BODY STRUCTURE GLOSSARY.

ABDUCTION	The raising of an arm or leg away from the centre line.
ADDUCTION	The lowering of an arm or leg towards the centre line.
CIRCUMDUCTION	The tracing of a circular path by an appendicular body part.
BONE	Rigid, calcified material which serve as levers for muscles and contain marrow for the manufacturing of red blood cells.
JOINT	Where two or more bones articulate.
JOINT CAPSULE	Connective tissue which envelops a joint and retains synovial fluid.
LIGAMENT	Strong fibrous band that attaches one bone to another.
TENDON	Strong fibrous band that attaches a muscle to a bone.
CARTILAGE	Tough white gristle attached to the ends of bones to prevent jarring.
MENISCUS	Crescent shaped lateral and medial cartilage in the knee joint.
INVERSION	Inwards rolling of the arches of the foot caused by the lifting of the outer edges of the foot.
EVERSION	Outwards rolling of the arches of the foot caused by the lifting of the inner edges of the foot.
SKELETAL MUSCLE	Collections of bundles of red fibres, wrapped together and enclosed in a sheath. They work in pairs, alternately contracting and releasing to move the bones around the joints at the dancer's instigation.
NERVE – motor	Conducts electrical impulses from the brain to the muscles throughout the body in order to produce desired movements.
BURSA	Protective fluid sac surrounding joints that may be subjected to pressure or friction (knee, elbow).
CONTUSION	Bruise.
HEMORRHAGE	Bleeding.
SPRAIN	Tearing of ligamentous tissue.
STRAIN	Tearing of muscle fibres.

WEEK ONE: THE SKELETON

The main functions of the skeleton are:

- To support the organs and tissues of the body.
- To protect the internal organs. For example: the skull protects the brain; the rib cage protects the heart and lungs; etc.
- To allow accurate movement when muscles contract by giving some rigidity.
- To provide a source of supply of blood cells as both white and red blood cells are produced in the bone marrow.

About 206 bones make up the skeleton. Most of their names come from Greek or Latin words. The size of these bones depends on their function: bones bearing larger body weights are bigger and denser, whereas those bearing lesser body weights are smaller and lighter. For example:

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

The shape of the bone also depends on its function. For example:

- Flat bones such as the skull, ribs, pelvis or shoulder blades give protection to the internal organs.
- Long bones such as those in the lower arm (radius and ulna) allow the system of levers to operate efficiently.
- Irregular bones, such as the vertebrae. These are rounded like building blocks and stacked to form the spinal column which surrounds and protects the spinal cord.

The skeleton is divided into two parts – the axial (the skull, spine and thorax which forms the basic structure from which the remainder of the skeleton is supported) and the appendicular (legs and arms joined together by the girdle of the shoulders and of the pelvis).

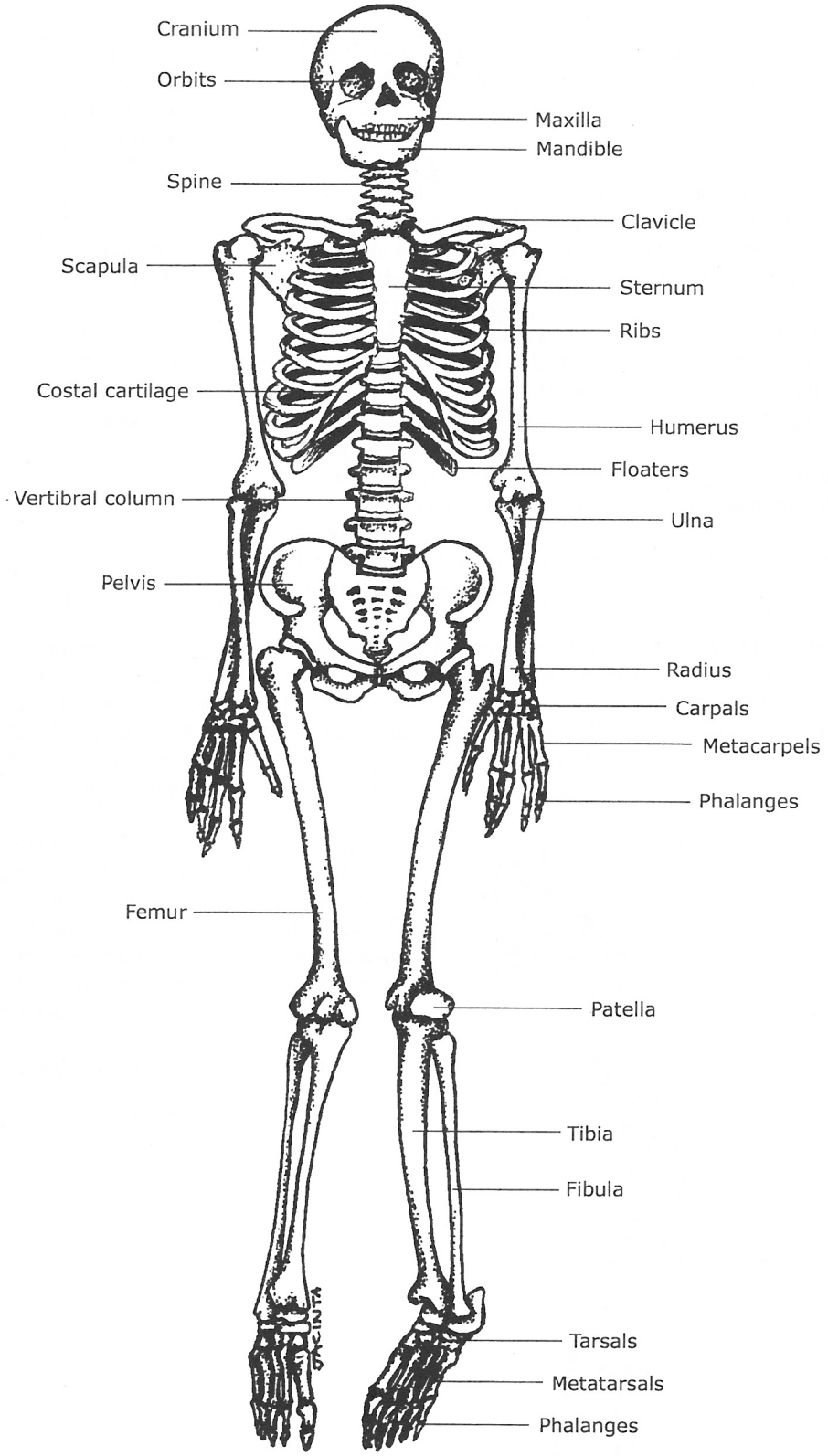
Overview of the axial skeleton:

The skull:	The skull consists of eight bones fused together. The face has 14 bones, some are fused together and others such as the lower jaw can move independently.
The spine:	The spine consists of seven cervical, twelve thoracic, and five lumbar vertebrae. The bottom nine bones are fused together to form a single bone. The first cervical vertebra is the atlas and the second is the axis.
The thorax:	The thorax consists of twelve pairs of ribs which join to the thorax vertebrae. The top ten pairs are joined to the sternum at the front by cartilage. The remaining two pairs have free ends.

Overview of the appendicular skeleton:

The shoulder girdle:	The shoulder girdle consists of the clavicle joined to the top of the sternum at one end, and holding the scapula away from the rib cage at the other. There is a cavity on the scapula for the joint with the humerus.
The arm:	The humerus joins the ulna and the radius at the elbow and in turn these are joined to a mobile wrist and hand.
The wrist:	The ulna and radius join two rows of four carpel bones at the wrist.
The hand:	The palm of the hand consists of five metacarpel bones which join the phalanges of the thumb and fingers.
The leg:	The femur is the longest and strongest bone in the body as it bears the weight of the body and shocks caused by movement. The femur fits into a socket in the pelvis and at the other end joins the tibia to form the knee joint. The patella (in front) protects the joint. The fibula acts as a support to the ankle and to the muscles of the lower leg.
The foot:	The seven tarsals and five metatarsals support the body weight. The fourteen phalanges are much smaller than those in the hand because they have less active function.

THE SKELETON



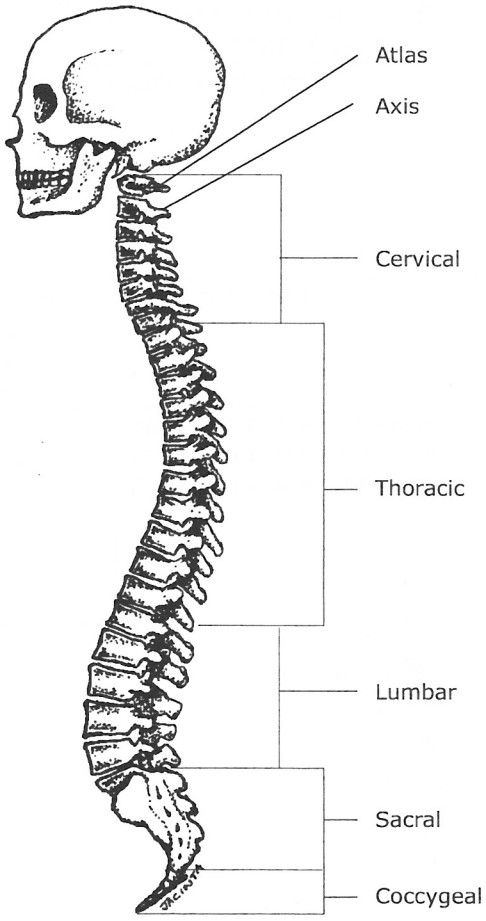
WEEK TWO: VERTEBRAL COLUMN (SPINE)

REGION AND NUMBER OF VERTEBRAE	POSSIBLE MOVEMENT	DISCUSSION
Cervical (7)	Flexion. Extension. Hyperextension. Lateral flexion. Rotation.	This flexible group of cervical vertebrae supports the skull and neck. Holding the head erect develops and maintains its curvature.
Thoracic (12)	Flexion. Extension. Rotation. Lateral flexion.	This rather rigid group of thoracic vertebrae and the 24 ribs with which they articulate support the thorax. Its prominent curvature is developed in fetal life. Thoracic vertebrae are characterised by long slender spines, heart shaped bodies, and facets for rib articulation.
Lumbar (5)	Flexion. Extension. Hyperextension. Lateral flexion.	These stubby quadrilateral lumbar vertebrae are the most massive of the spinal column. This region carries a large share of the body weight, balancing the torso on the sacrum. The lumbar curvature results from walking and standing erect. This group is quite mobile.
Sacrum		Five sacral vertebrae fuse to form this single bone. It transmits the body weight to the hip joints via its articulation with the pelvic girdle.
Coccyx		Consisting of 2 to 4 fused coccygeal vertebrae, the coccyx is functionally insignificant.

