, and so must be finely tuned. This needs an intelligent, aware, sensitive and disciplined approach to dance training. Dance training pursues the improvement of capabilities which the body already has naturally. As with an athlete, these capabilities need to be developed in order for their potential to be maximised. Safety and efficiency of movement need to be ensured. You can monitor your own safety by learning more about how your body works and what it needs to train, perform and stay healthy. Practise the theory as you dance. Safe dance principles are based on improving the following main areas of basic body fitness:

- alignment;
- flexibility;
strength and stamina;
■ co-ordination and technical skill;
■ general body maintenance.

Different technique classes vary in how much emphasis is placed on these areas. Often, because of the stop–go nature of these classes, there is not enough time for effective all-round conditioning of the body. This is a problem because these basic areas of fitness are all vital in ensuring safe practice and injury prevention, so extra body conditioning can help you to stay dance fit. In this chapter there are some exercises and ideas to assist you with extra body conditioning.

Let us now consider each of these five main areas in turn.

**Alignment – a balancing act**

During movement, the body should remain aligned, whether in a fall or jump or turn. In the well-aligned body, there is a feeling of freedom, easy movement, effortless carriage of the head and awareness of all parts of the body. It is a more expressive body that 'looks good' whatever it is doing, at any given moment. Good alignment is not static, it is a dynamic position of readiness to move and during movement. When you are dancing your teacher will be correcting and encouraging you to be aware of important alignment and other kinesthetic information. Discovering your muscular imbalances is an important part of your dancing and these can be felt when you work on correct postural awareness.

**Postural awareness**

Good posture is vital for control, safety and expression; poor posture or alignment of one part ricochets throughout the rest of the body.

![Figure 1.1 To show points that the line of gravity will pass through in correct alignment](image)

The correct postural line runs through the ear lobe, through the centre of the shoulder and hip, in front of the ankle and down through the foot (see Figure 1.1). The shoulders, hips and knees should be level.
Of course, this plumb line is imaginary. Similarly, your centre of gravity is an imagined point lying slightly below your navel (around the middle of the sacral vertebrae), depending on the shape and weight distribution of the dancer. If you shift your centre of gravity slightly you will feel your body move to keep up – like falling into travelling, running and skipping. When moving, a dancer with a deeper plié can lower the centre of gravity and have a greater range of control.

Now try Task One. You can use the human skeleton in Figure 1.6 to find the bones if you do not know all the names.

**TASK ONE – Finding Alignment**

**KEY SKILLS**  Improving own learning and performance
Communication

10 to 20 minutes

In pairs, let one read instructions and the other adjust posture. Checklist for standing in parallel first position:

- Weight evenly spread over the metatarsal arch. Check: long toes; lift inner medial arch, position of navicular for pronation.
- The tibia and fibula (lower leg) balance on top of the talus (ankle).
- The pelvis balances on the femur (thigh bone), so that the muscles of the lower back, abdomen and thighs are in equal contraction. Check: the thighs lift to support the hips; to check for level hips; place forefingers on the iliac crest. At the back place thumbs on the sacroiliac joint (where the two dimples are); drop the tailbone (sacrum)/flatten the abdomen so that the pelvis is in reciprocal relationship with the lumbar spine.
- Knees relaxed; soft patella; facing straight ahead.
- Upper back supported by thoracic vertebrae. Check: proper amount of anterior–posterior curvature; shoulder girdle rests easily on thorax. Shoulders relaxed/scapulae dropped and level.
- Weight of head even on top of cervical spine. Check: jaw at right angle to the floor; long neck lifted lightly from ears.
- Chest lifted, and sternum above balls of feet. Do not: lift shoulders/tighten neck/hold breath/lift chin/tuck seat under.

Now read this to your partner:

- Now hold this position and try to rise easily. (Check your partner does not: shift their weight forward or back when rising; flex at the hip or knee.)
- Move your arms and head easily without loss of balance.
- Use your bones for support – think X-ray!
- Feel control coming from the centre outwards.
- Let your arms connect to the centre of your back.
For effective movement, each segment of the body must be in proper relationship to its adjacent sections. The anti-gravity postural muscles (see Figure 1.2) are responsible for maintaining upright posture, so that the weight-bearing points on the skeleton will be balanced and the muscles will be able to release energy for action safely and economically. Look at Figure 1.2: can you see that the abdominal muscles are on the anterior (front) of the torso and the back muscles on the posterior surface of the trunk? The anterior and posterior muscles work in balance with each other.

Alignment thus relies on there being balanced relationships between different muscles in each part of the body. This means that different segments of the body give and take (extended and contracted muscles) in order to maintain skeletal balance. Without this balance movement will be inefficient and possibly unsafe, as energy is wasted pulling certain segments of the body into line. A good example of this is the position of the arms in second. The arms are abducted to the sides and often dancers put strain into the lower back by positioning the arms too far back. This position squeezes together the shoulder blades (scapulae) and places excess weight and force into the lower back. TRY this – stand in second position, arms by your sides. Close your eyes. Raise the arms to the side (abduct) into what you think is second position (DO NOT PEEP!). Then look straight ahead when you open your eyes. Wriggle your fingers and using only your peripheral vision (looking straight ahead), you should be able to see your fingers. If you cannot see them, reposition your arms. Lower your
Safe Dance Practice

arms and repeat the exercise until you can see the hands first time. If you practise this enough times your movement memory should recall this when you need the arms in a safe second position. This simple exercise is a great way to make your dancing safer and to hold a better line too.

Look at Figure 1.3 and write down the names of the four muscles, or muscle groups, that you can see on the anterior surface of the torso. In addition to these muscles, the quadratus lumborum connects the last rib to the pelvis and the spine. The muscle fibres of the quadratus lumborum are in a criss-cross weave and help to stabilise the ribcage and the lumbar spine (lower back). Now try Task Two.

Figure 1.3
Core stabiliser muscles of the anterior abdomen

TASK TWO – Finding Your Muscular Power
House for Alignment

KEY SKILLS Improving own learning and performance
Problem solving

10 to 20 minutes

You can do this exercise alone or with a partner to help each other with instructions or corrections. This exercise will help you connect with your abdominal muscles on the anterior surface of your torso. Don’t forget to breathe properly.

1 From standing in a parallel with a well-aligned posture that you found in Task One, breathe out fully and contract the FIVE muscles of the anterior surface of your torso. As you do this, bend your knees and relax your shoulders and allow your arms to softly float up in front to a comfortable level. What shape is your torso now?
2 How do your back muscles feel now?
3 Breathe in and return to standing.
Look at Figure 1.4 and find the large band of muscle, the transverse abdominis. This helps alignment by supporting your lower spine. When all of these core stabilising muscles are toned they will assist you to maintain expressive and safe alignment during dancing. These anterior core stabilisers are large, flat muscles, some lying deeper than others. If the anterior muscles are weak then the torso will lack stability and excess pulling by the lower back (lumbar) muscles can result in pain in the lumbar spine, or in the knees, hips or even feet. Even though the core muscles may be the problem, the pain can occur in other places, because the dancer may start to compensate for the torso muscle weaknesses by shifting the weight onto joints that are inferior (lower down the body). Muscles work together in sequence; therefore poor alignment in one body area can cause pain in others.

4 Repeat (1) – as you contract the muscles, name as many of your anterior abdominals as you can. Breathe in and return to standing.
5 Look closely at Figures 1.3 and 1.4 and notice which way the muscle fibres lie on your body for ONE of the abdominal muscles. Close your eyes and repeat (1). See if you can make an image in your mind to see the muscle fibres contract. Breathe in and return to standing.
6 Repeat for one other muscle.

Answers are on page 333.
Safe Dance Practice

The plié is a basic exercise for safe dance practice, because it offers the ideal opportunity to be aware of your alignment. When executed with correct alignment, the plié improves your feeling of being centred, strengthens the legs and increases your turn-out. All of these benefits lead to improvement in safety and quality of jumping, travelling and lifting. Obviously, you can see how important the plié is as part of your regular training. Now try Task Three – this will strengthen your pelvic floor and other abdominal muscles to improve alignment and ease of the plié.

**Figure 1.5**
Posterior muscular system of the body

**TASK THREE – The Magic of the Plié**

**KEY SKILLS** Improving own learning and performance

10 to 20 minutes

For this exercise to strengthen abdominal muscles and alignment, be prepared to concentrate on ‘seeing’ your muscles move.

**Part one** – Firstly, sit cross-legged or comfortably on the floor and imagine your pelvic girdle filled with water. Breathe in and allow arms to float up to second position and breathe out as arms lower slowly. Repeat this slowly and concentrate on feeling the water move outwards to fill the bowl as your pelvic bones move apart as you breathe in. As you breathe out, the bones move closer and the water
is pushed gently back. Repeat a few more times and concentrate on the pelvic floor muscle that lies in layers on the bottom of the bowl. As you breathe out, feel the pelvic bones move apart and the pelvic floor muscles lengthen (eccentric contraction) and the bones come closer and the muscle fibres shorten (concentric contraction).

- **Part two** – Now repeat this exercise three more times standing, turned-out in second position. Stand comfortably, in second position turned-out, arms by your side. Leave the arms there throughout and breathe easily the whole time. Be sure not to force your turn-out. As you plié, use the correct co-ordination of the pelvic floor muscles – ‘see’ them lengthen and shorten.

- **Part three** – Still standing in second, you are now going to concentrate on visualising the other abdominal muscles too. Check Figure 1.4 for the origin and insertion of the transversus abdominis. Now use your thumbs to locate the bony top of the pelvic crest at the front of your hip girdle. This is the anterior superior iliac spine (ASIS), which is the iliac crest that marks the origin of the transversus abdominis. This muscle is the pair of the pelvic floor and they work in balance as OPPOSITES – it shortens as you plié. To feel the transversus abdominis shorten, place your hands on the front of the ASIS and as you plié slide them in towards the centre. Can you feel the shortening of the transversus abdominis?

- As you straighten your legs, slide the hands back to where they started and concentrate on feeling a lengthening of the transversus abdominis.

- Finally, repeat more pliés, trying to feel both the pelvic floor and the transversus abdominis, as they lengthen and shorten to balance your alignment. Adding an image of a string from the top of your head pulling you up as you plié down will help the action to be smooth and fluent and elongate your neck and spine.

At this point it would be helpful to examine three specific areas of the body which are crucial for good alignment:

- the skeleton
- the spine
- the foot.

### The skeleton – the bones of the matter

The main functions of the skeleton are:

- support;
- protection of organs, e.g. brain, heart, lungs, spinal chord;
- to allow accurate movement when muscles contract by giving rigidity;
- to provide red marrow – some bones contain red marrow which is a part of the blood-forming tissue;
- storage of minerals, such as calcium and some fats for energy.
The skeleton is divided into two parts:

1. The axial (head, chest, pelvis): the skull, vertebrae, clavicle, scapulae, sternum, ribs, ischium, ilium.
2. The appendicular (legs and arms): the humerus, radius, ulna, carpal bones, metacarpals, tarsals, metatarsals, phalanges, femur, tibia, fibula.

The bones

Bones make up the skeleton. There are four types: long, short, flat and irregular. The size of these depends on their function: bones bearing larger body weights are bigger and denser, whereas those bearing lesser body weights are smaller and lighter. Bones provide attachment surfaces for muscles, ligaments and tendons so that joints can move.

- **Long bones** – tibia, fibula, humerus, radius, ulna, metacarpals, phalanges.
- **Short bones** – carpal and tarsal.
- **Flat bones** – skull, scapulae, sternum, ribs.
- **Irregular bones** – sacrum, innominate bone, vertebrae.
Here are some examples of bones and their function:

- The femur of the thigh (long bone) supports more weight than the humerus of the upper arm, and so it is larger and heavier.
- The vertebrae (irregular bone) of the spine are larger near the bottom to support the increased mass from above.

Similarly, the shape of a bone depends on its function. For example:

- The vertebrae are like rounded building blocks stacked to form the spinal column which surrounds and protects the spinal chord.
- The ribs are slender and curved to protect the lungs and heart, and also offer a broad surface for muscle attachments.
- Bones like those in the lower arm – i.e. the radius and ulna – are long and slender to allow the system of levers to operate efficiently.

Bone is very hard connective, living tissue and exercise helps to build stronger bone by imposing stress. As the condition of bone improves, calcium salts, in the matrix of the bone, are deposited. Bone density reaches a peak by the age of 20, so the younger you start to look after your bones, the longer into your future they will last.

### Table 1.1 Injuries to bones

<table>
<thead>
<tr>
<th>Injury</th>
<th>Symptoms/causes</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fractures</td>
<td>Uncommon as a dance injury. Most common is of fifth metatarsal and of ankle, when twisted – i.e. if inverted and rotated in the fall.</td>
<td>Plaster cast. Immobilise for six weeks or many months. May be treated with strapping if a minor fracture. Dancer may not dance, but should exercise areas not in plaster to stay strong/mobile. Once out of cast: ice and ultrasound, plus exercise of inactive muscle.</td>
</tr>
</tbody>
</table>
The spine – the vertebral column

In the well-aligned dancer, the healthy spine is another power centre for moving. The way you sit, lie, stand, travel or fall is affected by the spine. Its elasticity absorbs shock waves created as you dance.

The main functions of the spine are to:

- protect the spinal nerve chord;
- support the head, ribs and hips;
- maintain upright posture;
- absorb shock of movement.

**DANCE TIPS**

**QUICK GUIDE TO HEALTHY BONES**

- preventative practice
  - Diet: calcium intake found in dairy products, some tinned fish, e.g. sardines and salmon. Daily recommended intake: 12–15 years, 1000mgs; 16–54 years, 1200mgs.
  - Regular weight-bearing exercise.

**DANCE TIPS**

**PUTTING YOUR BONES AT RISK – unsafe practice**

- Smoking and high caffeine or alcohol intake affect your bones’ ability to absorb calcium.
- Osteoporosis is loss of bone density, usually found in women over the age of sixty, when levels of the female sex hormone oestrogen drop. Bones can become ‘brittle’ and breaks are more likely to occur. However, young women who are under a healthy weight and whose menstrual cycle is disrupted may also lack oestrogen, and this may result in stress fractures in the feet or legs. Lack of oestrogen reduces the absorption of calcium. Consult your doctor if you are having problems with your menstrual cycle.

*Safe Dance Practice*

( 데이터가 잘못되어, 구체적인 텍스트는 잘 이해가 안 됩니다. 개요가 없어서 정확한 텍스트를 제공할 수 없습니다. 다른 텍스트의 경우 관리자에게 문의해 주시기 바랍니다.)
The spine has four curves (see Figure 1.6), which correspond to groups of vertebrae:

1. the cervical curve: seven cervical vertebrae (neck);
2. the thoracic curve: twelve thoracic vertebrae (chest/rib area);
3. the lumbar curve: five lumbar vertebrae (lower back);
4. the sacral curve: sacrum and coccyx (fused at bottom).

The curves of the spine help to spread the stress involved in weight-bearing, as do the cartilage discs in between the vertebrae which act as shock absorbers. The cartilagenous spongy discs are essential, for example, when landing from jumps and in allowing the spine to flex, extend and rotate. The vertebrae have transverse processes that stick out on each side, which provide attachment points for muscles.

The sacroiliac joint (where the lumbar curve meets the sacrum) is vulnerable. This is the point where the mobile spine meets the immobile pelvis. If the lower abdominal muscles are weak and combined with tight lower back muscles, there will be weakness in this joint. The erector spinae muscle runs down the back as part of a group with other muscles such as the splenius, suboccipitalis and the semispinalis. These long, thin muscles attach along various vertebrae or to the skull. Underneath them are the deeper short, thin muscles that attach from one vertebrae to another. Together these back muscles balance with the abdominal group to provide core stability for dancers.

**Postural problems/injuries of the spine**

Generally speaking, if a particular form of dance training encourages bad habits and unsafe practice – for example, if a dancer attempts movements beyond their ability – alignment and muscular balance will break down. Serious postural problems or injury, or both, may then result. There are also various anatomical defects – e.g. curvature of the spine – which require medical diagnosis and cannot be changed by exercise. In training, dancers with these defects need expert advice on how to accommodate the problem whilst maintaining correct posture. Some postural problems are listed in Table 1.2

The neck (the cervical curve) is also vulnerable to strain because it is so mobile and bears the weight of the head. The neck muscles must therefore be in good condition. In the event that the neck extensor muscles are weak and the flexors are too tight, the dancer’s chin may jut up and the ear will be in front of the plumb line. This is known as cervical lordosis/forward head.

