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Flexibility

Correct stretching techniques and good flexibility provides many health- related fitness benefits. Specifically, a well-designed flexibility training program (stretching on a regular basis in a progressively intense manner) can help muscles relax; improve overall health-related fitness, posture, and body symmetry; relieve muscle cramps and soreness; and reduce the risk of injury – all of which make physical activities of all types easier and safer to do.

Defining flexibility

Flexibility is the ability of a joint and the muscles and tendons surrounding it to move freely and comfortably through its intended full range of motion (ROM). Simply put, it is the range of motion available in a joint or group of joints. Optimal flexibility, then allows a joint or group of joints to move efficiently. Flexibility – and the stretches that foster it – can be classified as follows:

- Static – using the ROM of a joint slowly and steadily in a held position
- Dynamic – moving (quickly or slowly) in a ROM necessary for a sport movement
- Ballistic – quickly and briefly bouncing, rebounding, or using rhythmic motion in a joint's ROM (usually to mimic sport movements)
- PNF (proprioceptive neuromuscular facilitation) – using the body's reflexes to relax a muscle before stretching it, so it can be stretched farther

Overload, fitt, progression and specificity principles

It is important to know how to apply the overload, FITT, and progression principles to achieve the basic level of health-related fitness in the area of flexibility. Flexibility intensity involves how the stretch feels; time is the length of time a stretch is held multiplied by the number of times each stretch is performed; and type is the specific muscles the stretch addresses. That is, you must stretch leg muscles to have more flexible legs and arm muscles to have more flexible arms. The table below outlines these principles applied to flexibility, based on fitness goals.

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The FITT principle applied to flexibility training, based on fitness goals			
	Base health-related fitness	Intermediate health-related fitness	Athletic performance fitness
Frequency	Before and after each activity/exercise session (minimum of 3 times per week)	Before and after each activity/exercise session (daily)	Before and after each training session
Intensity	To mild tension, or slight muscular discomfort	To mild tension, or slight muscular discomfort	To mild tension, or slight muscular discomfort, at a level appropriate for sport participation
Time	10-15 s; 2 times per stretch	10-15s; 3 times per stretch	Dependent on static, dynamic, or ballistic (usually conducted by qualified trainer/coach)
Type	Static; major muscle groups	Static; major muscle groups, introduction of dynamic stretching	Usually dynamic and/ or ballistic; major muscle groups and sport-specific stretches
Overload	Not necessary at base level	Ask student to identify level of stretch intensity; if appropriate for activity, have student stretch slightly farther than previous same stretch	As dynamic and ballistic stretches dominate advanced level, overload is not appropriate to ballistic stretching
Progression	Start very easy into stretch; slow movements with minimal applied resistance to muscle involved	Stretch major core muscles first, then move to extremities; begin introduction of dynamic flexibility	Start with easy multijoint dynamic movements, progression to more resistive dynamic movements, followed by moderate static and/or PNF stretching

A warm-up of full body movement, such as walking, jogging or stationary bicycle must precede any flexibility training activities. Be sure the student has sufficiently had time to warm up all muscles, primarily those muscles involved in the flexibility activities.

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Each individual should gradually progress to a higher level of fitness in flexibility, depending on his or her goals, abilities, and interests.

Intensity is an extremely important factor in a safe and effective flexibility-training program. A static stretch that goes beyond the point of mild discomfort to point merely increases the likelihood of injury. When it comes to intensity and flexibility, overloading is moving just beyond the existing ROM. Overloading may also involve one or more of the other parts of the FITT principle; stretching more often (frequency), holding a stretch longer (time), or stretching specific muscles (type). Naturally, safe overloading involves increasing all aspects of the FITT principle in a gradual, progressive manner. Indeed, as with other aspects of health related physical fitness, overloading without pain is the only way to increase flexibility.

Training methods for flexibility

The two main types of flexibility of interest to physical educators are also the names of the two main types of training: static and ballistic.

Static stretching

The static stretching technique is still an extremely effective and popular technique of stretching. This technique involves passively stretching a given antagonist muscle by placing it in a maximal position of stretch and holding it there for an extended time. Much research has been done comparing ballistic and static stretching techniques for the improvement of flexibility. Both static and ballistic stretching are effective in increasing flexibility, and there are no significant differences between the two. However, with static stretching there is less danger of exceeding the extensibility limits of the involved joints because the stretch is more controlled. Ballistic stretching is apt to cause muscular soreness, whereas static stretching generally does not and is commonly used in injury rehabilitation of sore strained muscles.

Static stretching is certainly a much safer stretching technique, especially for sedentary or untrained individuals. However, many physical activities involve dynamic movement. Thus stretching, as a warm-up for these types of activities should begin with static

stretching followed by ballistic stretching, which more closely resembles the dynamic activity.

