PHYSIOTHERAPY AND BALLET DANCING

DAVID ZUKER
Consultant Physiotherapist to the Australian Ballet School and the Australian Ballet Company.

The relationship of the physiotherapist to the athlete and dancer is twofold; he must be both teacher and healer. A teacher not only in exercise programmes, in the use of their tools of trade, their bodies and its bio-mechanics. A physiotherapist looking after ballet dancers must be a trained observer in movement and have an awareness of the movements that are required by a dancer.

Injuries suffered by dancers fall into four categories:
(i) Injuries due to wear and tear; for example, synovitis.
(ii) Injuries due to faulty technique.
(iii) Direct injuries; for example, falls, sprains and strains.
(iv) Injuries due to anatomical abnormalities; for example, knock knees leading to abnormal weight bearing.

The first two are the most common causes of injuries seen by the physiotherapist and here he must play the role of trained observer and movement teacher. It is not necessary to be highly skilled in ballet technique or parlance, for under all complicated ballet movements are the basic anatomical components and considerations for which the physiotherapist has been trained. Movement therapy is used for education and re-education of dance on an anatomical basis, and as such, in the healing mechanism of ballet injuries.

The Australian Ballet Company consists of approximately 53 dancers, who spend a great proportion of their time in Melbourne. The Australian Ballet School is situated in Melbourne and has about 50 students. The Honorary Medical Officers and the physiotherapist hold a clinic once a week during the school term. Usually one quarter of the students are present. They are encouraged to notify even minor injuries. Treatment is available throughout the week, and the medical officers are available on, virtually, a 24-hour basis.

Ballet dancing is a series of movements performed to music to express a mood, tell a story, or for the sake of movement alone. Movement is the operative word. Movement is taught and learnt by the dancer, but the anatomical basis of movement is usually glossed over. An integral part of any treatment programme should be a discussion on basic movement anatomy. Muscle action, innervation, muscle groups, antagonistic and agonistic muscular activity should be discussed and explained. Probably most important of all, the action of the anti-gravity group of muscles and their concentric and eccentric actions should be demonstrated. The importance of this becomes apparent if one imagines a dancer raising on to pointe (that is, on the points of the toes) or landing from a jump. Both movements can be broken down and explained on an anatomical basis, and, as a result, technique induced injuries, and, in many cases, wear and tear injuries can be reduced or avoided by a movement education programme. The education programme should be the cornerstone of any rehabilitative regime for a dancing injury. If there is any secret in the treatment of dancers, this is the key to it. After it follow the basic rules and modalities of physiotherapy.

The dancer is a highly trained movement machine, whose muscles and joints work at the upper limit of normality. Any injury takes a great physical and psychological toll on these highly trained athletes. Even young students, if not treated adequately from the start, are put back weeks and sometimes months in their training and in their physical aptitude for dancing. The chief aim in treatment is to restore, as early as possible, full range movement of joints, and full elasticity and strength of muscle and ligamentous structures.

Injuries About the Transverse Arch and Midtarsal Joint of the Foot

Apart from obvious swelling or other signs of trauma, forerunners of foot problems can be recognized by abnormal corns and callousing, particularly beneath the head of the second metatarsal and above gravity group of muscles and their concentric and eccentric actions should be demonstrated. The importance of this becomes apparent if one imagines a dancer raising on to pointe (that is, on the points of the toes) or landing from a jump. Both movements can be broken down and explained on an anatomical basis, and, as a result, technique induced injuries, and, in many cases, wear and tear injuries can be reduced or avoided by a movement education programme. The education programme should be the cornerstone of any rehabilitative regime for a dancing injury. If there is any secret in the treatment of dancers, this is the key to it. After it follow the basic rules and modalities of physiotherapy.