- Extensor muscles are those which stretch the body.
- Flexor muscles are those which curl or bend the body.

Many surveys report that the lower back is the most common site of injury for dancers.

A general word about injury would be helpful here. The *Fit to Dance?* (1996) survey found a link between poor fitness and numbers of injuries to dancers. It also gave examples of dance companies which planned swimming and fitness training into the dancers’ contracts, to provide appropriate body conditioning.
The use of the spine in different dance genres

There are interesting contrasting uses of the spine in the various genres of dance. The classical ballet genre has maintained the vertical spine as one of its characteristics from the fifteenth century. This relates back to its noble beginnings when correct deportment – how to walk, sit, stand and bow – was taught and denoted status and power. The nobility would perform dances in this manner, and later this tradition was taken on by professionals to become ballet as we know it today. The style of the vertical torso gives ballet its distinctive ethereal lightness, and facilitates the execution of characteristic multiple pirouettes and soaring jumps with greater ease.

Even this defiance of natural forces was not enough, however, for the pioneers of modern dance, and at the start of the twentieth century individuals like Isadora Duncan emerged in rebellion. For her, the solar plexus was the creator of all movement, and the name of the game was freedom. Along with this went...
a mobile, tilting, twisting, curving spine. This allowed a wider range of expressivity for the choreographer, and dance has never looked the same since. The spiral twists of the torso typical of many modern styles start in the thoracic vertebrae. The so-called ‘contraction’ of the Martha Graham Technique is in fact an extension of the spine, not a bend, similar to the exercise that you did in Task Two. The corset of abdominal muscles contracts as the erector spinae extends, resulting in the characteristic curving torso.

In jazz dance, too, the erector spinae is stretched and strengthened during the characteristic pelvic forward and backward thrusts. Also in the jazz body roll exercise the erector spinae is strengthened as it contracts to arch the back, on the downward, forward phase of the roll.

Ballroom dancers keep the head aligned with the spine at all times. The head may be turned, inclined, lowered or raised, but always aligned to float freely and safely on top of the spine. In the Latin hip or Cuban motion, the dancer’s hips rotate independently of and around the spine by alternating bends and stretches of the knees, giving the characteristic slinky look.

**TASK FOUR – Name Those Muscles**

**KEY SKILLS**  Problem solving

10 to 20 minutes

Fill in the missing words. In the photograph a male dancer is:

1 Using a c __ __ __ __ __ __ __ __ of the abdominal muscles.
2 This movement of the torso is a characteristic of the M __ __ __ __ __ G __ __ __ __ __ Technique in modern dance.
The foot – a true feat of engineering

Another crucial part of the body for dancers’ correct alignment is the foot. Isadora Duncan, with her defiant, rebellious barefooted look, named dance ‘the religion of the foot’. It is surprising, really, that such a small device is strong enough to support the whole of the rest of the body.

There are 26 bones and many small intrinsic muscles in the foot. These intrinsic muscles, which are layered, are vital because they allow the foot to point strongly with straight toes. Weak intrinsics will cause the toes to claw because the flexor muscles will be over-powerful.

Good practice in dance training aims to increase strength and suppleness of feet. In ballet, exercises such as battement tendu, dégagé, frappé and relevé strengthen the intrinsic muscles of the feet.

The other muscles which move the foot start below the knee and connect to the bones of the foot. The movements produced by these muscles are:

- plantar flexion – pointing downward, ankle extends;
- dorsi flexion – top of the foot points upward, ankle flexes;
- inversion – inner border of foot lifts;
- eversion – outer border of foot lifts;
- adduction – turns foot inward;
- abduction – turns foot outward;
- supination – combines adduction and inversion (sickle);
- pronation – combines abduction and eversion (looks like a flat, duck-footed walk).

The foot is divided into three sections – tarsus, metatarsus and phalanges (toes). We notice these sections as we walk, run or jump. When doing exercises like foot pushes and prances, the ‘going through the foot’ is felt particularly clearly as springy and strong. Strong, flexible feet are one of a dancer’s most valuable assets.

The tarsus section of the foot is made up of seven bones: talus (ankle), calcaneum (heel bone), cuboid, navicular and three small cuneiform bones (see Figure 1.7). In correct alignment the lower leg (tibia/fibula) rests on the tarsus on the same medial line as the ball of the foot (metatarsus) (see Figure 1.6). This means that when you plié, the knee should align over an imaginary line extending out from the middle toes. Look down as you plié in turn-out and you should be able to see your big toe and the one next to it. This is crucial for safe landing from...
jumps. The metatarsus consists of five long metatarsals and leads to the toes (phalanges) (see Figure 1.7).

The foot has four arches for normal function in supporting the body weight, stepping and protection:

- the inside medial arch: from heel to heads of metatarsals (longitudinal);
- the outside lateral arch: from heel to head of the fifth metatarsal (longitudinal);
- two transverse arches – one across the foot at its most forward becomes the metatarsal arch (dome-shaped) and the other running across the front heads of the metatarsal bones.

The metatarsal arch is supported by ligaments and lumbrical muscles. The two most important ligaments of the foot are:

- the spring ligament (between calcaneum and navicular);
- the plantar ligament (between calcaneum to cuboid and the three middle metatarsals).

The arches give the foot its strength and flexibility and allow it to withstand the shocks involved during weight transference (stepping and jumping). Rolling in on the arches of the feet or out to the border should be avoided. Generally, a triangular distribution of weight on each foot is best (see Figure 1.8): the weight is spread evenly here between points 1, 2 and 3, under the first and fifth metatarsals and under the heel bone (calcaneus). If poor alignment is diagnosed, corrective inserts in shoes can help with treatment. The sole of the foot also provides the brain with information. It receives sensations from nerves which directly relate to a dancer’s knowledge of orientation, alignment and support. For example, when jumping, the feet would tell you that there was no ground support.
If arches collapse, serious misalignments occur not only in the foot but also in the rest of the body. If the body weight is placed on the outside of the foot (‘sickling’ or inversion), it not only looks bad but can lead to sprained ankles from incorrect landings by damage to the lateral ligament.

A collapsed medial arch leaves a pronated foot and the foot rolls in on the inner border (eversion). When this happens, you can see the navicular is misaligned nearer to the floor. Check your feet when standing to find the position of the navicular – it is the little knobbly bone sticking out on the inside of the foot just under and forward of the ankle.

**Figure 1.8** Correct distribution of weight on the sole of the foot

**Figure 1.9** Strong flexible feet are one of a dancer’s most valuable assets.

**Photography**: Chris Nash
Postural problems/injuries of the foot

- **Stress fracture of metatarsals.** Appearance: ‘march fracture’ appears as a pain under the foot when pushing through the foot in jumps, on a rise or when stepping. Soldiers marching on hard surfaces are prone, hence the name. Causes: poorly aligned body weight/barefoot work where extra pressure has been put on the metatarsal arch/increase in work. Treatment: rest recovery over approximately 6–8 weeks; physiotherapy, which encourages the intrinsic muscles of the foot to support properly.

- **Morton’s Foot.** Appearance: abnormally short and hypermobile first metatarsal which can destabilise the foot and cause pain in the metatarsal area. Treatment: a foot pad to correct faulty weight placement.

- **Hallux Valgus and Tailor’s Bunion.** Appearance: an enlargement on metatarso-phalangeal joint of either the first or fifth toe. Inflammation appears on the bursa where extra mineral deposits accumulate. Pain occurs when the ankle is rolling inwards. The big toe distorts away from the midline and the little toe goes towards the midline. Causes: Hallux Valgus from foot pronation combined with walking with outwardly rotated hips. Tailor’s Bunion foot supination combined with inwardly rotated hips. Incorrect weight placement results. Treatment: by chiropodist placing a pad. Physiotherapy may use ice/ultrasound/corrective exercise. Check weight distribution on feet. Avoid tight shoes and barefoot work.

- **Hammer toes.** Appearance: crooked toes, big toe points upward, phalanges 2 and 3 are flexed downward, and the ends are often callused. This can lead to corns. Causes: too narrow or short shoes. Treatment: keep toes in extended position in jumping and travelling. If pain becomes too great, special footwear/surgery may be necessary.


- **Flat feet (pes planus).** Appearance: lowering of the medial arch. Aching under big toe and along to heel. Causes: unsuitable footwear/rolling in on ankles. Often related to poor turn-out and knee problems/bunion. Treatment: ultrasound/arch support/corrective exercises for the intrinsic muscles of the foot.

- **Rolling and sickling.** Appearance: if there is a bow in the tibia bone, a misalignment in the angle of the ankle joint will result. The knee will be out of line with the ankle and foot. Rolling and sickling will occur.

**TASK FIVE – Feet**

**KEY SKILLS** Improving own learning and performance

10 to 20 minutes

A corrective exercise for feet to strengthen the dorsi flexors and to help the prevention of, or to heal, shin splints of the lower leg:
Dancers should do as many exercises for their feet as for other parts of the body, since it is so important that the feet should be strong enough for the work demanded.

**Remember, healthy feet are happy feet and research has shown that people who wear sensible shoes live longer!**

*(Dr P. Brinson and F. Dick in *Fit to Dance?*, 1996)*

### The use of the foot in different dance genres

In classical ballet the foot is normally plantar flexed (pointed), whereas in the modern genre it is often dorsi flexed – this is particularly noticeable in the Martha Graham Technique. Some post-modern styles prefer a more neutral, relaxed position of the non-weight-bearing foot. Obviously, these all have very different expressive qualities – the light, endless line of the ballet in contrast to the harsher, broken look and more natural throw-away feel of the post-modern dancer. An even length in the metatarsals and toes will assist support in demi-pointe (weight distributed evenly on heads of metatarsals and phalanges) and full-pointe (weight on phalanges only) work. The feet on the ground gives a further contrast between the genres – the floating ethereal look of the ballerina on pointe as contrasted with the earthy, gravity-bound, flat look of the modern dancer.

Needless to say, the rigours of pointe work may cause alignment problems. Ballet dancers who work regularly in plantar flexion on pointe may be prone to tendinitis in the Achilles (the tendon of the calf muscles) at the back of the heel. Shoes must fit correctly, with, if necessary, high vamps (support pads) to protect high arches (*pes cavus*). Pointe work should never begin before the age of 12, when the bones have ossified sufficiently to cope with the weight. Continual pointe work may result in a thickening of the metatarsals, and this is why the feet may seem to widen. When pointe work is stopped completely, however, the feet will return to their original size.

Sometimes the wearing of shoes, as in high heels for female ballroom dancers, can cause problems because when the calcaneum bone (heel) is raised for prolonged periods of time it may shorten the gastrocnemius and soleus muscles in the lower leg.
No account about feet would be complete without some thoughts on tap dance. The blend of Northern English clog dance, Irish step dancing, American soft-shoe and African–American steps and rhythms is an energised and lively combination. In the eighteenth century, African slaves brought their rhythms to America but were forbidden to use drums, so they made taps and slaps to accompany their dancing instead. From Harlem, New York in the 1920s to Hollywood films in the 1940s and musical theatre, styles were varied but always tapping out captivating rhythms. Tap dance gained widespread popularity during the twentieth century and in the present day it is enjoying a revival.

Footwork requires articulate and supple ankles, toes, metatarsals and heels to make single, double and triple taps that counterpoint the music. A toe tap exercise, when the toes and metatarsal touch the floor and quickly rebound, increases ankle flexibility. While the feet are busy, the torso is counterpulling away from the feet and maintaining a dynamic alignment so that there is plenty of room for the toes to twinkle!

**TASK SIX – Toe power!**

**KEY SKILLS** Improving own learning and performance

10 to 20 minutes

This exercise is useful for dancers from all different dance genres. You are going to articulate the three sections of the feet. Repetitions of this exercise can be used for warming up and the feet will be strengthened. Your co-ordination for jumping and foot alignment can also benefit.

Start by standing in parallel. If you prefer, you can use a barre for support at first. Check that your weight is evenly distributed on the triangle of the sole of your foot, as in Figure 1.8. As you work, hold your torso steady in alignment to free the feet and legs.

- Slowly peel one heel (calcaneum) off the floor, leaving the ball (metatarsal) on the floor.
- Push the toes (phalanges) down forcefully into the floor so that they spring off the floor quickly as they extend. Your knee will be at 90 degrees now. During this motion it is important to use only the toes and not the upper leg muscles to lift the leg. You can ask a partner to check for any misalignment of the foot at this point, such as sickling, or for any shifting of weight out of alignment.
- Once on one leg you should be balanced and aligned and able to hold the position.
- Slowly return the foot to the floor, reversing the order of the sections of the foot – toes/ball/heel.
- Repeat this a few times slowly on one foot, then the other. Try to feel the ‘going through the foot’ and holding your alignment that are both important for safe practice in jumping and travelling.
- Repeat on each foot, increasing the speed, ensuring that the heel cushions onto the floor each time before the next spring from
As well as the spine and feet, other parts and functions of the body are crucial in maintaining correct alignment:

- The lateral flexor muscles of the trunk help to hold the trunk in place, for example during multiple pirouettes.
- Visual cues: the eyes send information to the brain on the body's position in space.
- Semi-circular canals in the inner ear send information on the body’s orientation in space.
- Receptors in joints, tendons and muscles provide continual information to the brain on the body's relative position in space.

Alignment – summary

It is clear that this fundamental skill of alignment is crucial to the prevention of injury for any dancer. Becoming aware of and correcting poor posture can improve alignment. The dancer requires the stretching and strengthening of appropriate muscle groups when they encounter misalignments/injuries.

Other examples of faulty alignment in training are:

- weight too far back;
- failing to turn out from the hips;
- twisted hips;
- feet overturning/rolling;
- misuse of muscle groups during plié (knees flex) and relevé (rise on toes either demi-pointe or full pointe).

Many dance programmes nowadays stress the importance of core stability and body awareness, as taught in the Alexander Technique and Pilates, for example, which emphasise the balancing of the muscles. Regular attendance to good dance classes is essential to maintain and improve posture and movement techniques.
technique classes in the presence of an observant teacher will help to maintain alignment and keep the chance of injury to a minimum.

Learning to dance is an extremely vulnerable activity . . . Dancers must learn to treat themselves with respect.


Now try Task Seven, a final quiz.

TASK SEVEN – Quiz: Check It Out!

KEY SKILLS  Problem solving
Improving own learning and performance

10 to 20 minutes

Test your knowledge about alignment and the skeleton, spine and feet.

1 Is your foot inferior or superior to your shoulders?
2 Is the position of your rectus abdominis anterior or posterior on your torso?
3 How are the fibres of your quadratus lumborum arranged and why?
4 Identify two ways that regular and correctly performed pliés improve safe practice.
5 How many arches are there in the foot and what is their function?
6 How many bones make up the tarsus and where are they found?
7 What is the purpose of the curves in the spine?
8 How many types of bones are there? Why are they different sizes?
9 Why is it important to have enough calcium in your diet?
10 In ballet, which position of the foot is often used and what is this position commonly known as?

Answers are on page 333.

Flexibility – freedom to move!

Increasing flexibility involves increasing muscular elasticity so that the range of motion (ROM) of joints will increase. Flexibility should not involve stretching the ligaments that provide the joints with stability: the elongation of the ligaments increases the possibility of injury. The limit to flexibility is either the ligaments, tendons (such as the Achilles) or bony restriction. Individual differences in the fascial sheath that surrounds the muscle will affect the range of motion/flexibility. Tight ligaments will reduce mobility, as will tight musculature.
Myth: a dancer can never be too flexible

Natural flexibility is not necessarily a bonus for a dancer. Flexible joints which are not protected by adequate muscle strength are more susceptible to injury.


The assumption that all dancers should be able to achieve the same range of motion is thus false. Other factors which will influence flexibility are gender, age, body and room temperature, and training. When flexibility is increased through warm-up, the range of motion in the joints increases. A more flexible body helps to avoid malalignment, muscle tears and injury generally.

Recent somatic approaches, such as Feldenkrais® and the Alexander Technique, concentrate on releasing the body’s full potential to move. By relaxing and using imagery, rather than forcing muscles, your ROM can improve not only during static stretches but also as you dance. As with alignment, flexibility is at its most important when dancers are moving and this is determined by being able to let go of tension and channel movement to flow freely through the body. This control involves co-ordination of movement and will be dealt with in more detail later in the chapter.