Ballistic stretching

If you were to walk out to the track on any spring or fall afternoon and watch people who are warming up to run by doing their stretching exercises, you would probably see them using bouncing movements to stretch a particular muscle. This bouncing technique is more appropriately known as ballistic stretching, in which repetitive contractions of the agonist muscle are used to produce quick stretches of the antagonist muscle. The ballistic stretching technique, although apparently effective in improving range of motion, is seldom recommended.

Prioprioceptive Neuromuscular Facilitation (PNF) Techniques

PNF techniques were first used by physical therapists for treating patients who had various types of neuromuscular paralysis. Only recently have PNF stretching exercises been used as a stretching technique for increasing flexibility. There are a number of different PNF techniques currently being used for stretching, including slow-reversal-hold-relax, contract-relax, and hold-relax techniques. All involve some combination of altering contraction and relaxation of both agonist and antagonist muscles (a 10-second pushing phase followed by a 10 second relaxing phase.)

Using a hamstring stretching technique as an example, the slow-reversal-hold-relax technique would be done as follows. Lying on your back with the knee extended and the ankle flexed to back with the knee extended and the ankle flexed to 90 degrees, a partner passively flexes your leg at the hip joint to the point at which you feel slight discomfort in the muscle. At this point you begin pushing against your partner's resistance by contracting the hamstring muscle. After pushing for 10 seconds, the hamstring muscles are relaxed and the agonist quadriceps muscle is contracted while your partner applies passive pressure to further stretch the antagonist hamstrings. The push-relax sequence is repeated at least three times.

The contract-relax and hold-relax techniques are variations on the slow-reversal-hold-relax method. In the contract-relax method, the hamstrings are isotonicly contracted

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so that the leg actually moves toward the floor during the push phase. During the relax phase, both techniques involve relaxation of hamstrings and quadriceps while the hamstrings are passively stretched. This same basic PNF technique can be used to stretch any muscle in the body. PNF stretching techniques are perhaps best performed with a partner, although they may also be done using a wall as resistance.

Formal leg flexibility exercises

Flexibility exercise No 57: Tibialis anterior stretch	
Illustration	
	
Objective	Increase flexibility of the anterior lower leg.
Primary Muscles	Tibialis anterior
Starting Position/ Command	Kneeling, hands on the heels, position ready.
Exercise Description	Kneel with toes pointing backwards, exhale, and sit on top of the heel. Grasp the top portion of the toes and pull them towards the head.
PTI Pointers	<p>Feel the stretch along the shin. This stretch can help prevent shin splints.</p> <p>Ensure that the buttocks sit on top of the heels and not between the feet.</p> <p>Do not do this stretch if learner presents with knee problems.</p>

Flexibility exercise No 58: Lying hamstring stretch	
Illustration	
	
Objective	Increase flexibility of the Achilles tendon and the posterior lower leg.
Primary Muscles	Gastrocnemius and hamstrings
Starting Position/ Command	Lie on your back, knees bent, hands next to the side, position ready
Exercise Description	Lie on the back, flex one leg and slide the foot towards the buttocks. Raise the opposite leg towards the face, grasp behind the knee, and slowly dorsiflex the foot towards the face.
PTI Pointers	If learner suffers from back problems allow him/her to flex the extended leg and lower it on the floor after the stretch.

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Flexibility exercise No 59: Gastrocnemius stretch	
Illustration	
	
Objective	Increase flexibility of the Achilles tendon and the posterior lower leg.
Primary Muscles	Gastrocnemius and hamstrings
Starting Position/ Command	Front support position ready. Walk in with your feet
Exercise Description	From a push-up position move the hands closer to the feet to raise the hips and form a triangle. At the highest point of the triangle slowly press the heels to the floor, or alternate slowly flexing one knee while keeping the opposite leg extended.
PTI Pointers	Do not jerk the heel flat onto the floor.

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Flexibility exercise No 60: Seated hamstring stretch

Illustration



Objective	Increase flexibility behind the knee.
Primary Muscles	Gastrocnemius , hamstrings and erector spinae.
Starting Position/ Command	Sit, knees slightly bent, hands on the toes, position ready.
Exercise Description	Sit on the floor with the knees flexed, grasp the toes and the ball of one foot, and extend the leg. Exhale; keeping the leg straight, pull the foot towards the trunk and bend at the hip so that the upper torso leans towards the extended thigh.
PTI Pointers	<p>Avoid this stretch if learner has hyperextended knees.</p> <p>Contracting and relaxing the quadriceps of the extended leg tends to alleviate some tension and discomfort behind the knee.</p>

Flexibility exercise No 61: Lying hamstring stretch- advanced

Illustration



Objective	Increase flexibility of the hamstring muscles.
Primary Muscles	Hamstrings
Starting Position/ Command	Lie on your back, knees bent, hands next to the side, position ready
Exercise Description	Lie on the back with the legs flexed and the heels close to the buttocks. Inhale and extend one leg upwards. Exhale and slowly pull the raised leg towards the face, keeping the leg straight.
PTI Pointers	Contract the quadriceps to alleviate tension in the hamstrings.