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the distal interphalangeal joints of the toes, which are obvious signs of impending trouble in the transverse arch. If a dancer has a longer second toe than the first, the foot, forced into a pointe shoe, forces the head of the second metatarsal down, stretching the supporting ligamentous structures causing metatarsalgia. The condition may progressively worsen to involve the intrinsic foot muscles and a nipping of the digital nerves. In extreme cases, periostitis may develop, followed by stress fractures of the shaft of the metatarsal; in particular that of the second. It has often been seen on X-rays that the shaft of the dancer's second metatarsal appears to be thicker than in the normal population (Fig. 1). This undoubtedly is due to the degree of weight bearing placed upon the longitudinal and transverse arch from an early age. It protects the metatarsal against the stress placed upon it in ballet dancing. Dancers with long second toes seem to be prone to injuries involving the transverse arch. This may be looked on as a problem of a long second metatarsal or of Hallux Aativicus. If the latter, one sees that weight is borne across the heads of the fifth to the second metatarsal, rather than from the fifth to the first, which may produce all the symptoms mentioned previously. A metatarsal dome, chemotherapy combined with faradism, ultra-sonics and graduated return to full normal activity usually corrects the condition.

A dancer, falling forward off pointe, strains the short ligaments of the mid-tarsal joint. Once again a slightly larger dome that will support the bases of the metatarsal, plus a normal physiotherapeutic regime will rapidly bring about a cure.

Injuries About the Ankle Joint

Sprains and strains are treated in the normal manner, however it is of utmost importance to ensure that the intrinsic and extrinsic muscles are actively exercised to their fullest extent. There is a place for passive movement of all joints, and passive stretching of all tendons in the area to prevent adhesion. Adequate taping with adhesive bandage for support of the affected area will allow early weight bearing and resumption of graduated activity.

The Role of the Flexor Hallucis Longus

The Flexor Hallucis Longus is prone to tenosynovitis and acute traumas. It is the longest tendon passing behind and beneath the ankle joint. When driving off the foot on to pointe, or jumping, it is the last muscle to bear stress and strain; when landing it is the first. A dancer striving for excellence in performance throws great strain on this tendon, which must work hard in holding a dancer's balance on half pointe, and must be capable of rapid contraction and relaxation, and of violent concentric and eccentric action. When a dancer lands from a jump on one leg it is the first tendon to bear full body weight. Hence it is not hard to understand how an inflammatory condition may arise, particularly within the tendon sheath as it passes below the medial malleolus. Another common site of injury is at the muscle origin on the Tibia.

Associated with injuries of the Flexor Hallucis Longus are injuries to the Tibialis Posterior and the long flexors of the toes, as well as the Peronei. The Peronei act as lateral supports for the ankle joint, and as primary and accessory muscles in the many movements required by the dancers. All these muscles may be injured in their roles as either prime movers, accessory muscles, or as supporters of ligaments, as for example, the Peronei, supporting the lateral ligament of the ankle.

Injuries to the Tendo Achilles

These injuries are minor tears either within the tendon sheath or at its insertion. Other tears may occur at the musculo-tendinous junction, and minor tears may occur within the muscle belly. The ankle should be taped, the heel raised, and a normal physiotherapeutic regime strictly adhered to. Activity should be reduced and a full stretching regime instituted, followed by a gradual return to full activity. The same applies for injuries to the calf muscles, when it is of prime importance that a full stretching programme be carried on, particularly in an athlete or dancer, where elasticity of muscles is of the utmost importance. Muscle, like elastic, must be capable of full contraction and full stretch. Dancers usually walk about in flat-heeled shoes and the heels should be raised as a means of providing partial rest to the injured part, while still allowing a range of movement. The heel should be lowered as pain permits.

Problems are often met at the origin of the posterior Tibial muscles. They respond well to injection, chemotherapy, and a graduated treatment programme.

Shin Soreness of the anterior Tibial compartment seems best treated by complete rest from activity. Diuretics are often prescribed, and a regime of ice and stretching is the treatment of choice. Absorption of inflammatory waste products seems to be much slower in this area, possibly due to the tight fascial compartments within which these muscles lie. The compartment becomes oedematous and heat seems only to exacerbate pain. It is interesting to note that the cases of shin soreness I have seen have invariably been associated with a relatively tight Achilles tendon.