The main concerns surrounding flexibility are:

- the joints – particularly the hip, knee and ankle;
- stretching.

The joints – meeting points

Where two bones meet, there will be a joint which allows movement to occur. There are several types of joint which allow different degrees of mobility – from fully mobile to very restricted. In dance, we clearly need a wider range of movement in the hip/leg joint (the ‘break’ of the leg) than in, say, the knee, which needs greater stability for its protection in actions like landing from a jump.

There are three types of joint:

- cartilaginous
- fibrous
- synovial.

Cartilaginous joints

These allow little movement but give great strength. The joints between the vertebrae where the intervertebral cartilage is placed are cartilaginous joints. The limitation of movement here is crucial in absorbing both the shock from, say, jumps and jarring to the skull and brain. These joints are characterised by the presence of the connective tissue called cartilage between the bones. Cartilage contains water and acts to cushion the pressures between the bones.
Essential Guide to Dance

**Fibrous joints**
These allow little or no movement; for example, the flat bones of the skull. Imagine what would happen to your brain if these joints moved around! Everyone needs to stretch their minds, but not their skulls. The bones are closely connected by seams of tough, fibrous connective tissue.

**Synovial joints**
These are the most mobile, so in dance these are the ones that are of greatest concern – e.g. the hip joint (ball and socket – see Figure 1.10), shoulder, fingers, toes, knees and ankles (hinge joints), which all allow a range of free movement.

![Figure 1.10 The hip showing features of a synovial joint](image)

Of all the joints, the synovial ones are the most complex in structure, having the following structural characteristics:

- a joint cavity (a space inside the joint);
- articular cartilage, which covers the bone, reducing friction and allowing smooth movement;
- a capsule, which surrounds the joint, holding together the bones and enclosing the cavity. Ligaments and tendons also cross and strengthen joints to protect from strain or dislocation;
- synovial membrane, which lines the joint;
- synovial fluid, which fills the joint cavity and lubricates the joint.

As we can see, these different joints either allow or restrict movement, according to their structure. The point here is to know which movements are suitable for which joints, and to be able to move within the body’s potential, thus avoiding injury. It is important to recognise your own limitations. Forcing or twisting a joint in directions for which it is not structured will cause injury. Therefore, it is helpful to know not only the joints’ structures but also their correct movement range – see Figure 1.11.
Generally, joint movements include a range from the following:

- flexion: bending a joint;
- extension: straightening a joint;
- abduction: motion away from the centre line;
- adduction: motion towards the centre line;
- rotation: motion around the joint axis line;
- circumduction: a combination of the above involving motion in a circle.

Now try Task Eight.

**TASK EIGHT – A Joints Jigsaw Puzzle**

**KEY SKILLS** Working with others

Problem solving

10 to 20 minutes

In groups of three or four, use sitting, standing and lying positions.

1. Experiment with bending and stretching all the joints in varying degrees – 45°, 90°, 180° – noticing which joints are more or less mobile.
   - Work on circling, rotational movement in the joints.
   - To music of your choice, put together a phrase to be performed in unison which contrasts rotations with bends and stretches, and uses different joints.

2. It may be fun to use chance procedures to make the phrase by writing down on separate pieces of paper the names of different joints and turning them face down. Select at random the joints, and perform the phrase in the order that you chose them.
The body and joints move through planes and axes (see Figure 1.12). An axis is the meeting point of two planes. Reflecting on the task, consider that different joints can be classified by their correct movement range, as follows:

- non-axial: linear movement only;
- uniaxial: movement in a single plane around a fixed axis;
- biaxial: motion in two planes around two axes;
- triaxial: motion in all three planes around three axes. This joint is sometimes also called a ball and socket joint.

Table 1.3 classifies the main joints in this way. Joints have sacs of fluid between the tendons and bones called bursa. These allow the smooth movement of tendon over bone. If over-used, joints may become inflamed, and this is known as bursitis.

<table>
<thead>
<tr>
<th>Joint</th>
<th>Joint type</th>
<th>Movement range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoulder</td>
<td>Ball and socket, synovial, triaxial</td>
<td>Adduction, abduction, flexion, rotation, extension and circumduction</td>
</tr>
<tr>
<td>Hip</td>
<td>Biaxial, synovial</td>
<td>Adduction, abduction, flexion, extension</td>
</tr>
<tr>
<td>Wrist</td>
<td>Pivot, uniaxial</td>
<td>Rotation</td>
</tr>
<tr>
<td>Atlas</td>
<td>Hinge, uniaxial, synovial</td>
<td>Flex, extend. Some rotation when not weight bearing</td>
</tr>
<tr>
<td>Knee</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elbow</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ankle</td>
<td>Non-axial</td>
<td>Linear only</td>
</tr>
<tr>
<td>Foot</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1.3 Classification of joints by type and movement range

Figure 1.12 The three body planes: In battement tendu, which plane of movement is the dancer’s left leg moving through?

Answer: The Horizontal Plane.
The hip/pelvis – the power generator

A useful image for dancers is to see the pelvis as a bowl. The rim of the bowl tilts during movement, and any small shift of the angle affects the body’s alignment in stillness and movement. Try visualising a tilting pelvis – tilting forwards (stick out your tailbone), backwards (tuck your tailbone under) and centred may help you to feel the correct position of vertical placement. The hip/pelvis (see Figures 1.10 and 1.13) is the strongest joint in the body due to its heavy net of ligaments and strong musculature. The ball and socket are deeply set to give greater stability. At the same time, the top of the head of the femur stands out from the pelvis, giving a greater range of movement in all directions. Consider this the next time you are performing rond\textsuperscript{e}s de jambe en l’air, an exercise which increases hip flexibility.

The turn-out associated closely with classical ballet depends on the ‘Y’-shaped ilio-femoral ligament and the angle at which the femur is set in the bowl of the acetabulum of the hip socket. The powerful ligament holds the femur, and if gently stretched at an early age, it can become more elastic and so increase the range of motion in the hip. While the gluteal muscle group (buttocks), with the abdominals, holds the pelvis in place, the six smaller deep rotator muscles are the ‘movers and shakers’ of the rotation of the thigh bone in the hip socket. \textit{Gluteus maximus} is the largest muscle of the group and it extends the hips, for example in jumps when you extend legs in the air or in landing recovering after the plié.

<table>
<thead>
<tr>
<th>Table 1.4</th>
<th>Movements that arise in the three planes and axes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Body Plane</strong></td>
<td><strong>Axis</strong></td>
</tr>
<tr>
<td>Sagittal Plane Divides body right to left <em>(Wheel Plane)</em></td>
<td>Anterior-Posterior (AP) Axis Back to front</td>
</tr>
<tr>
<td>Frontal (or Coronal) Plane Divides body back to front <em>(Door Plane)</em></td>
<td>Vertical Axis Up to down</td>
</tr>
<tr>
<td>Horizontal (or Transverse) Plane Divides body top from bottom <em>(Table Plane)</em></td>
<td>Horizontal Axis Side to side</td>
</tr>
</tbody>
</table>
An important muscle group of the hip area connecting the pelvis and spine to the legs is the iliopsoas, which is the main flexor muscle of the hip. Three muscles make up this group: psoas major, psoas minor and the iliacus. Their origin is on the vertebrae and they insert on the top of the femur bone (see Figure 1.13). When the iliopsoas is in good condition it can improve flexibility in the hip, core stability and turn-out. Also, it is the only muscle that, if sufficiently strong and supple, can lift the leg over 90 degrees.

If the pelvis is held out of alignment for prolonged periods, say with continual forcing of turn-out, the muscles around it will compensate and tighten or loosen,
losing their usual balance. Once the muscles lose their usual balance the spinal curves will also adjust. For example, a forward tilted pelvis produces a ‘hollow back’ in the thoracic curve, abdominal muscles weaken and back muscles tighten. And that’s not all – the ribcage will stick out forwards and breathing will be restricted. When moving, this shift of the pelvis affects the vertical axis so that the dancer’s lower back muscles try to compensate and extending the legs is restricted.

Now try Task Nine – this will help you feel the proper alignment of the pelvis.

**POSTURAL PROBLEMS/INJURIES – THE PELVIS**

Tight musculature and ligaments around the hip can affect the back and create misalignments around the body. Forcing turn-out, insufficient warm-up and misalignment are all possible causes of injuries such as strains to the *rectus femoris* or *iliopsoas*. The correct tilt of the pelvis is essential in order to support the normal curve of the spine. ‘Sticking the tailbone out’ will increase the hollow of the back and must be avoided.

Some dancers with too-loose ligaments may feel their hip go out of joint. Over time, this may lead to deterioration in the joint. The musculature must be strengthened in order to avoid this condition which, in time, can develop into osteoarthritis of the hip where the joint narrows and the bone surface wears away – this is very painful. Many dancers trained in the Graham Technique in the early days forced the opening of the hips and have suffered such deterioration as a consequence.
Men who begin training later than most women usually develop less hip flexibility.

The use of the hip in different dance genres

One of the best-known characteristics of classical ballet is the turned-out position of the hips, legs and feet. Other dance genres also use turn-out to different degrees to help free movement such as in tap and ballroom dancing. Turn-out starts with movement, a rotation of the femur in the hip socket, along with the whole leg, ankle and foot. It needs a balance of strength and flexibility. It increases the range of motion, freeing the hip socket by moving the head of the greater trochanter back and out of the way. Therefore the following are made easier:

- leg extensions
- changing direction
- balance.

Forcing turn-out at an early age by twisting the hips will over-stretch the musculature of the spine and lead to injury of the lower back, groin and knees. In tendu the pelvis stays mainly square, but in high leg raises it will tilt slightly in response to the rising leg. The spine too will shift to compensate for a 90-degree or greater leg lift. There should be no collapse in the waist or ribs. Thoracic and lumbar spine should stay long and extended. Similarly in arabesque the pelvis tilts forward slightly, supported by strong abdominals.

Jazz dance and modern dance, by contrast, sometimes use an inward rotation of the leg and hip. This uses the muscle tensor fasciae latae in the leg (see Figure 1.15).
1.4.). The inward rotation, or turned-in legs and feet, of Nijinsky’s 1913 choreography ‘The Rite of Spring’ was an early example of modern rebellion against some of ballet’s traditions.

In the jazz and modern genres, a more ‘natural’ parallel hold of the hips is preferred. This originated in the work of Isadora Duncan and the early ballets of Nijinsky as a rebellion against artificiality of ballet. Later, Martha Graham used it with greater emphasis to give her choreography a hard-edged look in combination with flexed hands and feet.

The mobility of the hips really comes to life in jazz dance. Hip isolations emphasise flexible movement with a strong sudden dynamic. The pelvis shifts side to side, backwards and forwards, as well as combining these directions in rotations and swinging through diagonals. These isolations are performed with walks and other combinations to express confident ‘cool’.

Remember the planes of movement? Using Figure 1.12, can you answer the following questions? Do the movements as you work out your answers. Stand in a wide parallel position and move your hips in isolations:

- From side to side – what plane are you moving in?
- Back and forth – what plane are you moving in?
- Rotate through side, forward, side, back – what axis are you moving around?

Answers:
Horizontal Plane.
Sagittal Plane.
Vertical Axis.
The knee bone’s connected to your thigh bone!

‘Knees over toes!’ How many times have you heard this? To be accurate it means, for example in plié, that the knee should align directly with a line extending forward from the middle toes. Any inward rotation of or excess weight into the knee (for example sitting into a grand plié) will strain ligaments.

The knee joint (see Figure 1.17) is potentially unstable, but the cruciate ligaments hold the femur on the tibia, making it strong and robust. Also, two semilunar cartilages help to deepen the joint and circulate the synovial fluid, assisting shock absorption. These do not take weight, but if the knee is twisted whilst weight-bearing, they can be trapped between the femur and the tibia and will tear.

The kneecap (patella) protects this joint and acts to increase the action of the big thigh muscles (quadriceps) by serving as a point of attachment of the tendon and thereby increasing leverage for the movement of the joint.

The quadriceps extend the knee. The hamstrings flex the knee with help from gracilis, sartorius and gastrocnemius (calf). When the knee first starts to flex, it uses its very own muscle, the small popliteus on the back of the knee.

Postural problems/injuries – the knee

Most knee injuries occur when bearing weight in flexion, because this is when the joint has least stability. Many such injuries result from repeated twisted misalignment, which will loosen ligaments. Such misalignment often arises during pliés, when there is a failure to maintain the line of the patella directly over the midline of the feet (which extends out from the middle toe). If the knee is allowed to ‘screw’ because of inadequate hip flexibility, the medial ligament will take undue stress, and there will also be excess strain on the inside of the knee. Foot-rolling may also be a factor.

The maintenance of a straight, secure knee joint with minimal rotation during movement is the main way to protect it. After a knee injury, attention should be

Answers to Quickfire Questions
1 The pelvic bones make the shape of a bowl.
2 The lower back muscles contract (tighten).
3 In the hip socket at the head of the femur bone.
4 Extend the leg, change direction, balance.
5 Vaslav Nijinsky.
given to the quadriceps muscle group in order to compensate for the loss of
strength due to lack of use. This muscle group wastes quickly (atrophy) and so
needs exercise, as do the hamstrings (the pair muscle group to the quadriceps),
which provide the necessary eccentric contraction as the quads contract
concentrically. This give-and-take relationship of muscle pairs is called reciprocal.

Figure 1.17 The knee joint (a) anterior, (b) from the side

Table 1.5 Injuries/problems of the knee

<table>
<thead>
<tr>
<th>Injury</th>
<th>Symptoms</th>
<th>Causes</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jumper’s Knee</td>
<td>Pain in plié and jumps, tender on patella under tibia when pressed.</td>
<td>Over-use during jumping.</td>
<td>Massage/ultrasound/stretch/strengthen quads.</td>
</tr>
</tbody>
</table>
Postural defects of the knee – hyperextension

‘Swayback’ knees, although useful in classical ballet because they give a long, aesthetically pleasing look, are a sign of weak quadriceps. Over-stretching of the hamstrings and locking of the knees should be avoided. Knock knees, bow legs and tibial torsion also impair alignment and safe movement.

QUICKFIRE QUESTIONS – Test yourself

1. What are the two functions of the patella?
2. Which muscle group extends the knee?

The ankle – anatomical architecture

FASCINATING FACT

On landing from jumps, the ankle can absorb up to eight times the body weight.

The ankle joint (see Figure 1.18) lies between the tibia, the fibula and the talus. The ligaments on the outside and inside are the main means of support. The ankle joint is very stable, but is also the site of large stresses, therefore

Answers to Quickfire Questions

1. Protect the knee joint and increase action of the thigh muscles to extend the leg.
2. Quadriceps.
ankles need to be strong but also have enough flexibility in the ligaments to allow:

■ safe turn-out in plié (eases stepping and landing);
■ sufficient extension for take-off in jumps.

The ankle and foot are extended and flexed by complex layers of muscles in the lower leg. See Figure 1.19 for the main ones. Contraction of the powerful gastrocnemius (calf) muscle extends the ankle (plantar flexion) for rising on the toes (rélevé) and jumping.

Postural problems/injuries – the ankle

The most commonly injured part of the ankle is the outside lateral ligament. It can happen from faulty landings causing the foot to sickle inwards as it rolls over on its outside edge. The ligament is then twisted and may tear. Treatment entails ice, rest, elevation and, if severe, a plaster or strapping. Recovery can take up to six weeks.

QUICKFIRE QUESTIONS – Test yourself

1 Name the three bones that intersect where the ankle joint is located.
2 Which ligament of the ankle joint is most commonly sprained?

Now try Task Ten.

TASK TEN – Quiz

KEY SKILLS Improving own learning and performance

10 to 20 minutes

Look at Figure 1.20 and answer the following questions.

In the dancer on your left:

1 Choose from rotation/flexion/extension.
   (a) What two anatomical actions are her right hip performing? (2 marks)
   (b) How are the actions in the knees of supporting legs of the two dancers different? (2 marks)

2 (a) Which muscle group is mainly responsible for extending the knee? (1 mark)
   (b) Which muscle group is mainly responsible for flexing the knee? (1 mark)

Answers to Quickfire Questions

1 Tarsus, tibia, fibula.
2 Lateral ligament.
Essential Guide to Dance

Revision Map – Introducing Muscles of the Lower Leg and Foot

**Figure 1.19 Muscles of the lower leg and ankle**

**Gastrocnemius**
- Very large muscle.
- Has two heads.
- Becomes Achilles’ tendon.
- Assists in movement of foot and leg.