In a well aligned dancer the healthy spine is the centre for moving. All movement is affected by the spine. Its elasticity absorbs the shock waves. The spine has four curves which correspond to the four groups of vertebrae (cervical, thoracic, lumbar, sacral). These curves help take some of the stress involved in weight bearing, as do the spongy discs in between the vertebrae which act as shock absorbers. The spongy discs are essential when, for example, landing from a jump. These discs can compress or rupture but as they bonded to the vertebrae it is impossible to "slip a disc"!

The spinal column moves not as a whole but in segments, the vertebrae gliding and turning upon each other. The degree of movement possible depends on the flexing of the ligaments and the muscles producing the movement. These may not necessarily be in the spine itself. For example, if the hamstrings are tight they will prevent forward bending in the lumbar region of the back.

The five distinct regions of the vertebral column:



POSTURAL DEVIATIONS

Postural deviations can be categorised as either functional or structural. As functional deviations involve soft tissue and respond to an exercise program, they can be easily corrected. Structural deviations however involve abnormality in bone structure and should be corrected through consultation with a qualified practitioner.

Some of the more common postural deviations are:

Thoracic kyphosis.

Lumbar lordosis.

C-shaped and S-shaped scoliosis.

DEVIATION	MAIN CAUSES	MAIN METHODS OF CORRECTION
Thoracic kyphosis: Kyphosis is the abnormal hyperflexion of the thoracic spine. It is often associated with round shoulders, a hump back and a poke chin.	• Weak trapezius and rhomboids. • Tight pectorals.	Exercise program.
Lumbar lordosis: Lordosis is an exaggerated hypertension of the lumbar spine.	• Tight erector spinnae (lower back) muscles. • Weak abdominals (protruding stomach).	Exercise program.
Scoliosis: Scoliosis is the rotolateral curvature of the spine in either a C shape (functional deviation) or and S shape (often a structural deviation).	• Hipshod standing. • Carrying weight on one side of the body.	Specialist treatment through a sports therapist (chiropractor, physiotherapist or osteopath).

CORRECT BODY ALIGNMENT AND POSTURE.

During movement the body remains aligned, whether we fall, jump or turn. In a well aligned dancers' body there is a feeling of easy movement and an awareness of all body parts. Good alignment is vital for control of movement, safety and expression. Each of us has been developing since birth our own kinaesthetic whereby we can balance, walk, run, catch or toss a ball. Sometimes, however, in our repetition of exercises and responses to such commands as 'stand up straight', 'shoulders back', 'pull up your knees', 'bottoms under', we throw the skeletal sections out of relationship with one another. Good alignment is not static – it is a dynamic position of readiness ready to move. Standing erect requires a continuing balancing act in relation to the outside forces of gravity and momentum, and between each body part. Structurally the body is composed of three main weights – the head, thorax and pelvis. If there is a true mechanical balance between these structures, associated muscles and ligaments will be under the least possible strain. (If you are out of alignment excess muscular energy must be used to maintain equilibrium.)

There is an ever present plumb line or straight line from the head to the toes which should be maintained during movement. Without this, movement will be inefficient and possibly unsafe. The longer the spinal axis, the more efficient the movement. This is the case whether you are standing upright, jumping or falling, bending forward, sideways or backward.

What constitutes good posture when standing?

- Body erect and well balanced.
- Feet parallel and slightly apart.
- Body weight equally distributed over feet and borne on heel and lateral side of the base of foot, then across ball of foot and all toes.
- Legs straight.
- Pelvis balanced on top of legs, lower abdomen flat and lower back curved normally.
- Shoulders level, head high, chin in, ear lobe over centre of tip of shoulder.
- Chest high, shoulder blades flat.

Side view alignment:

Vertical plumb line.

Line of body weight.

Centre of gravity.

Are you interested to discover the situation regarding your own standing position?

In pairs: view your partners' lateral (side) view alignment and their posterior (back) view alignment, check the GUIDE TO DEVIATIONS and complete the POSTURE SCORE SHEET. You will need to give your partner a mark then offer some relevant feedback regarding the state of their posture. Remember to have fun – no human on earth has perfect alignment!

GUIDE TO DEVIATIONS.

Side view faults:

1. Feet and ankles: placement of body weight.
2. Hyperextension of knee.
3. Pelvic tilt: check alignment of ridge of pelvis. Also note if toes are clenched or tendons on top of foot are prominent the tilt of the pelvis may not be aligned.