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Flexibility exercise No 62: Straddle hamstring stretch	
Illustration	
	
Objective	Increase flexibility of the hamstrings.
Primary Muscles	Hamstrings
Starting Position/ Command	Straddle stand, hands behind the head, position ready.
Exercise Description	Stand with legs spread and the back of the heels approximately 30 cm from the wall. Interlock the hands behind the head. Keeping the legs straight, extend the upper back, bend forward at the hips, and lower the trunk towards the thighs. Exhale and bend the knees or round the upper torso when returning to the upright position.
PTI Pointers	Remember to extend the upper back and keep it straight.

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Flexibility exercise No 63: Sitting adductor stretch

Illustration



Objective	Increase flexibility of the inside thigh (adductors).
Primary Muscles	Adductors
Starting Position/ Command	Sit, knees slightly bent , hands on the ankles, position ready.
Exercise Description	Sit on the floor with buttocks against the wall, legs flexed and spread, heels touching each other. Grasp the feet or ankles and pull them as close to the groin as possible. Place the elbows on the inner thighs or knees, exhale, and push the legs to the floor.
PTI Pointers	Be sure to keep the back straight when performing this stretch.

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Flexibility exercise No 64: Sitting forward adductor stretch	
Illustration	
	
Objective	Increase flexibility of the inside thigh (adductors).
Primary Muscles	Adductors
Starting Position/ Command	Sit, knees slightly bent , hands on the toes, position ready.
Exercise Description	Lie on the back and flex the knees, bringing the heels and soles of the feet together as they are pulled toward the buttocks. Exhale and spread the knees as wide as possible, keeping the soles of the feet intact.
PTI Pointers	<p>Exercise will feel more intense if performed on a narrow bench.</p> <p>Focus on moving the upper thighs outward and the knees.</p>

Flexibility exercise No 65: Straddle adductor stretch

Illustration



Objective	Increase flexibility of the inside thigh (adductors).
Primary Muscles	Adductors and hamstrings.
Starting Position/ Command	Sit, hands on the side, position ready.
Exercise Description	Sit on the floor and spread the legs as wide as possible. Exhale, rotate the trunk slowly, extend the upper torso onto one leg and grasp the foot.
PTI Pointers	Concentrate on keeping the lower back and legs extended and the heels on the floor.

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Flexibility exercise No 66: Lunge adductor stretch	
Illustration	
	
Objective	Increase flexibility of the inside thigh (adductors).
Primary Muscles	Adductors and hamstrings.
Starting Position/ Command	Attention position, hands on the hips, position ready.
Exercise Description	Stand with legs spread about 60cm apart and turn the right foot 90-degrees sideways to the right, keeping the toes and heel in line with the body. Place the hands on the hips, exhale, lunge forward with the left leg, and press down on the right hip.
PTI Pointers	Remember to turn the foot 90-degrees sideways.

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Flexibility exercise No 67: Prone lying quadriceps stretch	
Illustration	
	
Objective	Increase flexibility of the thigh (quadriceps).
Primary Muscles	Quadriceps.
Starting Position/ Command	Lie on your stomach, arms next to the side, position ready.
Exercise Description	Lie face down, flex one knee, and raise the heel towards the buttocks. Exhale, grasp the raised ankle, and pull the heel toward the buttock without over compressing the knee.
PTI Pointers	To maximise the stretch, make sure the medial sides of the legs touch each other and that the pelvis rotates backwards. Do not arch the lower back or twist the pelvis.

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Flexibility exercise No 68: Side lying quadriceps stretch	
Illustration	
	
Objective	Increase flexibility of the thigh (quadriceps).
Primary Muscles	Quadriceps.
Starting Position/ Command	Lie on your stomach, arms next to the side, position ready.
Exercise Description	Lie on the side, flex one knee, and raise the heel towards the buttocks. Exhale, grasp the raised ankle, and pull the heel toward the buttock without over compressing the knee.
PTI Pointers	To maximise the stretch, make sure the medial sides of the legs touch each other and that the pelvis rotates backwards. Do not arch the lower back or twist the pelvis.