**Soleus**
- Underneath gastrocnemius.
- Becomes Achilles’ tendon.
- Assists in movement of foot.

**Achilles tendon**
- All muscles join to form Achilles’ tendon:
  - Very poor blood supply.
  - Common area for injury.

**Tibialis anterior**
- Largest muscle across front of leg.
- Moves up and turns in the foot.

**Extensor Digitorum Longus**
- Lies from tibia and fibula to the four outside toes.
- Extends the four outside toes.
- Raises the foot.

**Extensor Hallucis Longus**
- Lies from middle of fibula to big toe.
- Moves the big toe.
3 (a) What type of joint is the hip? (1 mark)
   (b) How many axes can it move on? (1 mark)
   (c) What name describes this range of its movements? (1 mark)
4 Choose from plantar flexion/dorsi flexion.
   (a) What action is her support foot performing? (1 mark)
   (b) What action is her foot in the air performing? (1 mark)
5 (a) Which anatomical action is her neck performing? Choose from extension/flexion. (1 mark)
   (b) What is the name for this part of the spine? (1 mark)
   (c) How many vertebrae are in this part of the spine? (1 mark)
   (d) Why is this area of the spine vulnerable to injury? (1 mark)
6 (a) The dancer’s spine is rotated or twisted. Which curve of the spine does this action start in? (1 mark)
   (b) How many vertebrae are there in this curve? (1 mark)
7 The flexible spine is possible because of the intervertebral discs.
   (a) Where are these discs? (1 mark)
   (b) What are they made of? (1 mark)
   (c) What is the other function of these discs? (1 mark)

Answers are on page 333.

Figure 1.20 ‘And Nothing but the truth’ by V-TOL Dance Company, 1998. Dancers Chris Devaney, James Hewison. Photographer: Chris Nash.
Stretching – a feel-good factor

Flexibility is improved by stretching. This action lengthens the muscle along the direction of the fibres (eccentric contraction). When stretching there should be a pleasant sensation inside the muscle. Breathing out (exhaling) deeply during the stretch will make it more effective. There are several benefits to regular and safe stretching in terms of preventative practice:

- improves alignment;
- releases muscular tension;
- increases the muscle temperature, making muscles more flexible;
- makes joints and muscles more elastic;
- helps to prevent and aids recovery from injury;
- increases concentration;
- releases toxins from the muscles after heavy physical exertion and so helps safe recovery from exercise.

There are a number of ways to stretch correctly which may overcome the blocking effect of the stretch reflex. This is a natural protective reflex which makes the muscle contract immediately after a stretch, so that in the case of a sudden fall or twist, the muscle is prevented from over-stretching to the point of injury. There are three methods of stretching:

- The **ballistic method** is not recommended. This alternates eccentric and concentric contractions of the muscles by bouncing, which may tear the muscle fibres. For this reason, ballistic bouncing stretches are ineffective, unsafe, and may cause soreness.

- The **static stretch** is a long, sustained stretch and hold method, using low force. During a slow action, the brain can override the stretch reflex. With conscious control, this stretch can be sustained and gravity can be used to increase the extension for at least 30 seconds, or what is comfortable. Let the muscle 'hang off the bone' and 'nudging around', feel as though the muscle is elongating. This is the most commonly used method of stretching. It starts with relaxed muscle, then stretches slowly so it does not need to overcome the stretch reflex (see below). There should be no pain. Combined relaxation and constant breathing through the muscles and between joints can reach spots that other stretches do not. This relaxed type of stretching is featured greatly in post-modern anatomical release work.

- **Proprioceptive neuromuscular facilitation** (PNF) starts with a fully contracted muscle and moves through a joint's full range of movement to achieve the stretch. Then the muscle must be fully relaxed to recover. This is a complex and time-consuming method and is riskier than the static method. Trying to stretch a muscle while it is in any state of contraction will reduce the effectiveness of the stretch and may tear the muscle fibres. However, when using reciprocal inhibition, the maximum contraction of one muscle will temporarily inhibit the stretch reflex in its opposite muscle. So, if you wanted to stretch, say, the hamstrings, a consciously held contraction of the
quadriceps for 20 to 30 seconds first would then allow greater stretch in the back of the thigh. After the contraction, the hamstring stretch should be held for a further 30 to 60 seconds. For this principle to work, both muscles have to be of similar mass. A bonus of the reciprocal method is the strength gained due to maximal contraction.

Both of the above recommended stretch methods use reflexes which are activated at a spinal level by a release of chemicals.

The Golgi tendon reflex is another protective reflex, but one which acts as a reaction to pressure. The Golgi tendon organs are sited at the point where the tendon meets the muscle, and they are sensitive to pressure. They totally relax the muscle when the tendon is about to pull off the bone, and they block the stretch reflex for a longer time. A word of warning, though, to dancers who think, ‘Ah! I’ll use this to stretch more’ – the severity of the pull required to activate the Golgi reflex makes it a dangerous way to increase mobility. During intense stretching, if the reflex is experienced, there is a feeling of warm, total release. The muscle goes to jelly and the range of motion is increased noticeably. The safest way to reach this point is very slowly and carefully, after an adequate warm-up.

When the dancer holds their own body part being stretched, that is called active stretching. Passive stretches involve outside resistance, such as another person, or equipment such as a theraband, to help move the dancer into the stretch and hold them there.

**TASK ELEVEN – Some Stretches to Try**

**KEY SKILLS**  Improving own learning and performance

1. Passive stretch for hamstrings with a partner using reciprocal inhibition. Dancer ‘A’ lies on their back and raises the right leg towards the torso (knee bent). The partner kneels next to the left shoulder and places hands on the bent knee and the quadriceps muscle of the dancer’s bent leg. Dancer ‘A’ contracts the quadriceps muscle by pushing against the resistance of the partner’s hands. Hold for 20 seconds in full contraction. The partner lets go and Dancer ‘A’ extends the leg, relaxing quadriceps and hamstrings and holds for 30 seconds. The partner continues to assist with the stretch by moving position to kneel straddling dancer ‘A’s straight leg and gently applying a downward pressure on the stretching leg with the hands placed on calf and just above the back of the knee.

2. Active stretching. Check a partner’s flexibility:
   - For tightness in the back: one dancer kneels down with feet flat and curls forward. Look for flat places on the spine – these are points of tightness. Swap over.
   - For tightness in the front of the shoulder: raise an arm in abduction until it is parallel to the floor, then take the arm behind. Look for difficulty in this movement – this indicates tightness.
If any tightness has been found, now do the appropriate corrective stretch from below:

1. For the lumbar area: kneel as before, but stretch out the arms, breathe out and hold for 30 seconds. Apply the long, sustained stretch.
2. For the whole back: standing, drop from the head and curve down, lifting the abdominals; keep the legs soft and bent. Curl up again and repeat three times.
3. For the pectorals (the front of the shoulder area): make one arm reach directly behind you. Repeat with the other arm.

Generally speaking, the following guidelines should be used to sequence an exercise programme effectively:

1. Start gently and gradually build up to a more vigorous level. Do an all-over warm-up for 5 to 10 minutes first. This should raise the body temperature 1 or 2 degrees and make the muscle more elastic so that stretching is safer and deeper.
2. After the exercise of one muscle group, take time to undo the bad effects or to notice the good. For example, after a maximum contraction for strength, stretch out in the opposite direction. Or vice versa.
3. Before doing a major stretch, do a maximum contraction of the opposite muscle group.
4. Pinpoint the exact muscle or group that needs stretching/strengthening. Stretching three times a week should be adequate.
5. Find a quiet place for you to feel relaxed in.
6. See if closing your eyes assists focus and visualise imagery.
7. Vary your routine, such as the number of sessions weekly, the length of the session, the parts stretched, the duration of the stretches, to reach your target flexibility.
8. Listen to your body! Do not strain, avoid over-stretching and twisting of joints (especially the knee) and avoid compressing joints such as the discs of the spine.

Flexibility – summary

Improving mobility in the joints is crucial if the dancer is to maintain muscular balance in the body. This will also help alignment, safe working methods and avoidance of injury. You should learn what proper stretching techniques feel like when you do them, and so avoid unsafe methods.

Any muscular tightness you may have can be lessened by stretching, but any structural limitations of bone and ligament will not be affected by stretching, so all dancers should learn to work within anatomical restrictions and their personal range.

The next section is concerned with strength, and it is important to note that only when the muscles which control a joint are strong, can a full range of mobility be achieved through gradual stretching. Weak muscles should not be
stretched. When flexibility and strength are balanced the dancer can more easily reach and hold a position, for example, high leg extensions.

**Strength and stamina**

*Strength – fitness is specific*

![Image](strength.jpg)

When combined, increasing levels of flexibility, strength and stamina form a policy of preventative training (prevent injury).

Strength is the capacity to exert a muscle contraction against resistance. A strong body moves freely, efficiently and above all safely. The aim is all-round strength, not the over-development of certain muscle groups. To build strength, muscles must reach maximal contraction.

Strength supports preventative practice in dance training in several ways. It:

- reduces risk of injury
- improves flexibility
- improves co-ordination & performance
- enhances muscle mass & the toned ‘look’ of the body

However, the look of muscle may mean that you actually weigh more, so be sure not to confuse weight gain with obesity.

**Myths**

- Building strength = bulk.
- Building strength = loss of flexibility.
- Dancers should not use weights.

The main concerns are types of muscle contraction and muscles.
Types of muscle contraction

During exercise, there are two types of contraction: isotonic and isometric.

Isotonic contraction

This involves a dynamic resistance during which the muscle changes in length but tone is constant. Machines can help in passive stretching to maintain tone in the muscle. Isotonic work may be either:

- **concentric** – muscle shortens, e.g. hip abductors (gluteus medius) of the gesturing leg as it is raised to the side (abducted);
- **eccentric** – muscle lengthens, e.g. hip abductors of the gesturing leg to control lowering it to the ground.

Strengthening exercises should be performed, in the full range of motion of a joint, in sets of 10–15. Repetitions slowly build to two or three sets. By adding weights, self-resistance (such as another body part), pulleys or elastic bands, overloading may be increased gradually and strength increases. The training of tap dance and film star Eleanor Powell (1910–1982) provides a great example of overload. Her teacher, Jack Donahue, hung two sandbags on a belt around her waist to develop the skill of tap that stayed low to the ground. Although Donahue insisted that tap was executed by the feet, the sandbags would have had the effect of strengthening Powell’s legs and abdominal muscles, as she had to work harder in order to lift and free the legs, ankles and feet.

Isometric contraction

This involves a static resistance during which muscle tone increases but does not change length. For example, when a leg is raised to the side, holding it there means that the hip abductors have to work in static or isometric contraction to resist gravity. A weight-training programme for male dancers of the Birmingham Royal Ballet was devised by Yiannis Koutedakis at the University of Wolverhampton. The dancers used free weights and machines set at high resistance for a low number of repetitions. After the programme, the dancers felt that their physical appearance had improved.

To increase muscle strength, isometric (static) work as seen in Task Thirteen is useful, but the muscles will tire easily so frequent rests are needed. In Task Thirteen you could increase the frequency by increasing number of repetitions as your muscular endurance improves. Isotonic contraction, as seen in Task Twelve, is the most effective work to increase strength, and in this task as your
KEY SKILLS  Improving own learning and performance

10 to 20 minutes

Perform the following isotonic exercise to strengthen hip abductors (gluteus medius). If a dancer has weak hip abductors and tight external rotators, grand battement and battement tendu will be performed with hip flexed and externally rotated, rather than in abduction.

1 Lie on your side, with legs straight and feet together.
2 Internally rotate the top leg and abduct the hip through the full range of motion.
3 Repeat ten times.
4 Build gradually to a maximum of three sets of ten. Allow 2–5 minutes’ rest between sets.
5 When three sets are possible, perform the exercise standing with an ankle weight starting at 1 kg.

TASK THIRTEEN – Isometric

KEY SKILLS  Improving own learning and performance

10 to 20 minutes

Perform the following isometric exercise to strengthen the lateral trunk flexors and correct scoliosis and an uneven hip tilt.

1 Lie on your side on a mat, with legs straight and feet together.
2 Rest on one forearm and extend the other arm to shoulder height.
3 Raise the hips sideways off the mat as far as possible, and hold for 10 seconds.
4 Repeat, then change to the other side.

With the above in mind, the principle of progressive overload to build strength can be identified. This involves increasing:

- frequency: increasing the number of repetitions or the speed of a movement;
- intensity: adding more and more resistance, as with weights;
- duration: increasing the length of time a movement takes, or the number of sessions weekly.
strength improves the intensity is increased. Eccentric work should be included if muscles are weak or injured, or to increase flexibility. Targeting specific muscles for strengthening or flexibility, or the speed of execution of a movement such as fast, high leg kicks (*grands battements*), applies the principle of *specificity*. For example, you may need to strengthen the hip flexor, the *iliopsoas*, in order to improve abduction for high leg extensions.

**TASK TWELVE – *Isotonic***

**QUICKFIRE QUESTIONS – Test yourself**

1. What do you understand by the term *strength* in relation to the dancer?
2. What is the difference between eccentric and concentric contraction of muscles?

Muscles – in a duet of balance

Myth: muscles change to fat if exercise stops. This is not true at all. The strength of the muscle will reduce and it will feel softer if exercise stops, but muscle and fat are completely different tissues.

_I have a big feeling about muscle – to have a muscle, to feel a muscle, to have a muscle warmed up and toned and ready to do something, it’s a marvellous, sensual feeling._

*(Edward Villella in Dance from Magic to Art, 1976)*

Muscles are the meaty part of the body and there are over 600 of them. In dance, it is the striated or skeletal muscle which is of concern. This is controlled by the nervous system which sends electrochemical energy impulses, causing the muscle fibres to contract and the joints to move. The fibres in the muscles respond to nerve endings and detect the speed and amount of contraction that is required, so a jump that requires fast contractions and extensions in the legs will need the fibres to respond quickly. There are two different types of fibres in muscles:

- **slow-twitch fibres** (red fibres) contract slowly and can sustain tension over a long period. These are used for endurance, such as holding balances in dance. They work aerobically and are important for stamina. You will read more about this in the next section;
- **fast-twitch fibres** (white fibres) contract rapidly and tire easily. These are used for jumping, fast travelling sequences and similar actions. They work anaerobically.

**Answers to Quickfire Questions**

1. The ability to use muscles powerfully against resistance such as lifting and lowering a leg against gravity.
2. Eccentric lengthens muscles and concentric shortens them.
Strength and power in a dancer are most important during jumping, such as seen in the male solo in the ballet *Le Corsaire* (1837, Albert). The danseur’s dazzling display of jumping culminating in a circle of soaring leaps requires strong muscles, especially white fast-twitch fibres. Individual dancers are genetically disposed as to the amount of fast-twitch fibre they have, but can increase strength through training. The other factor which influences the height of jumping is the ratio of power to the body weight. The strength of ligaments and tendons in the legs and arches of the feet is also important. Just like bones, muscle shape varies according to function. Shorter muscles, such as the biceps of the arm, give more strength.

Muscles are attached by tendons to the bone at each end: (a) the origin – this stays still; (b) the insertion – the end which pulls and moves.

Muscles can pull only (i.e. contract) and movement is brought about by pulling on the bones so as to turn these bones into levers. The structure of each such lever has three main parts:

1. the load or weight;
2. the fulcrum (balance point) of the joint;
3. the muscle action producing the effort at the point of the muscle insertion.

There are three types of lever: first-order, second-order and third-order, depending on the position of the fulcrum.

In Figure 1.22, $F = \text{fulcrum}$, $E = \text{effort}$ and $W = \text{weight}$. An example of a second-order lever is shown in Figure 1.23.

![Figure 1.22 First-order lever](image1)

![Figure 1.23 Second-order lever in rising onto one toe](image2)
Most common levers in the body are third-order, where the ‘effort’ moves a shorter distance than the ‘load’. This has the advantage of allowing a large movement to be made with only a slight contraction/shortening of the muscle (see Figure 1.24), thus making it a more efficient movement.