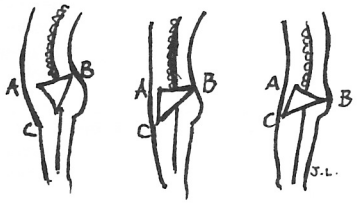
PELVIC ALIGNMENT

Bony landmarks should be on the same horizontal plane.

A. Anterior Superior Spine of the Ilium

B. Posterior Superior Spine of the Ilium

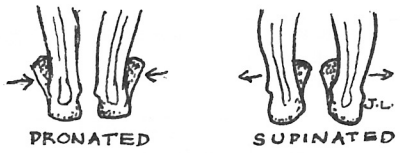
C. Symphasis Pubis.



4. Abdomen relaxed (protruding).
5. Kyphosis.
6. Lordosis.
7. Flat back (limited curvature in the 3 normal curves of the spine).
8. Shoulders hunched forward/ pulled back.
9. Neck: forward position of head due to forward position of cervical vertebrae or hyperextension – head back and chin up.

Back and front view faults:

1. Feet: toeing in or out.
2. Pronated or supinated ankles.



3. Knees: bowlegs or knock knees; check legs to ensure centre of hip joint, centre of knee and centre of ankle all fall in line and face the same direction.
4. Hips: high or prominent, uneven: to test place hands flat out on hip bones to observe is one hand is higher than the other in relation to the ground. Possible muscular imbalances of the hip include tight hip flexors, anterior or lateral snapping hip, sciatic syndrome.
5. Scoliosis: C or S shaped.
6. Scapulae (back view) should be flat against the ribs; note if winged scapulae present. Uneven scapulae may denote a scoliosis.
7. Shoulder: high, uneven; check to see if one arm hangs closer to the trunk than the other.
8. Head tilt.

POSTURE SCORE SHEET.

Name of observer:.....Date:.....

	GOOD - 10	FAIR – 5	POOR – 0	SCORE	COMMENTS
Side view: **NECK**	Neck erect, chin in. Head in balance directly above shoulders	Neck slightly forward. Chin slightly out.	Neck markedly forward. Chin markedly out.		
UPPER BACK AND SHOULDERS	Upper back normally rounded. Shoulders centred.	Upper back slightly more rounded. Shoulders slightly forward.	Upper back markedly rounded. Shoulders markedly forward.		
TRUNK	Trunk erect.	Trunk inclined to rear slightly.	Trunk inclined to rear markedly.		
ABDOMEN	Abdomen flat.	Abdomen protruding.	Abdomen protruding and sagging.		
LOWER BACK	Lower back normally curved.	Lower back slightly hollow.	Lower back markedly hollow.		
KNEES	Legs aligned from hip through knee to ankle (straight).	Slight hyper extension of knee.	Marked hyperextension of knee.		
Back view: **HEAD**	Head erect. Gravity line passes directly through centre.	Head twisted or turned to one side slightly.	Head twisted or turned to one side markedly.		
SHOULDERS	Shoulders level (horizontally).	One shoulder slightly higher than the other.	One shoulder markedly higher than the other.		
SPINE	Spine straight.	Spine slightly curved laterally.	Spine markedly curved laterally.		
HIPS AND KNEES	Hips level (horizontally). Aligned – level.	One hip slightly higher. Slight bow, knock knees or misalignment.	One hip markedly higher. Marked bow, knock knees or misalignment.		
FEET AND ANKLES	Feet pointed straight ahead.	Feet pointed out.	Ankles pronated or supinated.		
ARCHES	Arches high.	Arches lower, feet slightly flat.	Arches lower, feet markedly flat.		

TOTAL SCORE:

CAUSES OF POOR POSTURE.

Generally the main causes of poor posture are:

- Poor standing, sitting and walking posture.
- Physical defects: for example, an individual with short leg syndrome might tilt to one side.
- Lack of exercise: the muscles atrophy and have a low resistance to gravity.
- Fatigue or sickness, which cause decreased muscle tone.
- Choice of footwear: for instance continuous wear of platform or stiletto shoes may cause lordosis, and tight shoes can cause claw and hammer toes.
- Ergonomics: the way we sit to watch television, work at our computer or even sleep affect our posture therefore it is beneficial to implement the correct postural procedures for various tasks.

It is recognised that to improve one's overall posture a program which takes into account the individual's flexibility, strength or muscle tone, breathing and relaxation is advised.

The most systematic way to strengthen muscles is to subject them to progressively increasing workloads. For best results, it is useful to do your chosen exercises several times a day, holding muscle contractions for a short time (10 seconds) and employing a few repetitions. This is your baseline. From there you should increase slowly at a rate which feels comfortable.

General conditioning needs:

1. A conditioning program must be separate from dance technique class or other dance/ movement experience.
2. Should include specialised strengthening for weak areas.
3. Should include specialised release technique for hypertonic areas.
4. Maximum contraction, few repetitions over a range of motion = efficient strength.

SAMPLE CONDITIONING PROGRAM.