Stress fracture of the Tibia is not a rare injury amongst dancers. Persistent pain over the Tibia of more than three weeks' duration should be X-rayed for stress fracture. The treatment is rest, followed by graduated activity, and an insole of foam rubber in the shoe. The fracture should heal within two to three months.
These fractures are usually due to dancing on unyielding floors, or to faulty use of the anti-gravity muscle groups when landing from jumps.

These causes may also produce fractures in the shafts of the metatarsals. If a dancer continuously lands with a rigid leg, instead of with a concertina like action, absorbing the shock by eccentric action of the quadriceps, gluteals and calf muscles, undue stress is placed upon the musculature and bony structures. Repetitive bad landings can cause muscle strains, tears, ligamentous stress and bone problems such as the stress fractures of the Tibia and metatarsals.

It is therefore easy to see that for preventative and rehabilitative physiotherapy, an education programme of muscle activity is important. The physiotherapist assumes the role of teacher and may thus in the early stages, prevent further injury, or hasten recovery of injuries already established.

Injuries About the Knee

Injuries about the knee are not common. The most common, however, are strains of the medial aspect caused by dancers striving for "turn-out", that is, external rotation at the hip. If movement of the hip is limited, many dancers attempt to rotate the tibia on the femur, to give the appearance of increased turn out, and strains occur at the medial aspect of the knee joint. These are extra-articular and, usually, soon subside when the dancer, to protect the part, limits the movement which aggravates the injury. The usualmodalities as well as education into the cause of the injury quickly effect a cure.

Minor tears in the quadriceps tendon (particularly at the junction with the patella) sometimes occur. This is usually due to faulty technique in jumping, and in landing from jumps, as previously described. Professor Thomsen, Orthopaedic Surgeon to the Royal Danish Ballet has operated on a number of such injuries with excellent results (personal communication). The author has not seen any so bad that they have needed operation. Minor injuries have recovered with a normal regime of ice, quadriceps exercises, ultra-sonics, chemotherapy, graduated activity and movement education. It is, however, comforting to know that if an operation is necessary, the dancer may still be able to resume full professional activity. A number of such operations were seen by the author and all were very successful.

Nipping of the pad of fat beneath the quadriceps tendon may occur in forced and rapid full knee extension. This is usually treated with ice packs, quadriceps drill, ultra-sonics, and graduated activity. It rarely requires complete rest. Prepatella bursitis may occur from a lot of kneeling, as in modern dances, and is treated in the usual manner. Chemotherapy and ice packs to the knee three to four times daily for 10 minutes, combined with static quadriceps exercises with the knee in full extension seems to be the treatment of choice. Particularly stubborn cases usually respond to injection. A doughnut shaped pad of foam rubber surrounding the bursa should enable the dancer to continue to kneel by distributing the weight around the periphery of the pad.

One case of a dislocated patella has been seen. It occurred during a leap with the leg stretched out in front of the dancer. The dislocation had to be reduced under general anaesthetic.

Injuries About the Thigh

Hamstring tears and strains are unusual. This undoubtedly is due to the prolonged regime of a dancer's warm up. Abductor strains are also rare for the same reason. One inflamed semimembranosus bursa has been encountered, and this needed excision. If strains of the quadriceps, hamstrings, and abductors do occur, treatment aims at restoring full elasticity and strength, so that fibrosis is kept at a minimum. It is usually the shortening of a muscle caused by inadequate stretching that makes it vulnerable to re-injury. Strains of the sartorius muscle may occur, particularly when the dancer strives for further "turn out" with the flexed hip and bent knee.

Injuries About the Hip Joint

Ronds de Jambes, a combined movement of hip flexion, elevation, external rotation and abduction is the movement that most commonly causes problems in the hips of dancers. This movement may produce three distinctively different injuries:

Tendinitis of the Gluteus Medius at its insertion.