To dance without injury, a muscle needs a high level of efficiency in the antagonistic action of its pair muscle. This means that while a muscle is contracting, its opposite muscle must extend smoothly, in a harmonious duet. Muscles work in reciprocal pairs – like a *pas de deux*. Poorly trained or tired muscles do not tend to act antagonistically and they strain easily. Other muscles assist the prime moving muscle (*agonist*) by fixing parts of the body. These *fixators* and *synergists* contribute to the *agonist’s* work. For example, during hip abduction the *fixators*, the deep hip muscles, will prevent pelvic rotation, making the effort of the abductors more efficient. Meanwhile, the *synergists*, the torso side flexors and abductors on the opposite side of the hip, stabilise the core and standing leg. This clever balancing act is how muscle balance and the crossed-extensor reflex work in action.

So, for example, in raising a leg forward the quadriceps are the agonists, i.e. they concentrically contract to produce the raising movement. The hamstrings are the antagonists, on the opposite side of the joint. They relax and lengthen in eccentric contraction to allow smooth control. Similarly in *plié*, the quadriceps eccentrically contract, then in raising the body back to standing they contract concentrically to resist the force of gravity.

Muscle pairs include:

- biceps (front upper arm) and triceps (back upper arm);
- *rectus abdominis* (front torso) and the long muscles of the back;
- tibialis anterior (front lower leg) and gastrocnemius, soleus (back lower leg);
- thigh adductors (inside thigh) and gluteus medius and others (outside thigh);
- quadriceps and hamstrings.
Injuries – muscles and tendons

The stronger the dancer, the less the risk of injury, e.g. stronger hamstrings may reduce the risk of lower back injuries.

Muscles are attached to bones by the much stronger tendons. Both muscles and tendons are liable to injury. If a tendon is irritated by over-use, tendonitis may occur. Rest is then essential. The Achilles tendon is particularly prone to tendonitis. The symptoms are tenderness and crunching, particularly when plantar-flexing the ankle. Careful stretching of the soleus and gastrocnemius (lower leg) when cooling down reduces the likelihood of tendonitis.

Muscles and tendons are usually injured by too sudden a movement, or by a recurring strain on weak muscles from poor technique or over-use. Vulnerable muscles include the groin (iliopsoas, rectus femoris, adductors), the hamstring group and the calf (gastrocnemius). A thorough warm-up will help to reduce muscle and tendon strains, as it will for joint sprains. This preventative practice is the first line of defence. However, if you do injure yourself, the following is a good guide – PRICED is easy to remember:

P = prevent further injury
R = rest
I = ice
C = compress (bandage/support)
E = elevate (raise)
D = diagnosis, see a doctor

Once an injury has occurred, especially if it is major, you should seek diagnosis from a medical practitioner. As soon as you have injured yourself cold therapy will decrease the blood flow and bruising, which damages soft tissue. It limits swelling by lowering the muscle's need for oxygen and thus relieves pain. Apply ice for no more than 10–15 minutes, and repeat if necessary every few hours until the swelling, local heat or bruising stop. Bandaging and raising the injured limb will both help to lessen swelling. After two days, alternate between cold and hot in order to stimulate blood flow to the injury and encourage healing. The ice should not have direct contact with the skin – a bag of frozen peas works! Heat sources could be in spray form, an infra-red lamp or heat packs. Only a qualified physiotherapist should apply ultrasound. An appropriate exercise routine should be followed to maintain uninjured and injured parts alike.

Depending on the severity of the injury the dancer may need to rest for up to six weeks and should maintain treatment as advised.

Stamina – staying power

Dancing should look easy; like an optical illusion. It should seem effortless. When you do a difficult variation, the audience is aware that it is demanding, and that you have the power and strength to do it. But in the
end, when you take your bow, you should look as if you were saying ‘Oh it was nothing. I could do it again’.

(Helgi Tomasson in Dance from Magic to Art, 1976)

Stamina is endurance of either the muscles or the heart and breathing. As described in the quote above, it would be easy to think that stamina has to do with how you look. It is more than that, however, because it is crucial for the prevention of injury. In order to maintain quality performance over long periods, the heart and lungs need to deliver oxygen to the blood and muscles as efficiently as possible. Once fatigue sets in, mistakes in judgement or undue stresses on muscles and joints make continued dancing unsafe.

Stamina can be divided into two parts:

1 Muscular endurance is the ability of a muscle to continue to contract over a period of time. As you have just read, the muscles have special red slow-twitch fibres for stamina. Stamina is inseparable from muscular strength and size; both these are developed by the abovementioned principle of progressive overload. This type of conditioning needs many repetitions with light resistance, and of course this can be boring. So how many is enough? Listen to your body, and when you feel a burning sensation, the general rule is five more repetitions for increasing muscular endurance. Well-trained muscles are able to contract over longer periods before tiring, so in class the dancer aims to achieve increased strength and endurance in exercises. Speed will improve if movements are practised at an increasing pace.

2 Cardiovascular endurance is the ability to continue aerobic activity (activity which uses oxygen or air) over a period of time. The cardiovascular system includes the heart and lungs (and associated organs). It would be helpful to take a closer look at these vital systems.

The cardiovascular system – catch the beat and your breath

This consists of the heart, the blood and the blood vessels. Together these enable the transport of necessary nutrients and gases to and from the muscles and organs. The blood also carries heat to the skin for removal by sweating and radiation and takes away waste products.

During exercise, changes occur in the cardiovascular system. There is:

- an improvement in the condition of the overall system;
- an increase in the size/strength of the heart muscle and the volume of the heart chambers;
- an increase in aerobic capacity;
- a lowering of the resting heart rate;
- a better venous return of waste products;
- an increase in the volume of blood;
- an increase in the red blood cell count (i.e. haemoglobin cells which carry oxygen);
an increase in chemical buffers (potassium and sodium) in the blood (these lower acidity and help to maintain a lower cardiovascular rate);

an increase in stroke volume (i.e. the amount of blood pumped at each heart beat).

**FASCINATING FACTS: the heart**
- beats at about 70 times per minute (resting rate).
- pumps blood at a rate of about 5 litres per minute – i.e. about 180 million gallons in a lifetime.

**The heart**
A muscular pump about the size of your fist, the heart sends fresh oxygen (O₂) through the arteries to the rest of the body. The veins then carry waste products and carbon dioxide (CO₂) back to the lungs, to be expelled from the body.

**The heart rate**
During exercise, the heart rate (your pulse) increases from its usual resting rate to a maximum rate which is related to your age. When the exercise stops, it then decreases in order to maintain circulatory balance. The deceleration here is controlled by the vagus nerve, which stops the heart from constantly speeding up. This nerve is stimulated by increased blood pressure. In a healthy young adult, normal blood pressure is around 120/80. The higher figure refers to the blood pressure during each heart beat and the lower figure to your blood pressure between beats. The more strenuous the activity and the better the person’s physical condition, the more sensitive the vagus nerve is. This is thought to explain why fitter individuals have a lower resting heart rate than untrained individuals.

Other factors affecting the heart rate are as follows:
- The pacemaker stimulates a steady heart rate.
- Chemical regulation operates when there is an increase in the levels of CO₂ in the blood. The heart rate and blood pressure increase as adrenalin is released into the bloodstream.

**The target heart rate**
Most dance classes do not focus on cardiorespiratory conditioning. In order to stress this type of conditioning, a medium to high ‘target’ heart rate must be maintained continuously for 15–20 minutes. In dance class, it is usual to cross the floor once, then rest and wait for others to do so. This means that aerobic activity is not continued over a long enough time.

**The respiratory system**
During exercise, both the heart and the breathing rate speed up to increase the supply of O₂ to the muscle and the amount of CO₂ away from the muscle. When
we are huffing and puffing, CO₂ is being expelled more forcefully from the alveoli in the lungs out of the body. This removes the CO₂ from the muscles, making an exchange for O₂ possible in the capillaries, and in this way, exercise may continue (see Figure 1.25).

The rate of breathing is controlled by nerve cells in the brain. These detect the levels of O₂, CO₂ and acidity in the blood and stimulate an appropriate increase or decrease in respiration.

Carbon dioxide is a relatively harmless waste gas because it is displaced easily by oxygen in the haemoglobin. However, carbon monoxide, as produced by smoking cigarettes, is extremely poisonous because it combines with haemoglobin to exclude oxygen. It therefore deprives the body of a basic requirement, so smokers are less able to provide muscle with the necessary increased oxygen as demanded in dancing. Dancers who smoke will have less ability to maintain high-quality performance over long periods, and may be more prone to injury.

The ribcage protects the lungs. Attached to it are the muscles which control the expansion and contraction of the thorax cavity. These are the intercostals, the serratus group and the diaphragm. The lungs have no muscular power of their own.

The overall level of fitness for any sport or dance is something specific to that activity. However, the cardiovascular system does need a basic level of aerobic fitness, whatever the activity. An increase in the delivery of oxygen to the muscles by the heart, blood vessels and lungs is improved by slow and steady exercises, such as cycling or swimming, which gradually increase in intensity – in other words, through aerobic exercise where muscles work using oxygen. The American College of Sports Medicine defines aerobic activity as follows:
Aerobic activity is that requiring continuous, rhythmic use of large muscle groups at 60–90 per cent of the maximum heart rate and 50–85 per cent of maximum oxygen uptake for 20–60 minutes.

The main effects of aerobic exercise are:

- an increase in muscular endurance/stamina;
- an increase in cardiovascular endurance/stamina;
- a reduction of fat deposits (weight loss);
- a maintenance of bone mass.

Muscles can continue to work without oxygen, and this is called anaerobic activity. Anaerobic exercise begins when the muscle’s oxygen consumption stops increasing, despite an increased performance. At this point, an oxygen debt is accumulated and waste lactic acid, which the muscle produces, can be tolerated only to a certain level before exhaustion – i.e. before a point is reached where the muscle can no longer contract. This is when the importance of cooling down after vigorous exercise kicks in, because gentler exercise and stretching remove toxins from the muscles. Aerobic exercise improves long-term endurance while anaerobic exercise improves short-term endurance. Dance tends to use mostly anaerobic activity – during technique class, performing repetitive movements will improve muscular endurance. However, some choreographers may also place vigorous demands on the dancers’ aerobic endurance. This will result in progressive overload on the muscles and cardiovascular system.

Preconditioning/preventative training for building up the stamina of the cardiovascular system is therefore advisable. In the event that the dance class is not providing sufficient training in this respect, the dancer should once again invest in some supplementary training. This supplementary type of work was noted earlier in this chapter in the Birmingham Royal Ballet’s programme for male dancers, which aimed to increase upper-body strength and power. The programme focused on developing muscle fibres quickly by encouraging anaerobic activity through the use of free weights and machines set at high resistance for a low number of repetitions. But there were also exercises for slow muscle-fibre development in the form of aerobic sports such as cycling or running. You could consider walking or cycling to dance classes once or twice a week to improve your fitness and lessen your carbon footprint at the same time.

Recovery periods are needed after anaerobic exercise so that the oxygen debt is paid back and a normal chemical balance is resumed. Often, after such exercise, the muscles may feel sore or stiff. This may be caused by mild inflammation in the muscle fibres, which often occurs after new exercises or when adapting to new techniques. This condition reduces flexibility and causes general discomfort when dancing.
TASK FOURTEEN – Quiz: Check It Out!

10 to 20 minutes

1. Give two examples of the benefits of a strong, well-conditioned dancer’s body.

2. Describe one method of progressive overload.

3. When lowering a leg from a high position at the side of the body, how do the hip abductors contract?

4. What force does the strength of the hip abductors overcome during this slow lowering of the leg?

5. Which end of a muscle pulls the bone of a joint, the origin or insertion?

6. Muscles work in reciprocal pairs. What is the muscle called that contracts to pull on the bone?

7. Why is stamina important for dancers?

8. What is the difference between aerobic and anaerobic activity?

9. What are the two organs that make up the cardiovascular system?

10. What gas does the body take in and send to the muscles?

Answers on page 334.

Table 1.6 Muscular functions and problems

<table>
<thead>
<tr>
<th>Location</th>
<th>Muscle names</th>
<th>Function</th>
<th>Problems/injuries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feet</td>
<td>Intrinsic muscles</td>
<td>Strengthen arches and keep toes long when foot is plantar flexed.</td>
<td>If toes keep curled, increases stress on Achilles tendon.</td>
</tr>
<tr>
<td></td>
<td>Hallucis longus</td>
<td>Dorsi flex foot (flexed).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>tibialis anterior</td>
<td>Plantar flex foot (point).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Plantaris</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leg Lower</td>
<td>Gastrocnemius mover muscle</td>
<td>Plantar flex foot – a ‘white’ fast-flexed, knee straight.</td>
<td>Stretch out after use, with ankle</td>
</tr>
<tr>
<td></td>
<td>for travelling, jumps etc.</td>
<td>Reduces risk of tendonitis in Achilles tendon.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Soleus</td>
<td>Maintains plantar flexion, in relevé, pointe work – red holding muscle.</td>
<td>After a class with lots of adagio or balances, stretch it, with ankle flexed. Knee should be flexed and legs parallel.</td>
</tr>
<tr>
<td>Location</td>
<td>Muscle names</td>
<td>Function</td>
<td>Problems/injuries</td>
</tr>
<tr>
<td>----------</td>
<td>--------------</td>
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<td>-------------------</td>
</tr>
<tr>
<td>Knee</td>
<td>Quadriceps group</td>
<td>Extend the knee by increasing leverage.</td>
<td>In any knee injury, the quads waste/ weaken during recovery.</td>
</tr>
<tr>
<td></td>
<td>Hamstring group</td>
<td>Strengthen alignment of knee over centre of tarsus. injure patella. Flex knee and extend hip.</td>
<td>Pronation (knees over-rotate)</td>
</tr>
<tr>
<td>Hip</td>
<td>Small rotators</td>
<td>Externally rotate femur and stabilise hip.</td>
<td>Imbalance between rotators tightens buttocks and pinches sciatic nerve.</td>
</tr>
<tr>
<td></td>
<td>Adductors</td>
<td>Laterally rotate femur (inner thighs pull together), stabilise pelvis when acting against the abductors when standing on one leg.</td>
<td>If too weak or tense, will affect hips or knees.</td>
</tr>
<tr>
<td></td>
<td>Gluteus maximus</td>
<td>Extends hip. Feel it contract when lifting from being flexed at hip.</td>
<td></td>
</tr>
<tr>
<td>Torso</td>
<td>Sacrospinalis, quadratus lumborum, rectus abdominis oblique, transversalis</td>
<td>Extend spine. Flex spine.</td>
<td>Strong abdominals help to protect lumbar spine.</td>
</tr>
</tbody>
</table>
Warming up and cooling down – wise up!

Warm-up before and cool-down after class are advisable in order to reduce the risk of injury. Dancers do not always warm up adequately before class. Do you? It is generally accepted that class is where dancers learn and improve technique skills for performance, but consideration of body conditioning for safe practice must be included in the dancer’s routine. Dancers should take responsibility to allow time for their own warm-up to prepare before class or rehearsal. This applies to all genres of dance, but especially ones that require gymnastic and fast-moving sequences that put the body in positions where injuries are more likely, such as some hip-hop and break-dance moves.

Warm-up is a gradual physical and mental preparation for greater exertion which increases:

- breathing and heart rate;
- the deep temperature of the muscles – thereby improving their contractibility and flexibility;
- the flexibility of tendons and ligaments – so reducing the chance of injury;
- reaction speed;
- blood sugar and adrenalin levels.

The warm-up should include exercises which raise the pulse rate, such as moderate aerobic whole-body exercises, mobilise the joints and use the big muscle groups to raise internal body temperature quicker, and stretch the muscles (simple stretches). It is preferable for some warm-up exercises to relate to the dance movement that will follow, so that dancers are prepared physically and psychologically. If you know what your class or rehearsal will expect of you, your personal warm-up ritual may mark some of the movement that you already know, and you can use some visualisation of the moves too. As a dancer, your body is your responsibility and so a personal warm-up may have a few exercises prepared for specific muscles that need some extra t.l.c. Remember – fitness is specific and so is warming up. Stretches as the main means of warming up are unsafe and the body temperature must be raised before stretching can be safely performed. Now try Task Fifteen to devise your own warm-up ritual.

