INTERNATIONAL ASSOCIATION OF ATHLETICS FEDERATIONS

JUMP!

IAAF Coaches Education and Certification System

FUNDAMENTALS OF JUMPING

1. INTRODUCTION

At first look the four jumping events in athletics might appear very different from each other. From a technical point of view they range from the relatively simple Long Jump through the High Jump and Triple Jump to the apparently complex Pole Vault. There are, however, a number of very important commonalties among the jumps, the understanding of which will help the coach working with athletes in any of the events.

Aims

The goal in the jumping events is to maximize either the measured distance or height of the athlete's jump. In the Triple Jump, of course, the goal is to maximize the distance of three consecutive jumps while in the Pole Vault the athlete is aided by the use of the pole.

Biomechanical Aspects

Distance and height of flight are determined mainly by three parameters: (a) ***velocity at take off***, (b) the ***angle of take off*** and (c) the ***height of the centre of mass at take off***. Of these, take off velocity and take off angle are generally the most important.

The height of the centre of mass is determined by the athlete's body height though it is influenced by the athlete's position at take off. Take off velocity and take off angle are both the result of the actions of the athlete prior to and during take off. So, the take off is of major importance in all jumping events.

There are additional factors affecting the height of flight in the Pole Vault. The most important of these are the transfer of energy to the pole during the take off and then the return of that energy from the pole after the take off to provide additional lift to the athlete's body.

Once the flight path has been established at take off the measured result can be negatively influenced by, in the case of the High Jump and Pole Vault, ineffective bar clearance or, in the case of the Long and Triple Jump, poor landing technique.

Movement Structure

The movements of the jumping events can be broken down into four main phases:

1. ***Approach***
2. ***Take off***
3. ***Flight***
4. ***Landing***.

In the Triple Jump the take off-flight-landing sequence is repeated three times. In the Pole Vault the four phases apply but the phase structure used by coaches is modified to take into account the additional movements the athlete makes because of the pole.

In the approach phase the athlete generates horizontal velocity. In the Long Jump, Triple Jump and Pole Vault of the final result is largely determined by the level of horizontal velocity at take off, therefore, the athlete's objective in the approach phase of these events is to come close to his/her maximum running speed. In the High Jump horizontal velocity plays a lesser part in the final result and the athlete's objective is to find the optimum rather than maximum running speed in the approach. The approach phase also includes preparation for the

take off. It is vital, therefore, that the running speed is appropriate for the athlete's ability to use it in the take off and that the athlete is in control of the speed.

The characteristics of a good approach in all the events are:

- It is fast.
- It is accurate and consistent.
- It prepares the athlete for a powerful take off.

In the take off phase the flight path of the athlete's body (and thus the maximum distance or height of flight) is determined. Clearly, the take off is of critical importance in all the jumping events. The athlete's objectives in this phase are to (a) ensure that his/her centre of mass is as high as possible at the moment of take off, (b) add the maximum level of vertical velocity to the horizontal velocity generated in the approach and (c) take off at the optimum angle. The optimums for (b) and (c) vary depending on the event and the technique used by the athlete.

The characteristics of an effective take off are:

- The athlete must be 'tall'.
- The take off foot is planted firmly in a fast, flat 'pawing' action – it is not stamped on the ground and there is no bracing action.
- The knee of the free leg is driven or punched through from the hips.
- The hip, knee and ankle joints are fully extended.

In the flight phase of the Long Jump and the three flight phases of the Triple Jump, the athlete's objectives are to avoid actions that would reduce the distance of the flight path and to position the body for landing. In the flight phase of High Jump and Pole Vault the athlete must avoid reducing the height of the flight path and ensure clearance of the bar. In the Pole Vault the objectives also include maximizing the additional lift available from the pole.