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Flexibility exercise No 69: Standing quadriceps stretch	
Illustration	
	
Objective	Increase flexibility of the thigh (quadriceps).
Primary Muscles	Quadriceps.
Starting Position/ Command	Attention position, fingers stretched, position ready.
Exercise Description	Stand holding onto something for balance. Flex one knee and raise the heel to the buttocks. Slightly flex the supporting leg, exhale, and grasp the raised foot with one hand. Inhale and slowly pull the heel towards the buttock without over compressing the knee.
PTI Pointers	<p>To maximise the stretch, make sure the medial sides of the legs touch each other and that the pelvis rotates backwards.</p> <p>Do not arch the lower back or twist the pelvis.</p>

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Flexibility exercise No 70: Lying quadriceps stretch	
Illustration	
	
Objective	Increase flexibility of the thigh (quadriceps).
Primary Muscles	Quadriceps.
Starting Position/ Command	Sit, hands on the side, position ready.
Exercise Description	Sit on the floor and bend the right leg behind so that the inside of the knee and thigh are on the floor and the foot points along the line of the lower leg in a relaxed position. Exhale; lean diagonally back onto the forearm and elbow opposite the rear leg without arching the lower back. Continue leaning backward until flat on the back.
PTI Pointers	To increase the stretch, contact the gluteals and lift the hip of the floor. Do not let the foot of the rear leg flare out to the side. To guard against excessive stress on the lumbar spine, keep the forward leg in a slightly flexed position..

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Flexibility exercise No 71: Kneeling quadriceps stretch	
Illustration	
	
Objective	Increase flexibility of the thigh (quadriceps).
Primary Muscles	Quadriceps and hip flexors.
Starting Position/ Command	Kneel, hands next to the side, position ready.
Exercise Description	Kneel on knees keeping the knees together, buttock on the floor, and heels by the sides of the thighs, and toes pointing backward. Exhale and lean backward without letting the feet flare out to the sides.
PTI Pointers	Do not arch the back. Instead, contract the gluteal and rotate the pelvis backward. Do not allow the knees to rise off the floor or spread apart.

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Flexibility exercise No 72: Hip flexor stretch	
Illustration	
	
Objective	Increase flexibility of the anterior hip area.
Primary Muscles	Hip flexors.
Starting Position/ Command	Attention position, hands on the hips, position ready.
Exercise Description	Stand with legs spread about two feet apart. Flex one knee, lower the body, and place opposite knee on the floor. Roll the back foot under so that the top instep rests on the floor. Place the hands on the hips and keep the front knee bent at 90-degree angle. Exhale and push the front of the hip of the back leg towards the floor.
PTI Pointers	Do not bend the knee further than 90-degrees. Do not arch the back.

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Flexibility exercise No 73: Lying gluteus stretch	
Illustration	
	
Objective	Increase flexibility of the gluteal area.
Primary Muscles	Gluteals.
Starting Position/ Command	Lie on your back, hands behind your head, position ready.
Exercise Description	Lie on back with left leg crossed over right knee. Exhale and flex right knee, lifting the right foot off the floor, and let it slowly push the left foot towards the face, keeping the head, shoulders, and back flat on the floor.
PTI Pointers	Keep the neck and head relaxed and in a neutral position.

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Flexibility exercise No 74: ITB sitting single leg cross-over stretch	
Illustration	
	
Objective	Increase flexibility of the gluteal area.
Primary Muscles	Gluteals and iliotibial band..
Starting Position/ Command	Sit, hands next to the side, position ready.
Exercise Description	Sit on the floor with hands behind the hips and legs extended. Cross the left foot over the right leg and slide the heel towards the buttocks. Place the right elbow on the outside of the left knee. Exhale and look over the left shoulder while turning the trunk and gently pushing on the knee with the right elbow.
PTI Pointers	Keep the neck and head relaxed and in a neutral position.

Flexibility exercise No 75: ITB sitting double cross-over stretch

Illustration



Objective	Increase flexibility of the gluteal area.
Primary Muscles	Gluteals and iliotibial band..
Starting Position/ Command	Sit, hands next to the side, position ready.
Exercise Description	Sit on the floor and cross one knee over the other. Exhale and lean forward.
PTI Pointers	Keep the neck and head relaxed and in a neutral position. Avoid this exercise if learner has knee problems.

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Flexibility exercise No 76: Standing ITB stretch	
Illustration	
	
Objective	Increase flexibility of the gluteal area.
Primary Muscles	Iliotibial band (ITB)
Starting Position/ Command	Attention position, fingers stretched, position ready.
Exercise Description	Stand with hands on the side and extend and adduct the left leg as far as possible. Exhale and flex the trunk laterally towards the right side, keeping the hands by the hips.
PTI Pointers	Keep abdominals activated to assist with balance.