Cool-down is the gradual slowing down of the circulation in order to safely return to a resting heart rate. This promotes blood circulation to remove waste products from the muscles and helps prevent soreness. Stopping exercise too suddenly can cause the pooling of blood in previously active areas such as the lower limbs, and this can cause soreness, fainting and dizziness. Walking ‘out’ can work well, or marking gently some movements that you are learning can be productive too. This can also give you time to work on memory of new movement phrases and reflect on challenges from the learning experience. After a few minutes of slowing down, some gentle stretching or breathing for about five minutes is advised, and this is your chance to work on those weaknesses and capitalise on the warmth of the muscles and joints. The wearing of warmer
**TASK FIFTEEN – MY WARM-UP RITUAL**

**KEY SKILLS**  Improving own learning and performance

45 minutes to an hour

Prepare your own warm-up ritual of 15–20 minutes along the following lines:

- 5–10 minutes easy pacing/jogging either in place or around the space;
- a light, easy moving of joints building to swings;
- gentle stretches;
- some ‘technical’ exercises, or a rehearsal of the dance about to be performed – this is important for mental readiness and the avoidance of injury.

Clothing will help to avoid pulls and aches, and if you are going to take a few moments to relax and rest, will keep you warm.

**Strength and stamina – summary**

A healthy, well-conditioned cardiovascular system will provide the dancer with sufficient endurance to maintain safe, expressive and efficient movement throughout technique classes, rehearsals and performances. This system, however, works only in tandem with an equally well-conditioned respiratory system.

Strength and muscular endurance are related in a number of ways. If the muscle is strong, it can continue activity for longer. In progressive overload, which conditions for muscular endurance, the fatigue level rises and the last few repetitions can be ‘maximal’. Such overload can thus serve to build strength and stamina.

Generally speaking, prevention is better than cure when it comes to injury. Technique classes and rehearsals are not always considered adequate conditioning to build a body which is ‘dance fit’. The level of conditioning in any training programme must take into account the individual physical system.

Rest periods, although beneficial and necessary, can be a problem. ‘Mostly the dancers are worried about getting some stamina together. After a very lovely week off, my body feels as if I’ve had two weeks off. Well we just have to . . . do the runs (of the whole show), daily to build it up.’

These most basic physical attributes – alignment, flexibility, strength and stamina – are all under the control of those most fascinating parts of the body, the brain and the nervous system. These are attuned to respond to the ever-changing conditions of our body and surroundings. They are the instruments which fine-tune the high degree of co-ordination and skills which dance demands. It is to this control tower that we now turn our attention.
Co-ordination – fine tuning!

The skills of balance, control of energy and accuracy of action are the subjects of co-ordination in dance training. In order to increase skill levels, the nervous system must be finely tuned. Through repeated practice in class, skills will improve. This may – for example, in balance – involve a decrease in the weight-bearing area. Greater speed will result if the pace of an exercise is gradually increased. You may have noticed that your teacher gradually increases the complexity or length of phrase, or the speed of an exercise. This will help to gradually improve your skills. Co-ordination requires negotiating the direction of forces in the body so that complex dance skills and combinations can be performed safely and expressively.

The function of daily class is to practise technical skills. By movement repetition, dancers build a link between commands and muscle memory. Gradually, as small memory pictures (engrams) are stored in the brain, skills become more automatic. Once these are memorised the dancer can focus more on the nuances of expression for performance. Computer software such as Life Forms can be used to aid memory. Choreographer Merce Cunningham uses it to store class exercises in a computer which dancers can check for clarification of co-ordination and sequences. Research has shown that it can take up to 180 repetitions to establish a new muscle memory, so technique learned in jazz class may not be helpful in a contact improvisation class, because the engrams acquired in one dance style may not be relevant to other styles. The nervous system consists of:

- the nerves/neurons;
- reflexes and receptors;
- the brain.

Together, these engage in a complex communication system which controls all human interaction in the internal and external environments.

There are two parts to the nervous system:

1. The autonomic nervous system regulates involuntary functions of digestion, hormones and cardiovascular activity.
2. The somatic nervous system regulates both movement itself and our perception of movement.

Both systems are controlled by the brain via neurons – there are millions of these individual cells capable of sending messages to and from the brain and the rest of the body. There are two types of neuron:

1. Sensory neurons transmit messages about tension in muscles, tendons and ligaments, and about hot, cold, pain, orientation in space and co-ordination to the brain.
2. Motor neurons pass impulses from the brain to the muscles.

The two types together allow you to put your finger on your nose without having to look at it.
The brain and neurological centres – communications networks
The brain can lose up to 100,000 cells a day and, just like flexibility, reduces after the teenage years.

The centres comprise:
- **the midbrain**: the primitive control centre regulating physical reactions like sweating and cardiovascular activity;
- **the cerebral cortex**: the centre of fine motor control, involving decision making for initiating and arresting motion. When new movement combinations are being learned, the new information may cause a feeling of awkwardness. Gradually, in dance, most movement becomes reflex as motor memory develops;
- **the cerebellum**: this transmits information to the midbrain and cerebral cortex regarding the status of the body. It is crucial in maintaining upright posture and balance. When you miss the last step on the stairs, it is because the cerebellum has been misinformed by the eyes and so sends the wrong messages, and in turn, the wrong amount of muscle contraction required for ascent or descent is then executed.

Receptors and reflexes – incoming and outgoing messages
In order for the centres in the brain to function, receptors must send information from muscles, tendons and joints about tension, co-ordination and spatial orientation. The brain then reacts by sending messages via motor neurons so that appropriate adjustments are made. Earlier in this chapter in the section on flexibility, the spinal reflexes affecting stretching were mentioned. These are muscular reflexes which are designed to protect the joints and muscles. There are three other such reflexes, as shown in Table 1.7.

There are also reflexes relating to the senses of sight, touch and hearing (*proprioception*): receptors in the eyes, skin and ears react to stimuli from the outside and send messages to the cerebellum, and appropriate adjustments are made on command from the brain. These reflexes are known as the righting reflexes (see Table 1.8) because they are primarily concerned with maintaining balance and orientation, and they comprise the aural, skin and visual righting reflexes.

The psychology of dance training – mind over matter
As the explanations above demonstrate, there is a definite connection between mind and body: the mind can affect the way the body feels and reacts. In dance, where the focus is such a personal one as your own body, there is a need to avoid
unhelpful, harmful practice when learning new co-ordinations. The concerns involved here are:

- tension and stress;
- kinesthetic sense;
- the use of imagery/feedback.

**Tension, stress and the dancer – cool under pressure**

One look at a beginner’s dance class will tell you how much of an increase in the overall tension level there is in order to achieve a desired movement. As we
know, the cerebral cortex activity and other muscular reflexes are the reasons for this. It is incredible that students can move at all when trying to use such high levels of tension to perform relatively easy tasks. In addition, localised tension in fingers, face, shoulders, etc interferes. Known as ‘beginner’s paralysis’, this does lessen as the dancer’s general skill level and co-ordination increase. The ability to inhibit undesired movement in one part of the body is necessary in order to focus on a new skill. The paralysis may return with each new difficult skill, but gradually tension is lowered. In this trial and error process, the dancer may try different muscular combinations, and may encounter blockage in motor learning and co-ordination. Eventually, with enough practice, a dancer is not always relying on feedback about the position of, say, a foot or when to bend the leg, and even in the most complicated sequences they control their dancing so that it looks smooth and ‘natural’.

You cannot help facing movement blocks that will stand in your way. No one can remove these blocks except you yourself, and only when you are able to remove them will you eventually discover yourself. This is the only way to improve . . .

(Hanya Holm in The Vision of Modern Dance, 1980)
Movement blocks to co-ordination vary and are due to any of the following:

- specific weakness in the musculature, e.g. an inelastic antagonistic muscle;
- variations in potential according to body type (somatotype): mesomorphs, ectomorphs and endomorphs have preferences for different types of movement. The mesomorph prefers faster turns and jumps, whereas ectomorphs prefer a slower pace. All have different areas of weakness. Mesomorphs need to stretch their heavier muscles, whereas ectomorphs work to improve strength and stamina. Endomorphs work to improve their endurance and may need to control their weight. Similarly, males, with narrower hips and a more direct connection between the femur and the pelvis than females, tend to be able to run faster but have less of an outward hip rotation. Other individual anatomical differences include different lengths of torso and legs: those who have long legs and a short torso easily allow their limbs to reach out around them, whereas the long-torso and short-legged dancer would be more mobile in the torso and have a greater range of tilt, curve and bend;
- stylistic blocks: unfamiliar patterns between techniques – say, between release style and classical ballet technique.

Whenever possible, the emphasis should be on relaxing and allowing natural reflexes to guide the way. Once the conscious use of the cerebral cortex cuts in, the intuitive powers of the dancer have less of an influence, and stress and tension start to mount. Sometimes, taking some rest can even help you to remember movements because the brain keeps on processing new movement memories for up to five hours after class ends.

How you treat your body can influence your thoughts and feelings. Regular exercise makes one feel good, builds body awareness and should generate confidence and an overall sense of health and well-being.

Constant demands for utmost physical control result in high muscular tension, sometimes in specific parts of the body. This can cause muscular imbalance, pain and a subsequent spread of the tension. The specific demands of dance can increase levels of neuromuscular tension for dancers, making this a major cause of injury in dance training. An over-anxious dancer may have high levels of neuromuscular tension, and this may have any of the following effects:

- There is more injury than usual (the accident-prone dancer).
- The dancer starts to imagine injury and then feels actual pain.
- A dancer pretends to be injured in order to avoid a stress situation.
- There is a loss of flexibility.
- There is a loss of smooth, co-ordinated movement.
- There is an increase in the heart rate and blood pressure.

A relaxed dancer will have better co-ordination, circulation and respiration. Tight muscles can constrict blood vessels and so impede blood flow, cutting down the exchange of O₂ and CO₂. Any long-term effect of anxiety which impedes performance – like pretending to be injured – needs firm handling.
Pre-performance nerves, butterflies, breathlessness, nausea, dry mouth and a need to sit on the lavatory are all normal nervous responses associated with an increased release of adrenalin into the blood. Once the dancer is on stage, however, the fear vanishes and the show goes on.

Sometimes, after a long intense period of training or rehearsal or a tour, dancers become stale. All the hours of repetition and practice are suddenly gone, and fatigue and depression follow. A dancer may be injury-prone at this time.

Injury itself may cause further anxiety. Injured dancers, instead of treating symptoms early on, may continue to work until eventually they have to stop completely.

**Dancers are afraid of being seen as lazy or unworthy . . . Injuries should be seen as a positive opportunity to resolve the problem, not as purely negative.**

*(A dancer in Fit to Dance?, 1996)*

Symptoms such as a loss of appetite, weight loss, depression, tiredness and digestion problems are common. A change of routine or environment or a few words of support may be simple but effective anecdotes to aid the recharging of the emotional batteries. Eighty per cent of learning difficulties are said to relate to stress.

Often, a dancer will be unaware of neuromuscular tension until they actually feel pain: it will have been gradually building up, allowing the nervous system to tolerate its presence. Until the tension is released, the dancer will not even be aware of its presence – it has been successfully hidden for so long because it would otherwise have interfered with progress in training.

There are certain areas of high tension which are most difficult to release:

- An habitual posture is a learned habit often adopted in order to over-achieve in a specific skill (leg higher/more turn-out, etc.).
- The tension has become part of the expected feedback during dancing, and changing it can cause real feelings of disorientation and disturbance.
- Emotional or physical pain from the past is often cloaked in neuromuscular tension, so reducing it can cause fear, often related to a loss of control. This may manifest itself as nausea, weeping or exhaustion, and needs careful handling. The need for relaxation techniques such as yoga, 'release' and the Feldenkrais® and Alexander techniques is now widely recognised.

Let us take an example of neuromuscular tension in the shoulder joint. Raising the arms and keeping the shoulders down is a learned co-ordination. Naturally, the scapulae (shoulder blades) will rise. In training, this involves constant contraction of the antagonistic muscles, so the tension level may build. It is the *latissimus dorsi* muscle which holds down the scapula. Careful stretching and relaxation will lessen the tension.
The shoulder joint (see Figure 1.26) is an area of great mobility, and special conditioning is needed before such skills as lifting are taught. There is perhaps more concern here for male dancers, although post-modern work makes this a potential danger area for females too.

**Figure 1.26** (a) Shoulder girdle (b) shoulder joint

**Figure 1.27** To show lifting: Nina Sorokina and Mikhail Lavrosky of the Bolshoi Ballet
A general strengthening of the following muscle groups should proceed by progressive overload to a point where more weight is being lifted than will be lifted in performance:

- the flexors/abductors of the shoulder: deltoid, trapezius, serratus anterior, rhomboid major and minor, *latissimus dorsi*, pectoralis major;
- the torso generally;
- the upward rotators of the scapula: subscapularis, teres minor, infraspinatus;
- the extensors of the knee and hip.

Six basic principles for safe lifting in dance are as follows:

1. Maintain proper alignment.
2. Apply force close to the centre of gravity of the person to be lifted.
3. Apply force as close to the vertical as possible.
4. The lifter should lower their own centre of gravity with a *plié* in order to harness the powerful force from the knee and hip.
5. The lifted dancer should be kept as directly above the lifter’s centre as possible.
6. Use the muscles of the leg, but the torso/back must also be strong and stable during the lift.

When lifting a partner above head height, abduction and flexion of the shoulders is important. There should be no backwards tilt in the lumbar spine. If the elbows or wrists are swayback (hypermobile), there may be an increased vulnerability to injury. In order to avoid injury, greater strength is needed. Restriction of the dorsi flexion of the wrists may also cause lifting problems.

**Problems/injuries of the shoulder joint**

The constant contraction increases tension deep in the muscle and as a result the scapula will be pulled forward and eventually the muscles will go into spasm. This is known as pectoralis minor syndrome, and it may be painful to rotate the neck. There may also be numbness in the fingers and arm (on the ulna side). When the muscle is very tight, the nerve is pressed, in a way similar to sciatica in the hip. The source of the problem is mainly in the front in the pectoralis minor. Deep-pressure massage can relieve the pain, though it would seem that it takes considerable time for the posterior muscles – i.e. the trapezius and the deltoid – to get the message that they can finally relax. Pectoralis minor syndrome is common in dancers because of the demands to keep the shoulders down. However, non-dancers such as typists, swimmers, flautists and string players are also susceptible.

Clearly, there are some complex co-ordinations and timings to be learned in order to acquire correct lifting techniques. Any co-ordinations in dance have traditionally been taught through verbal instruction, ‘monkey-see-monkey-do’, and touching the dancer. This approach has been tried and tested over centuries of dancing. Relatively recently, however, a new school of thought has introduced...
alternative approaches which put more emphasis on the inner self. This holistic approach involves seeing life as a whole, with mind and body together, and is an altogether more internal approach, starting from the inside out.

**The kinesthetic sense, sensory feedback and imagery – pictures in your mind**

The mind can work in a negative way in training, as we have read. It is only common sense, therefore, to assume that it can also be put to positive use – namely, by allowing our minds to use pictures and images that affect every cell in our bodies through sensory feedback. You may have already tried this in some of the tasks in this chapter. In the traditional list of the five senses – touch, taste, sight, hearing and smell – the forgotten sixth one is the kinesthetic sense. This involves the perception of motion and of position, and it depends on the proprioceptors that are in the skin, muscles, joints, tendons and sensory organs involved in the righting reflexes. These send information to the central nervous system regarding muscle contraction, relaxation, joint position and speed of motion. Accurate kinesthetic perception requires the integration of this information with the perception of spatial co-ordinates, and it operates in the skills of balance, accuracy and the control of energy. Without proprioceptors you would have to look at your body every time you wanted a part of it to move!

The proprioceptors on the skin can be useful for teachers when they use touch to correct and guide their students. Touch can help dancers to locate a muscle that should be working in a certain way and at a given time, and this can help to improve alignment, balance or give support to a part of the body. Dancers can also find massage useful for tired and stressed bodies, and use touch on their own muscles to improve specific movements. For example, try Task Sixteen.