1. Knee overs (warm up abdominals).
   Beginning in hook lying position, drop the knees to the right. Use abdominal contraction to initiate bringing the knees back up to vertical. Repeat to the left. Repeat sequence about 8 to 10 times, gradually increasing tempo. As strength increases, draw the bent knees towards the chest and do the sequence with feet off the floor.

2. Abdominal curl (strengthens abdominals).
   In hook lying position slowly curl up to a position just short of sitting. Slowly curl down to a position just short of contacting the floor. Repeat 2 – 3 times. As strength increases, increase repetitions.

3. Arches (strengthens extensors of the spine).
   Beginning in a prone position with the arms out to the sides, lift the head, arms, torso and legs off the floor as high as possible. Variation: twist to right and left. Repeat 2 – 3 times. As strength increases, increase repetitions and add weights to hands.

4. Curl (stretch out extensors of the spine).
   From a prone position, suck the knees up under torso with buttocks down on heels. Contract abdominals and press into areas of spine that are tightened from the arches.

5. Plow (stretch hamstrings and spine extensors).
   From a supine position, bend the knees and bring the legs over the head until the toes touch the floor.
   Flex the feet, extend the knees and maximize the hip flexion by lowering more of the spine to the floor. Hold for at least 30 seconds. The focus is on stretching the hamstrings.
   Flex the knees and raise most of the spine off the floor, tipping right over. Contract the abdominals to press gently against the spine. Slowly return to a hook lying position. The focus is on stretching the extensors of the spine.

6. Supine leg swings (warm up for ab/ adductors of the hip and lateral flexion of the spine).
From a supine position, spread the legs as far apart as possible. While stabilizing the pelvis on the floor and without lifting the legs, swing the right leg over the left, and back to the right. Repeat the sequence with the left leg swinging to the right leg. Repeat 6 – 8 times remembering to keep the pelvis stabilised.

7. Side leg lifts and torso lifts (strengthen ab/ adductors of the hip and lateral flexors of the spine).
With legs extended, roll to the right side, flex the feet and keep the hips in a parallel position while raising the left leg to the side (don't flex the hip or cause hypertension to the spine). Take 4 counts to raise the leg and lower it. On the fourth repetition hold the left leg in the abducted position and raise the right leg 4 counts up and 4 down. Repeat 4 times.
Holding both legs off the floor scissor action the legs for 8 counts.
Raise the torso off the floor, contracting the left lateral flexors of the torso (can assist with the left hand at first). Repeat for 8 counts and repeat to the right side. As strength increases. increase the repetitions and add weights.

8. Stretch out: use any combination of the following
   a. Curve stretch (stretch lateral flexors of the torso and abductors of the hip).
   b. Lunge stretch (stretch abductors of the hip).
   c. Leg over stretch (multi purpose stretch – hips, torso, shoulders).
   d. Yoga sit stretch (stretch outward rotators of the hip).
   e. Latissimus stretch (stretch the latissimus dorsi and lateral flexors of the torso).

ALTERNATE SUGGESTIONS FOR STRENGTHENING SPECIFIC AREAS OF THE BODY:

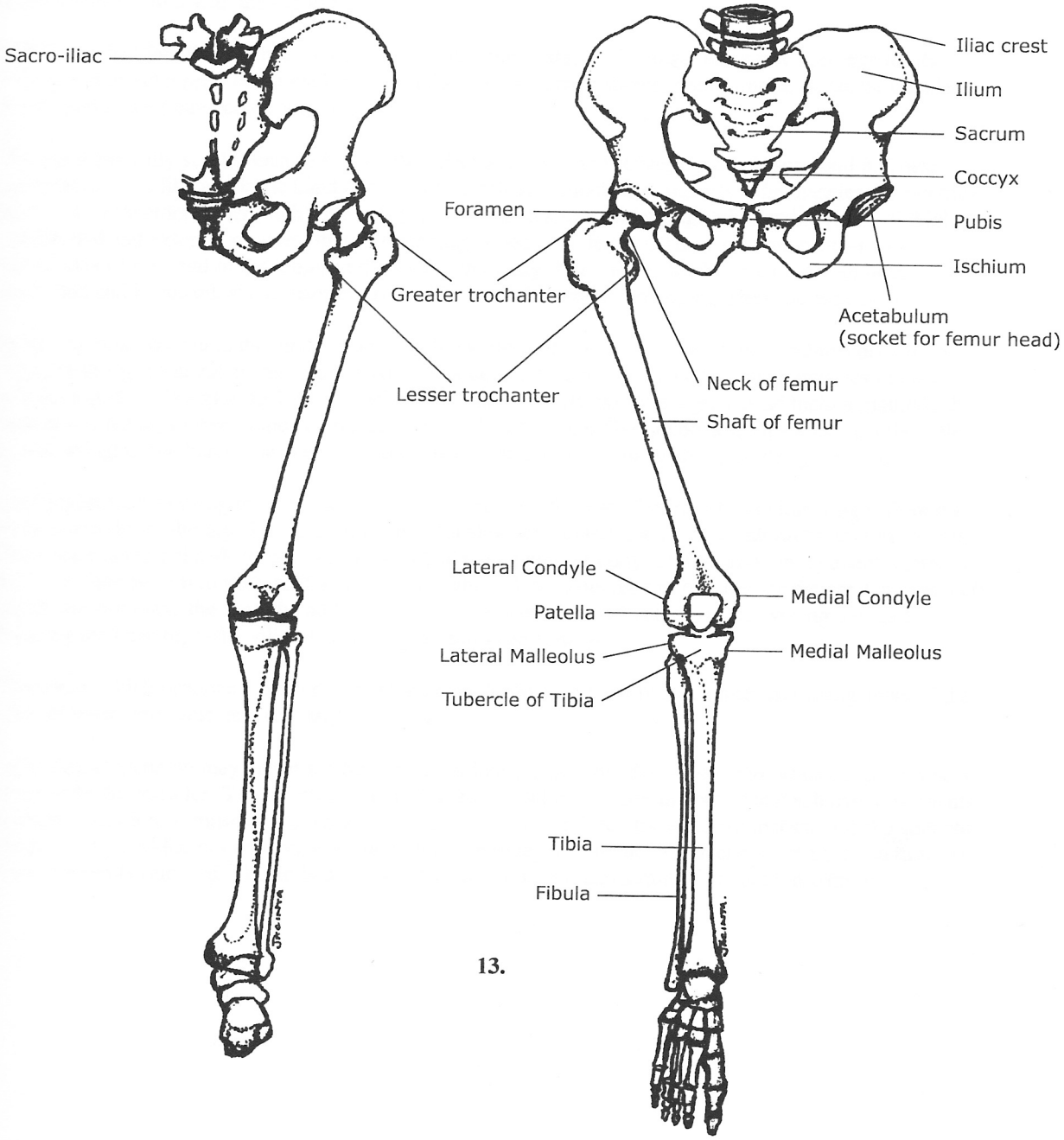
PART OF BODY	MAIN MUSCLES	LOCATION	EXERCISE
ARMS AND SHOULDER	TRICEPS	Bottom of upper arm when arm is lifted to side at right angle.	Push up. Weights: standing triceps extension (weights overhead, drop to neck level and back up again).
	BICEPS	Top of upper arm.	Push up and pull up. Weights: bicep curls (bend lower arm to upper arm).
	PECTORALS	Front of chest.	Push up. Weights: bench press, dumbbell fly and pull over.
	TRAPEZIUS AND LATISSIMUS DORSI	Upper back. Middle back.	Push up, pull up, chin up. Weights: with arms extended wide apart overhead, pull weight down to neck level and back up again.
ABDOMEN	OBLIQUES	Over ribs on either side.	Twist or rotate upper body.
	RECTUS ABDOMINIS	From upper ribs to pubic bone.	Sit up: with knees bent raise upper body towards knees.
	QUADRATUS LUMBORUM	Small of back.	Sit up. Bend upper body to side.
HIP AND THIGH	GLUTEALS	Buttocks.	Leg raises to the back.
	QUADRICEPS	Front of thigh.	Leg raises forward. Weights: quadriceps press.
	HAMSTRINGS	Back of upper leg.	Toe touches. Sit on floor extend and stretch legs forward.
LOWER LEG	GASTROCNEMIUS (CALF)	Back of lower leg.	Rise up and down on a raised surface so heels drop below. Repeat using weights.
	TIBIALIS ANTERIOR	Front of lower leg.	Toe pulls with a towel.
	TIBIALIS POSTERIOR AND PERONEALS	Around either side of ankle.	Rotate ankles in a circle. Raise and lower on a step.
	ACHILLES TENDON	Lower part of leg and heel on back of leg.	Stretching. Weights: calf machine.

WEEK THREE: THE PELVIS AND HIP JOINT

The pelvic girdle consists of the two hip bones that join with each other at the interpubic joint. The pelvis is that bowl created from the two hip bones, the sacrum and the coccyx. It has an inlet above and an outlet below. The two hip bones, each with its propeller shape, together form a weight bearing area with the sacrum, directing the body weight to the thigh bones while giving consideration to the line of gravity which passes in front of the sacroiliac and behind the hip joints. The male and female pelvis differ in that the female cavity is rounder and wider in all dimensions. This larger pelvis can accommodate a developing fetus, especially as it transverses the birth canal in the pelvic outlet.

The pelvis acts as a single unit with co ordinated movement occurring between the lumbar spine and pelvic and hip joints as a result of muscular co ordination.
Movement of the pelvic girdle:

- rotation to the right and left;
- lateral tilt to the right and left;
- slight forward and backward movement.



The hip joint supports the pelvis, which in turn supports the upper part of the body. Motions at the hip may occur from movement of the pelvis on the femur, from movement of the femur on the pelvis, or from a combination of pelvic and femoral motion.

Movement of the hip joint:

- Hip flexion: movement of the femur forward on the pelvis.
- Hip horizontal flexion: forward movement in horizontal plane from abducted position.
- Hip extension: return from flexion.
- Hip horizontal extension: sideward movement in a horizontal plane from adducted position.
- Hip abduction: movement of femur to the side.
- Hip adduction: return from abduction to the original position.
- Hip rotation outward: movement of the femur outward.
- Hip rotation inward: return to original position.