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Flexibility exercise No 77: Bend over standing ITB stretch	
Illustration	
	
Objective	Increase flexibility of the gluteal area.
Primary Muscles	Iliotibial band (ITB)
Starting Position/ Command	Attention position, fingers stretched, position ready.
Exercise Description	Stand with hands on the side and extend and adduct the left leg as far as possible. Exhale and flex the trunk laterally towards the right side. Try and touch the heel of the left leg with both hands. Exhale, round the upper torso, and return to the starting position.
PTI Pointers	Keep abdominals activated to assist with balance. This is a severe stretch since it incorporates both spinal flexion and rotation.

Informal leg flexibility exercises

Flexibility exercise No 78: Achilles stretch	
Illustration	
	
Objective	Increase flexibility of the Achilles tendon and the posterior lower leg.
Primary Muscles	Gastrocnemius and hamstrings
Exercise Description	<p>Lean forward against a wall with one leg bent forward and the opposite leg straight.</p> <p>Keep the rear foot flat on the floor and both feet pointing straight forward. Bend the arms, lean towards the wall, and shift the weight forward. Exhale and flex the forward knee toward the wall.</p>
PTI Pointers	Keep the head, neck, spine, rear leg, and ankle in a straight line.

Flexibility exercise No 79: Buddy hamstring stretch

Illustration



Objective	Increase flexibility of the hamstrings.
Primary Muscles	Hamstrings and erector spinae.
Exercise Description	Sitting on the floor with the legs extended and spread apart, flex one knee until its heel touches the groin on the other leg. The partner assumes the same position while the other braces an extended leg against the partners flexed leg and vice versa; interlock hands. Exhale, bend forward at the hips and lower the trunk onto the extended thigh as the partner leans backwards and pulls on the hands.
PTI Pointers	Ensure that no excessive pull is exerted from the partner.

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Flexibility exercise No 80: Buddy adductor stretch	
Illustration	
	
Objective	Increase flexibility of the inside thigh (adductors).
Primary Muscles	Adductors and hamstrings.
Exercise Description	Sit on the floor with the legs spread. The partner assumes the same position with feet braced against each other. Lean forward and grasp each other's wrists. Exhale, keeping the legs straight, extend the upper torso and bend forward at the hips and the partner leans backwards and pull on the wrists.
PTI Pointers	Ensure that no sudden pulling occurs.

Flexibility exercise No 81: Cross standing quadriceps stretch

Illustration



Objective	Increase flexibility of the thigh (quadriceps).
Primary Muscles	Quadriceps.
Exercise Description	Stand holding onto something for balance. Flex one knee and raise the heel to the buttocks. Lean forward, slightly flex the supporting leg, and grasp the raised foot with opposite hand. Exhale, pull the heel towards the buttock and crisscross the raised knee behind the knee of the supporting leg. Pull the heel towards the buttocks without over compressing the knee.
PTI Pointers	Do not arch the lower back or twist the pelvis.

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Flexibility exercise No 82: ITB lying cross-over stretch	
Illustration	
	
Objective	Increase flexibility of the gluteal area.
Primary Muscles	Iliotibial band (ITB)
Exercise Description	Lie on the back with legs extended. Flex one knee, raise it to the chest, and grasp it with the opposite hand. Exhale and pull the knee across the body to the floor, keeping the elbows, head and shoulders flat on the floor.
PTI Pointers	<p>Keep the neck and head relaxed and in a neutral position.</p> <p>Do not do any sudden movements and ensure that this is a slow stretch.</p>

Formal Lower torso flexibility exercises

Flexibility exercise No 83: Prone abdominal stretch	
Illustration	
	
Objective	Increase flexibility of the anterior lower torso area..
Primary Muscles	Abdominals.
Starting Position/ Command	Lie on your stomach, arms next to the side, position ready.
Exercise Description	Lie face down on the floor with the body extended. Place the palms on the floor by the hips with the fingers pointing forward. Exhale, and press down on the floor, raise the head and trunk, and arch the back while contracting the gluteals to prevent excessive compression of the lower back.
PTI Pointers	Ensure that the lower back does not hyper extend excessively.

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Flexibility exercise No 84: Bridge abdominal stretch	
Illustration	
	
Objective	Increase flexibility of the anterior lower torso area..
Primary Muscles	Abdominals.
Starting Position/ Command	Kneel, hands on the ankles, position ready.
Exercise Description	Kneel on the floor with the legs slightly apart and parallel with toes pointing backward. Place the palms on the upper hips, arch the back, contract the buttocks, and push the hips forward. Exhale, continue to arch the back, drop the head backward and gradually slide the hands onto the heels.
PTI Pointers	Ensure that the lower back does not hyper extend excessively.

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Flexibility exercise No 85: Standing abdominal stretch

Illustration



Objective	Increase flexibility of the anterior lower torso area.
Primary Muscles	Abdominals.
Starting Position/ Command	Straddle stand, hands on the hips, position ready.
Exercise Description	Stand with legs spread about one metre apart and hands on the buttocks. Arch the back, contract the buttocks, and push the hips forward. Exhale, continue arching the back, drop the head backward and gradually slide the hands below the buttocks.
PTI Pointers	Ensure that the lower back does not hyper extend excessively.