**TASK SIXTEEN – Inside Out**

**KEY SKILLS** Improving own learning and performance

10 to 20 minutes

Ensure that you are warmed up thoroughly first. Stand at the barre in a comfortable first position and brush the leg out to the side, keeping it long, off the ground, three times. You are abducting the leg (grand battement). Try not to think about how high the leg is going but work to feel stable in your torso and hips. Repeat on the other side. Start again, but this time place your hand at the top of the leg, just under the gluteals, and as you brush slide the hand down the leg and in time with the leg lengthening; let the hand direct the energy out along the leg, to wake up and lengthen the hamstrings. Work until you have the timing of leg with hand. Repeat on the other side. The leg should feel freer and longer with the hand.
Safe Dance Practice

Start again and with the hand add the breath – exhale and fill the leg with air as you brush. Again the movement should be feeling easier and more controlled if your co-ordination is well timed.

Finally, ask someone you trust to give your shoulders a soft massage. Now return and with the hand, breathe and feeling the shoulder blades (scapulae) softly dropping down your back like a waterfall, repeat the brushes. Write down any differences you felt throughout this exercise.

When a dancer is under pressure in class to perform there is the risk that they may pick up bad habits in the way that they do certain movements. These habits then have to be ‘unlearned’ and the muscles reconditioned so that a new, more appropriate muscle balance replaces the previous one. This can take time and the use of imagery can be most helpful here in establishing correct, safe engrams. Often when beginners who have had a great deal of ballet experience start to use parallel position, they comment that it feels ‘wrong’. This is typical of the difficulties dancers encounter when learning new ways to balance the muscles. Parallel position is not easier than turn-out and the use of the leg muscle, tensor fasciae latae, may come as a surprise to dancers who are unaware of it. This muscle helps to secure the head of the femur bone in the hip socket. You can try this visualisation to help connect legs in parallel: close your eyes and visualise pulses of light running up and down the back and sides of the leg, connecting your heels to under the gluteals and the talus (ankle) to the head of the femur. This is an anatomical image that, if used regularly, may help to put in place an appropriate engram so that the parallel position becomes automatic and no longer feels ‘funny’.

When the kinesthetic sense is operational, it can act as a link between mind and body in order to improve co-ordination. Functional Magnetic Resonance Imaging measures the blood flow in the brain and has shown that the pre-motor cortex in the brain can be activated by watching dance, just as if the muscles were dancing. The receptors and brain centres can link up and use imagery to cause changes in, and to deepen the dancer’s understanding of, movement. The post-modern dancer Remy Charlip called such release work ‘bone meditations’.

Take an image, let it hang in the mind, let the sensation of the thought dissolve through the body. Let the movement inside of the body . . . move the outside.

(Miranda Tufnell in Body Space Image, 1990)

- Kinesthetic imagery involves using feelings that accompany body movement, so that when a movement is performed correctly, it has a certain feel. For
example, when doing foot ‘pushes’, as in Task Six, use the image that the floor is covered with sharp pins to improve the use of the intrinsic muscles of the foot and the articulation of the arches and metatarsals. This exercise increases strength and mobility in the feet.

- Visual imagery involves a mind picture, maybe of a rainbow, which the fingertips may draw in the space above your head as you do large side-to-side triplets. It must relate to a desired shaping or placement of body parts, and be an image which you can hold in your mind’s eye. Visual imagery can also be helpful for relaxation exercises. Set a scene in your mind which will be clear to you – say, a deserted, beautiful beach where a warm, soft breeze blows and the waves lap gently at the shore.

- Anatomical imagery can help with alignment, and as with all images, returning to the same picture or feelings each time a certain movement is executed should trigger the same muscle response, thereby improving accuracy and safe practice. Anatomical imagery is based on a sound understanding of body structure – of the size and shape of bones, joints and muscles, as in Task Eighteen.

**TASK SEVENTEEN – Chill Out**

**KEY SKILLS**
- Improving own learning and performance
- Working with others
- Communication

10 to 20 minutes

In pairs, play some soft music in a warm, quiet space. One person reads out the task slowly and quietly for the other, who is lying in the constructive rest position:

‘In a relaxed state, surround the head with a cushion of air, and let the jaw hang softly. Allow the brain to rest lightly in the bones of the skull. The brain is a control tower of information, sending and receiving, quietly humming, pouring, sifting. The brain sends messages that flow out into the spinal chord, down the spine and out to all over the body, networking to the six senses. Relax and listen to the world around you. Let the sounds and sights be felt and reflected through your body.

[Allow time here for the dancer to absorb these thoughts.]

‘Open the body through the senses. Allow the body to move out amongst these sensations. Send these feelings back to the fluid-filled corridors of the mind where over 10 billion cells await the arrival of the information. Repeat this feeling of to-ing and fro-ing from brain, to body and outside a few more times.’
Safe Dance Practice

**TASK EIGHTEEN – Kinesthetic, Visual and Anatomical Imagery**

**KEY SKILLS** Improving own learning and performance

10 to 20 minutes

Read and visualise this. Standing, let the shoulder girdle rest on a rounded ribcage. See the shoulder girdle like a ring circling, opening. See the scapulae like a pair of rafts floating on the ocean of the back. The arms hang from the scapulae. Imagine the scapulae as a pair of ears opening . . . listening out to the tips of the shoulders . . . down in the lift to the basement of the spine.

(Based on an image in Body Space Image, 1990)

Now try visualising the following. Stand in second turned-out, close your eyes, arms by your sides. You are going to slowly raise your arms to second, breathing out without opening your eyes. As you do this, first use the anatomical image of the muscles of your latissimus dorsi on your back (check with Figure 1.5 if unsure). You can see these muscles broadening across your back and energy flowing from the tip at the bottom of your back out towards your arms. Lower the arms.

Repeat and add in the image of your scapulae bones sliding down your back. Keep using soft breath to support your movement.

Finally, repeat a third time and see the latissimus dorsi like a powerful pair of angel wings sending light through your hands out in front of you. You may need to repeat these images a few times to benefit and build solid engrams that are safe and reliable.

This visualisation should help you to raise your arms without putting tension in the wrong parts of your shoulder girdle. One image may work better for you than another, so choose which one you prefer or make up your own.

- **Body image**: these days, the stereotyped image of the dancer’s sylph-like body is gradually being eroded away. Yet anorexia nervosa and related illnesses are still common. Dancers who have a negative body image, or who block out parts of their body that displease them, may be on the road to injury, failure and illness. A complete, clear and accurate body image is required for dance work. Too often we are bombarded with media-approved images of men and women. While we know anyone can dance well, and while our teacher may encourage all the politically correct attitudes, there are still the magazines, television programmes, etc. contradicting what we want to believe.

- **Mental rehearsal**: this is an imagery technique that uses the body image to improve motor skills. You review the performance of an action in the mind. The aim is to see yourself executing the desired move effortlessly and
accurately, e.g. a pirouette. Many believe that this technique releases impulses over the neuron pathways and taps into natural movement. New co-ordinations result as appropriate muscles are triggered. Research has found that this technique produces action potential in the muscles.

- Movement memory: this is separate from the kinesthetic sense. It is stored in the cerebral cortex and assisted by the kinesthetic sense. Motor memory is developed by repeating movements in class or in rehearsal. As with any repetitive activity, the ability to pick up a movement quickly improves, as a larger and larger storehouse of movement pictures (engrams) to draw from is developed. Memorising of several different aspects of dance can help co-ordination build from simple to complex moves and should include order, action, timing, orientation in space, and dynamics, as well as techniques specific to a single dance genre or style.

The mind is a muscle.
*(From the dance of the same name by Yvonne Rainer, 1966)*

Dance skills become second nature as they are repeated and memorised. So, just like the training of a muscle, the more you use the memory, the fitter it becomes. Indeed, the physical senses of experienced dancers are so well tuned to their minds that they can later reproduce a movement learned by observation only. This is one reason why repetition of movement in class is so important.

**Physical skills in dance training – bare necessities**

The concept of co-ordination in dance training is a complex one. It takes into consideration the many aspects of the nervous system in the psychology of dancers, as well as psychological strategies which can improve the quality of training. What are the actual skills which a dancer may improve by adopting such strategies? A general heading of ‘co-ordination’ covers a number of individual skills. These are listed below, and along with each is a task which adopts the use of psychological strategies as mentioned earlier. The skills are:

- control of energy;
- balance;
- accuracy.

**Control of energy – may the forces be with you**

The image of energy flowing from the centre of the body outwards is a vital one for dancers. In classical ballet, the lifted centre is the accepted norm. Learning to lift the weight up from the centre of the body, away from the pull of gravity, gives a look and feel of lightness, and also enables you to move, stop and change direction easily. (Do not hold the breath here.) Movements such
as plié. Falls, turns and jumps are all performed more safely and effectively with a lifted centre. In a fall, the centre keeps lifting as the body drops. This prevents too hard a landing and enables recovery for the next move (similarly for a jump).

Dancers are often required to show changes of character, mood or emotion and will need to be able to have control over a wide range of dynamics. You can read more about the dynamic range later in Chapter Three.

A swing requires the dancer to drop with gravity on the downward phase. Too much tension/resistance will prevent the arc of the swing from giving in to gravity. Swings are useful for warming up too, because they promote blood flow to the muscles in a low- to medium-impact movement range. Now try Task Nineteen.

**TASK NINETEEN – There is Nothing like a Swing!**

**KEY SKILLS** Improving own learning and performance

10 to 20 minutes

Standing, swing one arm back and forth. Notice how energy is required to lift your arm, but that gravity takes over on the downward phase. Try swinging other parts of the body – the leg, hips, upper body from the waist. Too much resistance, as you will see, will block the natural swing.

Figure 1.28 To show balance. Bedlam Dance Company ‘In the Third Person’, 1997. Dancer: Rachel Krische. Photography: Chris Nash.
Balance – delicate and solid
This has to do with:

- alignment and stability;
- directing energies through the body.

Balance is developed as a dance skill through training. Stability is decreased by lessening the base on the floor – thus, balancing on, say, one foot makes it more difficult to keep the centre of gravity over the base. Energies are directed out from the centre through the extremities of all the limbs, and whenever one body part reaches away from the centre, an opposing part has to be stretched in the opposite direction in order to maintain balance. For example, on a rise (*relevé*), balancing is easier if you think about pressing down smoothly into the floor whilst sending energy up through the centre.

Make a drawing copying the figure in the photograph of Rachel Krische (Figure 1.28). Fill in arrows which show the direction that energy is being directed to maintain balance.

As mentioned earlier, the crossed extensor reflex is a natural muscle co-ordination. It is crucial to maintenance of balance in many movements. Look back to the dancer on the left in the photograph (Photo 1.2) for Task Ten and you can see it in action. Her left arm and shoulder are in diagonal opposition to her right hip and leg. Often beginners in dance class can become so confused and tense that they lose touch with this natural reflex, so you can see walking actions take on a rather awkward robot-like look. As the cerebellum overloads with too many new co-ordinations, movement becomes over-conscious and contrived, cutting out the usual natural reflexes. Similarly, dance styles may deliberately cut out such reflexes for expressive effect. This occurred when Nijinsky used parallel actions to give the two-dimensional look in his 'Rite of Spring' (1913) and required the dancers to 'unlearn' their trained oppositional skills.

Dancers mainly use the eyes to maintain balance, e.g. when spotting turns, but blinding stage lights may lessen their effectiveness. This is when the other righting reflexes come in handy. The aural organs and the skin exteroceptors are both essential to good balance. In class, try doing some movements with eyes closed in order to sharpen your awareness of the other righting reflexes. The balance mechanisms of the inner ear are delicate and that is why if you have flu and your ears are affected you should not dance because your sense of balance will be impaired.

Being centred is crucial to achieving good balance. Centring is both a physical and a psychological concept: it refers to the physical centre of gravity and, psychologically, to the satisfying feeling of being whole and grounded.

In ballet and tap, the placement of the centre is fairly stable in order to enable fast footwork, multiple pirouettes and so on, but in the modern genre the centre shifts more frenetically as the body tilts, curves, falls, bends and extends.
continuously. In technique for contact improvisation, when partnering consists of building trust during counterbalancing, catches, support and lifts, the physics of aligning the lifter’s centre under that of the dancer who is being lifted in preparation for the lift makes lifting safer and easier. If this positioning is executed with accurate timing, the body does the work for the dancer, with less need to use ‘brute strength’. Some ideas on how to make a start on this are given in Chapter Six.

Accuracy – nail it!
The dancer must be able to move not only well but also accurately. This comes about with the ability to reproduce movement that has been seen in a demonstration. Beginners need to see movement in terms of placement, shape and direction. As dancers become more experienced in co-ordination, they are able to see more of a whole picture and yet at the same time be sensitive to detailed positioning. A good example of this is the skill of spotting turns. As mentioned earlier, when you turn, the fluid in the inner ear starts to circulate and, after several turns, builds up momentum. When you stop turning the fluid continues and fools your brain into thinking that you’re still moving – you feel dizzy! Flicking the head around in the skill of spotting keeps the fluid relatively still and so the dizziness may be only momentary, allowing the dancer to maintain balance during the turn and continue dancing accurately after it too.

Dancers also need to develop sensitivity to changes in dynamics and spatial orientation, so that these may also be performed accurately each time. For dance, the fullest movement potential of each individual dancer should be developed, and whatever the genre, this entails controlling movements more efficiently, harmoniously and expressively. This makes performance more pleasing to watch for the audience, safer for the dancer and presumably allows the choreographer more probability of expressing the intentions of the dance.

The use of breath with the movement can help accuracy. It also adds vitality and reduces tension in the body. It further assists with the control of active muscles and with the relaxation of those not required. The overall effect is to give movement an effortless look and a greater expressive quality – in phrasing, rhythm, balance, jumping and stretching. Restricted breathing will limit both the movement of the thorax and stamina.

Task Twenty offers a few things to try which show how breathing can either enhance or restrict movement.

Well-timed breathing also reduces stress and tension, which are major causes of injury in dancers. Relaxation techniques can play a crucial part in safe practice, and it is ultimately each dancer’s responsibility to ensure adequate rest and relaxation for themselves. This may be a regular daily routine attached to a class or rehearsal schedule, or participation in yoga or meditation or some other relaxation-based technique. A lack of it can produce staleness and proneness to injury (real or imagined).
Co-ordination – summary

In training, the dancer is clearly engaged in a complicated day-to-day workload, not least of which is to improve the many complex co-ordinations of the
nervous system as demanded by any dance style or genre. Be it ballet, modern, post-modern, jazz, tap, street, ballroom, African or South Asian, all ask a great deal in terms of co-ordination. Control of energy, balance and accuracy are all essential when performing any dance actions.

General body maintenance – domestics

To be fit for dance, all the aspects mentioned in this chapter are essential. What is required is a balance of exercise, training in skills, rest and relaxation, and finally an adequate diet.

Diet – nutritious habits

So what are you then? A can of diet coke? That means you’re sweet but go flat too quickly. A chocolate bar? Fatty and satisfying but prone to constant cravings. A fresh mackerel? A cool alert customer. Recent research has proven that eating oily fish regularly provides the right chemicals to improve transmission between brain cells. So the old wives’ tale that fish is brain food is true! Therefore, if you wish to improve your co-ordination in dance training, cut out the junk food and settle for the fish.

Dancers are notorious for food abuse, and possibly even more so for pretending that it is not happening. Mention the word ‘diet’ to a dancer and the response will be cloaked in terms of eating less. ‘Diet’ should be a term which implies eating a sensible range of foods adequately. Enough calories, vitamins and minerals, etc. must be consumed to keep you healthy now and in later years.

Basic considerations are:
- what to eat
- when to eat
- how to eat
- eating disorders

**TASK TWENTY-TWO – Quiz: Check It Out!**

1. Name two important foundational physical skills for dance.
2. What is an engram?
3. Why is the cerebellum important for dancers?
4. Give an example of a picture that you may use for visual imagery, and describe the dance movement that the image relates to.
5. Name two righting reflexes.
6. What are two aspects of being centred for a dancer?