Problems associated with the hip joint.

The anatomical fact that the hip connects the trunk/ pelvis area to the lower extremity accounts for the widespread effect a problem in the hip can produce. An incorrect stance, poor turnout, muscular imbalance or hip tightness all have consequences.

The hip is basically stable because it is a ball and socket joint, and strong ligaments surround it. These ligaments are not like an elastic band and do not stretch very much after puberty. The muscles surrounding the hip are adductors (inner thigh), gluteals (buttocks), abductors (outer thigh), hamstring (back of thigh), and internal and external rotators (that turn the thigh bone – the femur). These rotators control the movements of the head of the femur in the socket smoothly. If motion in the hip area is not smooth, controlled and balanced, subsequent injuries will eventually produce snapping, pain and weakness.

Specific problems around the hip area occur in the various dance styles. The act of standing correctly on one or both legs requires correct muscle control. A correct stance is achieved when all muscles in the hip area act together. The gluteals keep the pelvis and trunk directly over the legs. The adductors maintain the turnout and the legs close to the centreline of the body's balance. The flexors keep the knees gently pulled up and straight. The hamstrings keep the lower back stable as the spine is dropped straight down.

The biggest fault in using the turnout is in trying to turn out from the feet rather than initiating it from the lower extremity of the hip. The limit of the turnout should be determined by the natural turnout in the hip. There are anatomical differences in all dances and the amount of bony rotation and hip ligament tightness will vary from person to person. If a hip joint is tight with a 30 degree turnout, but the dancer achieves a 60 degree turnout using the foot, the additional range has been obtained at the cost of twisting the knee. Twisting the knee repeatly will only cause strain and knee damage.

Conditions which produce a limited turnout are back lordosis, gluteal bursitis, internal derangement of the knee, patellar tendonitis, and cartilage softening.

Lack of full extension may be caused by lumbar lordosis, hyperextended knees, and weakness or tightness in the adductor muscles. The inner thigh muscles are critical to stabilise the pelvis and achieve movements in second position. If muscles are weak other muscles will be injured trying to compensate for the adductor function. Tight adductors will make the outer thigh muscles (the abductors) overwork in trying to turn the lower extremity outward. This imbalance will lead to tendonitis and strain of the outer hip muscle.

SECTION THREE: QUESTION AND ANSWER BOOKLET.

To be completed by you each week as a homework task.

List three reasons why it is important to study body function and care in dance.

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WEEK ONE: THE SKELETON.

1. List the five functions of the skeleton.

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2. The skeleton is divided into two parts, the axial and the appendicular. Discuss the differences between these two.

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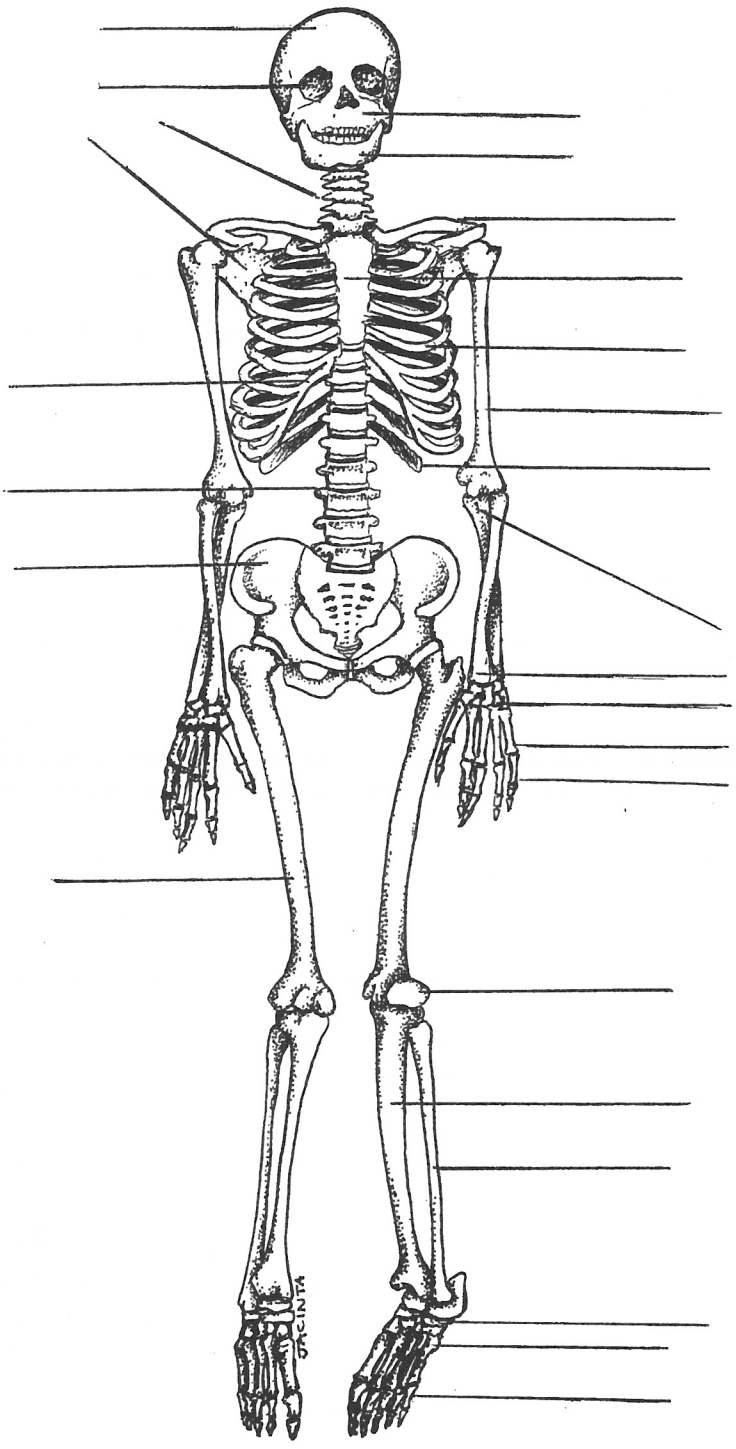
3. Label the following skeleton:



WEEK TWO: VERTEBRAL COLUMN (SPINE).

1. List the sections of the spine and state the number of vertebrae which comprise each group.

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2. Discuss the movement of the spinal column.

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3. Name the three most common postural deviations. Explain the main causes of the condition (name the muscular imbalances) and suggest specific exercises for correcting the problem.

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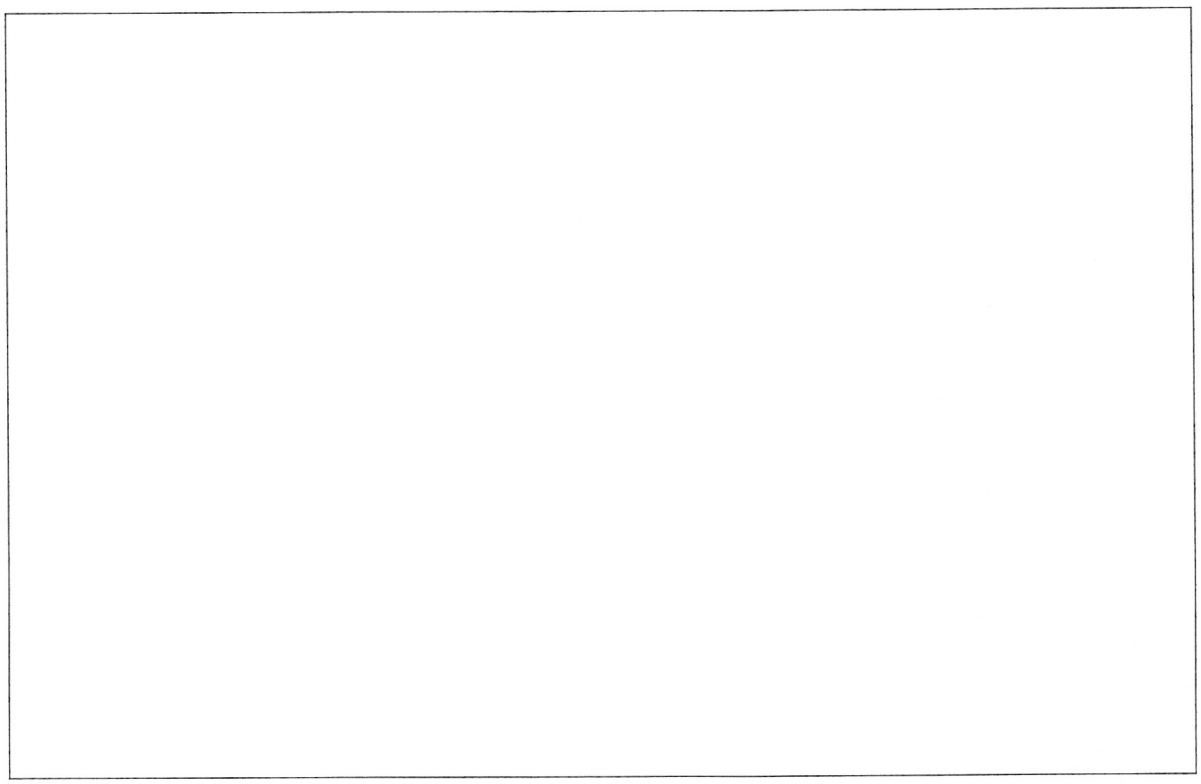
4. Describe the best body alignment for a dancer – you may use a labelled diagram.



5. Describe how unsafe body alignment can affect the body in two different body actions.

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6. Using your POSTURE SCORE SHEET describe your body alignment in terms of its strengths and weaknesses. You may suggest some corrective exercises to help improve your problem areas.

WEEK THREE: THE PELVIS AND HIP JOINT

1. Name the bones which make up the pelvic girdle.

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2. List the movement possibilities of the pelvic girdle and give examples.

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3. Name the bones which make up the hip joint.

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4. List the movement possibilities of the hip joint and give examples.

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5. Discuss the factors which limit a dancer's ability to develop a turnout and suggest the safest method to improve one's turnout.

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