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Flexibility exercise No 86: Cat stretch	
Illustration	
	
Objective	Increase flexibility of the lower back.
Primary Muscles	Erector spinae, quadratus lumborum.
Starting Position/ Command	Front support, position ready.
Exercise Description	Kneel on all fours with toes pointing backwards. Inhale, contract the abdominals, and round the back. Exhale, relax the abdominals, and return to the 'flat back' position.
PTI Pointers	Do not pass the 'flat back' position into hyperextension of the lower back.

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Flexibility exercise No 87: Lying back stretch	
Illustration	
	
Objective	Increase flexibility of the lower back.
Primary Muscles	Erector spinae, quadratus lumborum.
Starting Position/ Command	Lie on your back, knees bent, hands on the side, position ready.
Exercise Description	Lie on the back, flex the knees, and slide the feet towards the buttocks. Grasp behind the thighs to prevent hypextension of the knees. Exhale, pull the knees towards your chest and shoulders, and elevate your hips from the floor. Reextend the legs one at a time to prevent possible spasm or pain.
PTI Pointers	Keep the neck and head relaxed and in a neutral position.

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Flexibility exercise No 88: Straddle lateral torso stretch	
Illustration	
	
Objective	Increase flexibility of the lateral torso.
Primary Muscles	External obliques, erector spinae, latissimus dorsi.
Starting Position/ Command	Sit, hands next to the side, position ready.
Exercise Description	Sit on the floor with the legs spread. Interlock the hands behind the head. Exhale and bend the upper torso from the hip, attempting to touch the right elbow to the floor outside the right thigh while keeping the left shoulder and elbow back.
PTI Pointers	Do not twist the spine.

Flexibility exercise No 89: Standing lateral torso stretch

Illustration



Objective	Increase flexibility of the lateral torso.
Primary Muscles	External obliques, erector spinae, latissimus dorsi.
Starting Position/ Command	Straddle stand ,hands next to the side, position ready.
Exercise Description	Stand with feet slightly apart and hands interlocking and overhead. Exhale, and drop one ear towards the shoulder, and lower the arm sideways.
PTI Pointers	Do not rotate the spine.

Informal Lower torso flexibility exercises

Flexibility exercise No 90: Advanced back stretch	
Illustration	
	
Objective	Increase flexibility of the lower back.
Primary Muscles	Erector spinae, trapezius and hamstrings.
Exercise Description	Lie on the back with arms by the hips, palms down. Inhale, push on the floor with the palms, raise the legs to a vertical position, and support the body with the hands placed on the lower back. Exhale, keep the legs straight and together, and lower the feet to the floor.
PTI Pointers	This stretch should also be felt in the posterior neck and hamstrings. Avoid excessive flexion of the neck.

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Flexibility exercise No 91: Side back stretch	
Illustration	
	
Objective	Increase flexibility of the lower back.
Primary Muscles	Erector spinae, external obliques..
Exercise Description	Kneel on all fours. Straighten the arms, reach forward as far as possible, and lower the chest to the floor. Exhale, slightly twist the upper torso, and press the palms and forearms on the floor.
PTI Pointers	Do not twist the spine.

Formal Upper back flexibility exercises

Flexibility exercise No 92: Sitting upper back stretch	
Illustration	
	
Objective	Increase flexibility of the upper back.
Primary Muscles	Trapezius, infraspinatus, teres major and latissimus dorsi.
Starting Position/ Command	Sit, knees slightly bent, hands on the knees, position ready.
Exercise Description	Sit on the floor with the knees slightly flexed, upper torso resting on the thighs, elbows under the knees, and hands grasping the thighs. Exhale, lean forward, and pull back on the thighs while keeping the feet on the floor..
PTI Pointers	The stretch should also be felt between the shoulder blades (rhomboids). Round the back to intensify the stretch..

Informal Upper back flexibility exercises

Flexibility exercise No 93: Prone upper back stretch	
Illustration	
	
Objective	Increase flexibility of the upper back.
Primary Muscles	Trapezius, infraspinatus, teres major and latissimus dorsi.
Exercise Description	Kneel on all fours, extend the arms forward, and lower the chest to the floor. Exhale, extend the shoulders, and press on the floor with the arms to arch the back.
PTI Pointers	Keep head and neck in a neutral position.

Formal Neck flexibility exercises

Flexibility exercise No 94: Lying neck stretch	
Illustration	
	
Objective	Increase flexibility of the posterior neck.
Primary Muscles	Trapezius
Starting Position/ Command	Lie on your back, knees bent, hands behind the head, position ready.
Exercise Description	Lie on the floor on the back with both knees flexed. Interlock the hands behind the head near the crown. Exhale and pull the head onto the chest while keeping the shoulder blades flat on the floor.
PTI Pointers	The stretch will be dissipated if the shoulder blades lift off the floor.