Bursitis about the Greater Trochanter.

Tendinitis of the Ilio-Psoas tendon or an inflammatory condition of the bursa between the Ilio-Psoas tendon and the Lesser Trochanter.

The third is difficult to diagnose. In many cases the dancer presents with a loud, painful clicking emanating from the front of the hip joint. Sometimes there is a definite painful "catch" sensation and the femur has to be internally rotated and lowered to obtain relief. The pain usually is felt when the hip is approaching 90° of flexion. It is difficult to establish a diagnosis of tendinitis or bursitis. The treatment of both however remains the same. Rest, chemotherapy, injection, physiotherapy, followed by graduated activity in the middle range only. The dancer is instructed to "work low". Because the click is so pronounced, it is thought that it may be due to the tendon slipping over the anterior aspect of the lesser trochanter as the femur is externally rotated, causing an inflammatory condition of the tendon and/or the bursa.

Rather like the humerus, the femur must be externally rotated to abduct the leg further than 90°. This clears the greater trochanter from the ilium and ischium. Abduction is then limited by the tightness of the structures on the medial aspect of the hip joint.

One case of a stress fracture of the neck of the femur has been seen in a 16-year-old female dancer.

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It has been asked if the degree of stress placed upon the hips of a ballet dancer will lead to hip problems in later life. This question must remain unanswered for the moment, as no long-term study in this aspect has been carried out. However, the author personally knows of three dancers retired from full-time professional dancing who have required total hip replacements. Whether this is of any significance still remains unanswered.

The Spinal Column

The most common site of injury to the spine is the Lumbo-Sacral joint in female dancers. This is usually caused by forced hyper-extension, especially in arabesques, when the dancer strives to lift the back leg higher. It is important that exercises be given to increase the range of movement throughout the whole spine. It is interesting to note that most spinal problems occur in dancers that have a flat lumbar spine in flexion. One can almost predict low back problems for these dancers. In a dancer, full range mobility in all directions is an essential prerequisite for any joint, and particularly in the lumbar spine.

Male dancers may injure any part of their spine through incorrect lifting. To prevent injury, correct lifting techniques and muscular bracing of the spine and shoulder girdle during lifting must be taught. Manipulations and normal physiotherapeutic modalities should be instituted to obtain early relief, as painless full range movement is difficult to regain in the lumbar spine of a dancer. Injuries to the lumbar spine should be X-rayed as a matter of course for any developmental abnormalities or signs of wear and tear and disc injuries.

Correct "spotting" techniques are important to the dancer performing pirouettes. If this movement is uncontrolled, spasm at the atlanto-axial articulation may occur, with, usually, painful limitation of movement.

The thoracic spine that is limited in movement in lateral flexion rotation and extension, predisposes to nipping of the intercostal nerves, and strains of the intercostal musculature, when the dancers attempt full range movement. The articulation of the ribs with the thoracic spine is a particularly vulnerable area. Manipulative techniques, postural and mobilizing exercises, as well as the modalities of shortwave and ultra-sonics are all of use. Incorrect lifting, when held about the rib cage, often causes a "springing" of the costal cartilage from the ribs. This is a painful condition and often takes a long time to heal.

One must not forget the use of traction in treating spinal injuries, particularly of the cervical spine.

Injuries to the Upper Limb

Injuries to the upper limbs are usually confined to men, and usually caused by lifting mishaps. They require no special physiotherapeutic procedures, but the dancer usually has to limit his lifting for a time to protect the part, and, by inference, the dancer being lifted.

SUMMARY

In the highly competitive world of the ballet dancer, it is important to treat all injuries with accuracy and with speed. Trivial injuries may become major ones, and distress caused by these injuries can be as difficult to treat as the injury itself; speedy recovery is essential. Full range painless movements, and strength through a full range is the first requirement of the dancer. Education in the prevention of injury will prevent many problems before they occur. Correction of faulty technique will also prevent many others. An early return to dancing benefits the rest of the body, and relieves the mental strain.

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