Answers on page 334.
### Table 1.9 Essential components for a healthy diet

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Sources</th>
<th>Needed for</th>
<th>Amount per day</th>
<th>Lack of: the effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proteins</td>
<td>Lean meat, fish, dairy, bread, cereals, beans</td>
<td>Muscle and tissue development and repair. Normal metabolism</td>
<td>40g per day = 400g bread or 200g meat</td>
<td>Loss of muscle. Illness – e.g. flu – causes loss of protein</td>
</tr>
<tr>
<td>Carbohydrates (sugars, starch, cellulose)</td>
<td>Sugar, potatoes, wheat, rice, cereals</td>
<td>Energy</td>
<td>50–60% of food intake</td>
<td>Fatigue – weakness, headaches, irritability, poor co-ordination, nervousness</td>
</tr>
<tr>
<td>Fats</td>
<td>Dairy, meat, eggs, oily fish, cooking</td>
<td>Improving the taste and feeling full. High energy source = high calories! Carry vitamins A, D, E &amp; K</td>
<td></td>
<td>Too much is more the issue: heart disease, high level of cholesterol in blood</td>
</tr>
<tr>
<td>Vitamins</td>
<td>Most foods, particularly vegetables</td>
<td>Proper body functioning</td>
<td>Small daily amounts; e.g. 30g vitamin C, 1g vitamin B12</td>
<td>Vitamin D: rickets, bones soften. Vitamin C: scurvy. Too much: vitamin A: harms eyes; Vitamin D: upsets metabolism</td>
</tr>
<tr>
<td>Minerals</td>
<td>Most foods</td>
<td>Producing enzymes and hormones which control a number of functions in: blood, bones, teeth</td>
<td>Some, like calcium (in dairy products), are needed in large amounts. Others, like</td>
<td>Lack of iron (18g): anaemia. Lack of iodine: low metabolic rate, energy loss, weight</td>
</tr>
</tbody>
</table>
We need to re-educate dancers and get them to establish good nutritional habits. They should be eating carbohydrate and eating every three hours. We want the dancers to be slim, but with healthy, strong muscle tone so that they can resist injury.

*(Tony Geeves in New Scientist, 25 December/1 January 1994)*

Appearances can be deceptive. You may look thin, but snack-based, high-fat diets produce underdeveloped muscles which leave space for a substantial layer of fat on a seemingly slim body.

**What to eat**

An ordinary person with a quiet lifestyle needs 1,500 calories daily just to maintain normal body functioning and minimum activity. It is only reasonable, therefore, to assume that dancers need more in the region of 2,000 calories daily. About two-thirds of calorie intake is needed just to maintain the normal functioning of muscles, organs and body temperature. The rest of the day’s activities – eating, walking, dressing, working – need about 800 calories. The equation is easy – whatever calories we use up day to day come from food. If you consume more calories than you use, you put on weight. If you consume fewer calories than you need, you lose weight.

The following are essential components of a healthy diet:

- proteins – for building up the body;
- carbohydrates – to provide energy;

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Sources</th>
<th>Needed for</th>
<th>Amount per day</th>
<th>Lack of: the effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>Water! Tea and coffee are diuretics and increase fluid loss. So does alcohol</td>
<td>Physiological processes, e.g. flush waste from kidneys, maintain blood volume, sweating</td>
<td>Drink plenty daily</td>
<td>Dehydration, muscle fatigue, cramp, injury, exhaustion</td>
</tr>
<tr>
<td>zinc, sodium, potassium, in smaller amounts</td>
<td></td>
<td></td>
<td>gain. Lack of calcium (1200mg daily): long-term brittle bones</td>
<td></td>
</tr>
</tbody>
</table>
■ fats – for energy and flavour;
■ vitamins – small but essential;
■ minerals – for bones and blood;
■ water – for basic physiological functions.

The reduction of specific fatty areas, like under the upper arm, can be brought about by certain strengthening exercises for targeted spots. For example, lots of abdominal curls will remove fat from the abdomen, and similarly with strengthening exercises for the hips, thighs and upper arms.

Starvation diets are dangerous and unlikely to succeed. They cause dehydration and long-term damage to basic body tissues and functioning if followed regularly. Similarly, the spot reduction of weight in specific sites such as the thighs is not helped by wearing plastic trousers. These do not reduce fat and in fact promote a loss of fluid that cause dehydration and heat stroke; they are useful only for keeping warm. The best way to lose weight is a calorie-controlled diet in combination with aerobic exercise. Burning off fat from all over the body by breaking it down for use as energy is the result of aerobic exercise.

Losing weight is a long-term process: it takes months. It should be a carefully monitored affair. Height and weight tables are not the best way to gauge whether you are over- or underweight. The use of skin-fold callipers to measure fat on, say, the triceps is recommended and the fat here should not exceed 8–10 mm in women and 6–8 mm in men.

Remember, the calories required for energy will vary with the individual metabolic rate. Muscle tissue burns off calories more quickly than other forms of tissue because it has a higher metabolic rate. It is also heavier than fat tissue. There is a possibility of confusion here. Through exercise, muscle tissue builds up and therefore weight increases. Weight loss is thus not an indication of fitness. Although muscle weighs more, it also burns off more calories, so weight loss is easier! With regular exercise, dancers who burn calories slowly can become high-calorie burners (there is a general increase in the metabolic rate as muscle increases) and fat stores are reduced more rapidly. More muscle and less fat results in an improvement in body shape and general fitness, but not necessarily weight control.

There is nothing nutritionally wrong with being vegetarian; in fact, nutritionists favour such diets. However, the recommendation is to eat foods from all food groups. Eating more carbohydrates or protein than fats will ensure fewer calories and more energy.

When to eat
An important consideration here is that when the body is digesting food, the blood flow moves away from muscles to the digestive system. Obviously, this would not, therefore, be a good time to be exercising. Eating too soon before class or a performance will cause increased blood flow to the digestive system and so deprive the muscles of an essential supply. Pre-performance eating needs
careful scheduling. A small meal at least two hours before the show gives enough time for digestion. Foods like pasta or a sandwich, containing complex carbohydrates, are best because they will allow a steady release of energy throughout the performance. Concentrated sweet fluids are to be avoided because their absorption is too slow to enhance energy levels. These fluids may produce a peak of glucose in the blood (the body will release a burst of insulin to deal with this) and then a fall and a trough (see Figure 1.29) below the normal level, which will make the dancer feel fatigued. Obviously, a tired dancer is one prone to injury. The daily rush and demands on a dancer can create a tendency to skip meals. Several small meals daily – ‘grazing’ – is an effective eating regime to accommodate such schedules.

**Figure 1.29** Changes in blood sugar level after drinking sweet liquids

**TASK TWENTY-THREE – Food Glorious Food!**

**KEY SKILLS** Communication

Several hours

Make a large (A3-size) poster which gives advice to dancers on what to eat. Use drawings, magazine cuttings, food labels, etc. Make it bright and informative. Research the calorific values of food to include on the poster.

**TASK TWENTY-FOUR – Dear Diary**

**KEY SKILLS** Improving own learning and performance

Keep a food diary over two weeks of all the foods that you eat, and their weights. From this you can work out the total calories taken in and divide this figure by 14 to obtain your daily intake. Compare your food diary with an activity diary for the same period. You can then work out the daily expenditure of calories per 24 hours. Then you will know the average number of calories you will need daily to maintain your present weight. If weight loss is desirable, decrease your daily intake by 500 calories – which comes to a weight loss, per
How to eat
A balanced daily intake of all food groups is the best way to eat. Also ensure that when your dance schedule is at its busiest you eat and drink enough water to maintain safe energy levels. Weight loss and weight gain are often concerns for dancers, and this reflects the preoccupation with abnormal thinness that permeates today’s society. Gymnasts, models, some athletes and more and more men are targets of this ‘look’. The eating disorders which arise from these unreasonable demands will be discussed below.

The definition of a ‘good’ dance student may be considered dangerous and harmful to methods and aims of dance training. The stereotype of the slender sylph, with a wraith-like figure, is still dominant in people's minds when they think of dance. Even the words ‘sylph’ and ‘wraith’ are actually names for sprites and ghosts and it is easy to overlook the romantic roots of this image. After all, dancers are only human and the last time I looked there were no elves or goblins – not real ones anyway. So why do dancers still allow themselves to be stereotyped in this inhuman way? Why is there this illusion, or delusional way of seeing dancers as romantic princes and princesses?

What do princes (or princesses) look like? Whose choice is it? Who is it ‘up to’, if not each individual dancer? Should a dancer consciously choose to become anorexic? These romantic images are loaded with serious, and on occasion life-threatening, implications.

Eating disorders
Research has found that ballet dancers had a notoriously high incidence of anorexia and bulimia. Anorexia nervosa is self-starvation and bulimia is a related disorder involving binges of eating and then vomiting, the abuse of laxatives or diuretics, or fasting. Both of these disorders will disrupt menstruation and give a long-term risk of osteoporosis (thinning of the bones). The first conference about osteoporosis was held in 1993. Many findings were brought to light. Here are some of them:

- Poor nutrition may be a contributory cause to hormonal imbalance, and when hormonal imbalance is combined with intensive exercise, the menstrual cycle may be upset. Any dancer weighing less than 47kg (7st 6lb) is at risk.
- In adolescence, 50% of the bone mass is acquired. Loss of bone density correlates with missed periods. Adequate nutrition is essential if stress fractures are to be avoided. As always, prevention is better than cure. Taking extra calcium and avoiding smoking, drinking and drugs are advised.
Oestrogen therapy for younger dancers can help alleviate loss of period and fragile bones later in life. Some dance experts look ahead and even foresee a time when dancers may sue their companies and teachers for exposing them to food abuse under health and safety legislation.

In extreme cases, these eating disorders can be fatal. If you think that you have such problems, or that a friend does, then it is important for you or your friend to talk about it and seek help. Some symptoms are obsessive preoccupation with weight, guilt about eating, unrealistically high expectations of oneself.

**Diet – summary**

The food you eat should be organised to give you:

- maximum energy;
- minimum body fat;
- enough variety to ensure efficient body functions and so avoid injury.

**A dancer’s domestic duties**

To finish Chapter One, here are a few thoughts on the responsibilities of being a dancer and making a positive commitment to working with others in class and rehearsal.
Essential Guide to Dance

Dance Studio Culture

YOU ARE A DANCER. DANCERS ARE:

INFORMED
INVOLVED
INSPIRED

Dancers:
■ participate and concentrate fully at all times
■ help each other
■ are punctual and attend regularly
■ listen to and work on direction positively
■ respect other's differences
■ trust each other
■ wear safe and suitable clothing
■ look neat and tidy with hair tied back, jewellery removed and do not chew or eat in class
■ ask for help when they need it.

AND MOST OF ALL THEY
■ have good manners – please and thank you are always appreciated.

There are a few other responsibilities that you have as dancers. You should always let your teacher know about any injuries that you have. Try to make sure that you come to class rested and ready to commit to the session. If you're having a difficult time in your life, do not take bad energy into the studio because it will affect others, unfairly. Anyway, think about leaving your troubles on the other side of the studio door and enjoy being away from them in a world of dance. Always have your notes, assignments and homework ready on time. If you have difficulties with time management, get help and advice from the learning centre. Practise in your own time in between classes and always work with maximum effort – it's more fun that way too!

Here is my 3 Cs Formula for dancers

Concentration + Commitment + Care = SUCCESS

The dance studio space itself raises some important considerations for you as a dancer, although some of these things may be outside of your control. It is important to remember that ideally a studio floor should be sprung, because this helps dancers to avoid injuries like shin splints from jumping and high-impact activities. Dancers should respect the floor and remove all footwear that has been worn outdoors. Not only is it unhygienic to wear shoes that have been outside into a space that will be used by bare feet and for rolling on (you never know what you've trodden in out there ...), it is unsafe because of the risk of glass and other sharp objects being walked on the floor. Also the floor will suffer if grit and dirt are walked into the surface and revarnishing or relaying of Marley floors is an expensive affair. Finally, remember: don’t wear your dance shoes outdoors ... if you see where this is headed.
The studio should allow adequate space for travelling, be high enough for jumping or lifting others and generally let you feel free enough to fully express yourself. Air should circulate freely and be fresh so that there is plenty of oxygen to keep you aerated when working to the max. Noisy fans can be problematic because of the interference with music, the teacher’s instructions and concentration. The Equity Union recommends a minimum safe working temperature of 18°C (around 65F), but many prefer between 21°C and 24°C as a minimum to allow for the stop and start nature of dancing in class or rehearsal.

You should be aware of risks in the space, such as obstacles that may cause dancers to tumble, and that is why leaving clothes and bags around can be dangerous. Also lighting levels should be good enough so that the whole studio is well lit.

Mirrors are a contentious issue for dancers . . . love ’em or hate ’em. Dancers who rely on mirrors need to broaden their learning habits – use more inner imagery, as described in this chapter. After all, there are no mirrors in performance. However, mirrors can be useful to check alignment and line. Ideally, the mirrors should be curtained so that they can be used as appropriate.

Overall summary

This chapter should have given you enough information in text, pictures and practical assignments to increase your understanding of what your body needs and how it functions, so that you can dance and stay healthy and safe. You have the main responsibility for the body’s maintenance, so learning about and putting into effect preventative practice is your responsibility, just as much as your teachers’. Be good to your body and it should last you a lifetime of dancing and living.

Task Twenty-six gives you a good starting point to make some targets for yourself. These can be about your dancing, body conditioning, nutrition or anything that you think you need to work on and improve. Try to keep your targets achievable over a specific timeline and keep a regular diary of your progress. A thoughtful and informed dancer is one who can do anything well, and most of all safely.

**TASK TWENTY-SIX – Its All About Me!**

**KEY SKILLS** Improving own learning and performance

You could do this task at the start of every term as part of an ongoing self-improvement programme.

- Target three areas that you need to improve on from the list below. You may need to consult your teacher to identify them.
- Describe your strategy for improvements and the progress in anatomical detail. Again you may need to consult your teacher or a
friend to help you monitor changes. You should evaluate how effective your programme is.

<table>
<thead>
<tr>
<th>Area targeted for improvement</th>
<th>Describe strategy</th>
<th>Needs improvement</th>
<th>Working towards</th>
<th>Achieved</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.g. Flexibility of hamstrings</td>
<td>– A regular routine of reciprocal stretching. Monitor improvements regularly.</td>
<td>✓ 2nd Sept. Unable to touch toes. Hands at calf level.</td>
<td>✓ 2nd Nov. kept to routine once every two days. Hands now a little lower – lumbar spine feeling more relaxed.</td>
<td>✓ 2nd Nov. kept to routine once every two days. Hands now a little lower – lumbar spine feeling more relaxed.</td>
</tr>
</tbody>
</table>

Copy this table into your own portfolio. Select and enter three target areas.

Strength of ............
Stamina ............
Alignment of ............
Co-ordination ............
Control ............
Balance ............
Accuracy ............
Motor memory ............
Attention to:
■ warming-up ............
■ cooling-down ............
Diet ............
Smoking ............
Understanding and safe use of
Technical terms
e.g. turn-out ............
Safe practices;
clothing/floors ............
treatment of injury ............

 ✓ 2nd Dec.
Didn’t keep up routine regularly so not much more progress.
✓ 2nd Jan.
Christmas – Blew it!
New Year’s Resolution – to keep to routine.

✓ 29th Feb.
I am writing this whilst stretching. Mission accomplished!
References and resources

**Books and articles**


Brinson, Dr P. and Dick, F., *Fit to Dance?*, London: Calouste Gulbenkian Foundation, 1996


Dick, F., ‘Fit but fragile’, *Dance Theatre Journal*, vol. 11, no. 2, 1994 (article about osteoporosis)


Koutedakis, Y. and Sharp, N.C.C., *The Fit and Healthy Dancer*, Chichester: Wiley & Sons Ltd, 1999

Laws, H., *Fit to Dance*, London: Dance UK, 2005


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**Video and DVD**

dancebooks.co.uk – on this site there are many jazz, tap and ballroom film resources

*The Erick Hawkins Modern Dance Technique*, 2000, DVD

*Tools for Modern Dance*, Y. van der Slik, 2007, DVD

■ For anatomy/injury treatment, causes and prevention

www.eskeletons.org – interactive learning with human anatomy, great fun!


www.foot.com – for foot health

www.footphysicians.com – for foot and ankle information

For ‘alternative’ techniques to improve safe and effective movement:
www.alexandertechnique.com
www.feldenkrais.com – for information on the Feldenkrais Method
www.pilatesfoundation.com – The Pilates Foundation
www.skinnerreleasing.com – The Skinner Releasing Institute

For general interest in health, safety and preventative practice in dance
www.danceuk.org – Dance UK
www.intute.ac.uk/artsandhumanities – dance photography by Chris Nash