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Flexibility exercise No 95: Standing neck stretch	
Illustration	
	
Objective	Increase flexibility of the posterior neck.
Primary Muscles	Trapezius
Starting Position/ Command	Straddle stand, hands on the hips, position ready.
Exercise Description	Stand or sit and interlock the hands behind the head near the crown. Exhale and pull the head forward, and allow the chin to rest on the chest. Keep the shoulders depressed during the stretch.
PTI Pointers	The stretch will be dissipated if the shoulder do not remain depressed.

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Flexibility exercise No 96: Anchored shoulder neck stretch	
Illustration	
	
Objective	Increase flexibility of the lateral neck.
Primary Muscles	Trapezius, sternocleidomastoid and scalene.
Starting Position/ Command	Straddle stand, hands on the hips, position ready.
Exercise Description	Sit or stand with the left arm flexed behind the back. Grasp the elbow from behind with the opposite hand and pull it across the midline of the back to keep the left shoulder stabilised. Exhale and lower the right ear to the right shoulder.
PTI Pointers	The stretch will be dissipated on the release of the anchored shoulder.

Informal Neck flexibility exercises

Flexibility exercise No 97: Standing/ sitting lateral neck stretch	
Illustration	
	
Objective	Increase flexibility of the lateral neck.
Primary Muscles	Trapezius, sternocleidomastoid and scalene.
Exercise Description	Sit on a chair with the right hand grasping the lowest part of the chair frame to stabilise the right shoulder. Place the left hand on the upper right side of the head. Exhale and pull the left side of the head onto the left shoulder.
PTI Pointers	The stretch will be dissipated on the release of the chair.

Formal upper limb flexibility exercises

Flexibility exercise No 98: Lateral shoulder stretch	
Illustration	
	
Objective	Increase flexibility of the lateral shoulders.
Primary Muscles	Deltoids, trapezius, infraspinatus, teres major, latissimus dorsi.
Starting Position/ Command	Straddle stand, arms crossed high, position ready. (Standing)
Exercise Description	Sit or stand with one arm raised to shoulder height; flex the arm across the other shoulder. Grasp the raised elbow with the opposite hand, exhale, and pull the elbow backwards.
PTI Pointers	Experiment with flexing and extending the arm of the stretched shoulder to find the most effective stretch.

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Flexibility exercise No 99: Posterior shoulder stretch	
Illustration	
	
Objective	Increase flexibility of the shoulder external rotators.
Primary Muscles	Deltoids.
Starting Position/ Command	Straddle stand, hands on the hips, position ready.
Exercise Description	Sit or stand with one arm flexed behind the back and grasp the elbow from behind with the opposite hand. Exhale and pull the elbow across the midline of the back. Grasp the wrist if the elbow is out of reach.
PTI Pointers	Keep the head and neck in a neutral position.

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Flexibility exercise No 100: Shoulder extensor stretch	
Illustration	
	
Objective	Increase flexibility of the shoulder extensors
Primary Muscles	Deltoids, trapezius, infraspinatus, teres major, latissimus dorsi.
Starting Position/ Command	Straddle stand, arms crossed high, position ready.
Exercise Description	Sitting or standing, cross one wrist over the other and interlock the hands. Inhale then straighten and extend the arms behind the head. The elbows should be behind the ears.
PTI Pointers	Keep the head and neck in a neutral position.

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Flexibility exercise No 101: Overhead tricep stretch	
Illustration	
	
Objective	Increase flexibility of the triceps brachi.
Primary Muscles	Tricep brachi
Starting Position/ Command	Straddle stand, arms crossed high, position ready.
Exercise Description	Sit or stand with one arm flexed, raised overhead next to the ear, and the hand resting on the shoulder blade. Grasp the elbow with the other hand, exhale, and pull the elbow behind the head.
PTI Pointers	This stretch is most effective when the elbow is against the wall.

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Flexibility exercise No 102: Double tricep stretch	
Illustration	
	
Objective	Increase flexibility of the triceps brachi.
Primary Muscles	Tricep brachi
Starting Position/ Command	Straddle stand, hands on the hips, position ready.
Exercise Description	Sit or stand with one arm behind the back and as far up on the back as possible. Lift the other arm overhead, flex the elbow, and interlock the fingers.
PTI Pointers	This stretch is most effective when the raised elbow is against the wall.

Informal upper limb flexibility exercises

Flexibility exercise No 103: Buddy pec stretch	
Illustration	
 <p>The illustration shows two men in a gym setting. One man is sitting on the floor with his legs extended forward and arms reaching back. The other man is kneeling behind him, holding both of his wrists to assist with the stretch. Both are wearing white t-shirts and dark shorts.</p>	
Objective	Increase flexibility of the shoulders.
Primary Muscles	Deltoids, pectoralis major
Exercise Description	Sit on the floor with the hands about 30cm behind the hips, fingers pointing away from the body, palms sown, and legs extended forward. The partner kneels directly behind and holds both wrists. Exhale as the partner gently pulls the arms backwards and downwards.
PTI Pointers	Be sure to communicate with each other. It is not necessary for the wrists to touch each other. Variation is when the partner gently pulls the arms backwards in a horizontal plane.

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Flexibility exercise No 104: Wrist extensors stretch	
Illustration	
	
Objective	Increase flexibility of the wrist extensors.
Primary Muscles	Brachioradialis
Exercise Description	Kneel on all fours, flex the wrists, and place the top of the hands against the floor, fingers pointing towards the knees. Exhale and lean against the floor.
PTI Pointers	Do not place too much body weight on the wrists.

Flexibility exercise No 105: Wrist flexors stretch	
Objective	Increase flexibility of the wrist flexors.
Primary Muscles	Finger flexors.
Exercise Description	Sit or stand on the floor with the wrists bent backwards. Place the heel of the one hand against the upper portion of the fingers of the one hand, and press the heel of the hand against the fingers.
PTI Pointers	Repeat on both hands.

Speed

Speed is the ability to perform a particular movement very rapidly. It is a function of distance and time. It is an important component for successful performance in many competitive athletic situations.

Speed training

Speed (velocity): use high-speed contractions with little resistance

Example: have athletes run 3 repetitions of 50m at top speed, taking a full recovery of 3min after each repetition. Be sure each runner's pulse drops under 120 BPM before starting the next interval.

Power

Power, the explosive aspect of strength, is the product of strength and speed of movement.

$$\text{Power} = (\text{force} \times \text{distance})/\text{time}$$

Two individuals can each bench-press 200kg, moving the weight the same distance. The one who can do it half the time has twice the power of the slower individual. Although absolute strength is an important component of performance, power is even more important for most activities. In football, for example, an offensive linesman with a bench-press 1 RM of 200 kg may be unable to control a defensive linesman with a bench-press 1 RM of only 150kg if the defensive linesman can move his 1 RM at a much faster speed. The offensive linesman is 50kg stronger, but the defensive linesman's faster speed coupled with good strength gives him the performance edge.

Power training

To best develop power it is suggested high-intensity training with resistance greater than that lifted at 10-RM, varying the intensity over time (e.g. 1- to 5-RM 6- to 10-RM) yet completing no more than 5 repetitions per set and emphasizing speed of movement. There should be a moderate to long rest periods between sets and exercises.

Agility

Agility is not easily defined because it is the culmination of nearly all the physical abilities that an athlete possesses. When integrated with a coordination system, agility permits an athlete to react to a stimulus, start quickly and efficiently, move in the correct direction, and be ready to change direction or stop quickly to make a play in a fast, smooth, efficient, and repeatable manner. People possess several types of agility:

- Whole-body horizontal changes of direction such as faking and avoiding
- Whole-body vertical changes of direction such as jumping and leaping
- Rapid movements of body parts that control movement of implements in sports such as tennis, squash, and hockey.

An athlete who possesses high-quality agility can use it to advantage in competition. High quality agility decreases the potential for injury, improve performance and evasiveness by allowing the athlete to fake or neutralize the completion, and refines the athlete's ability to adjust to an outside object such as a puck or ball.

An athlete can be compared with a computer system; both demonstrate a lot of power and potential. Without agility, however, the athlete is as ineffective as a computer that lacks the appropriate software – great potential but limited performance. There are two critical elements in developing agility, coordination and skill. The role of coordination is to execute the movements chosen in response to a stimulus. The role of skill is to orchestrate these coordinated abilities into an efficient and effective set of general, special, and sport-specific movements. These movements should be executed in a manner that uses maximum certainty with minimum time and energy. Specific acts require the use of unique qualities. When athletes struggle to achieve great agility, it is usually due to a deficiency in one or more of the qualities illustrated in figure 8.

Designing an agility program

A drill is an exercise designed to address a specific aspect of a greater skill. Today we see people train by “just doing” a myriad of drills meant to improve speed, agility, or

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quickness without understanding how the drills will help. Coaches continue to use these drills repeatedly without analysing them or having a specific goal or outcome in mind.

It is important to classify drills based on how much they contribute (by percentage) to the desired motor ability (mobility, biomechanics, strength, energy system development, and so forth). Drills should be classified as to whether they are general, special, or sport-specific exercises for a given skill, movement, player, sport, or position.