In the landing phase of the Long Jump and the final phase of the Triple Jump the athlete's objective is to minimise the loss of distance that occurs after the initial touchdown of the feet. In the first two landings of the Triple Jump the objective is to make the transition to an effective take off into the following phase. The athlete's objective in the landing phase of the High Jump and Pole Vault is land safely and avoid injury.

2. TEACHING JUMPING TECHNIQUE

Chaining and shaping methods are both used to teach the jumping events. Concentration should be on the following elements:

- Take off from a running approach
- Movements in the flight phase
- Landing

Points to Emphasise:

- Increased stride frequency at the end of the approach.
- Active foot plant with the entire sole at take off.
- Forceful lead leg action at take off.
- Full extension of the ankle, knee and hip joints at take off.

Points to Avoid:

- A decrease in speed at the end of the approach.
- Lowering of the centre of mass in preparation for take off.
- A bracing step with heel contact at take off.
- Standing jumps.
- Premature emphasis on the flight phase.

Note: Be aware that all jumping exercises involve a high mechanical load on the entire body, especially the foot, ankle and knee joints. Therefore take care to avoid overloading.

3. SKILL AND CONDITIONING EXERCISES

EXERCISE GROUP 1: GENERAL RUNNING EXERCISES AND DRILLS

All exercises and drills described in the Fundamentals of Running are valuable for jumpers.

EXERCISE GROUP 2: SPECIFIC RUNNING

- Acceleration Runs (all events) - imitation of the approach with or without imitation of take off.
- Runs with a pole (Pole Vault) – including Ankling, Heel Kick-up, High-knee and acceleration runs.
- Curved Runs (High Jump) – slalom runs and "J" runs (first part straight, second part curving to the left or right) with or without imitation of take off.

Loading:

Exercise	Distance	Repetitions	Sets	Load Level
Acceleration Runs	20-40 m	2-3	2-3	High
Runs with the Pole	20-40 m	3	2	Medium
Curved Runs	15-25 m	3-5	2	Medium

EXERCISE GROUP 3: BOUNDING (Take off and landing on alternate legs)

- Bounding from a standing start.
- Bounding from a short approach.
- Bounding from a fast approach.
- Bounding uphill.
- Bounding for distance (i.e. 5 x 10 bounds as far as possible).
- Bounding for speed (i.e. 5 x 30 m bounding - timed).

Loading:

Exercise	Distance	Repetitions	Sets	Load Level
Bounding from a standing start	20-50 m	3-5	2-4	Low
Bounding from a short approach	20-40 m	3-5	2-4	Medium
Bounding from a fast approach	15-30 m	2-4	1-3	High
Bounding Uphill	20-50 m	2-4	1-3	Low

EXERCISE GROUP 4: HOPPING (Take off and landing with the same leg)

Note: Hopping produces a higher load than bounding. Always alternate left and right with each alternate repetition.

- Hopping from a standing start.
- Hopping from a short approach.
- Hopping from a fast approach.
- Hopping up stairs.
- Hopping for distance or time.
- Rhythmic hopping (i.e. l – l – l – r – r – r – l – l – l – etc. or l – l – l – r – r – l – l – r – r – l – etc.)

Loading:

Exercise	Distance	Repetitions	Sets	Loading
Hopping from a standing start	10-15 m	2-4	2-4	Medium
Hopping from a short approach	10-20 m	2-4	2-4	Medium
Hopping from a fast approach	10-15 m	1-3	1-3	High
Rhythmic Hopping	15-30 m	2-4	2-4	Medium
Hopping up stairs	10-20 m	2-4	1-3	Medium

EXERCISE GROUP 5: HURDLE JUMPS

Example: Single leg take off hurdle jump with one step in between and take off leg landing

- Ankle flips over mini hurdles
- Double leg hurdle jumps
- Single leg take off hurdle jumps with one step in between and lead leg landing
- Single leg take off hurdle jumps with three steps in between and lead leg landing
- Single leg take off hurdle jumps with one step in between and take off leg landing
- Single leg take off hurdle jumps with three steps in between and take off leg landing.

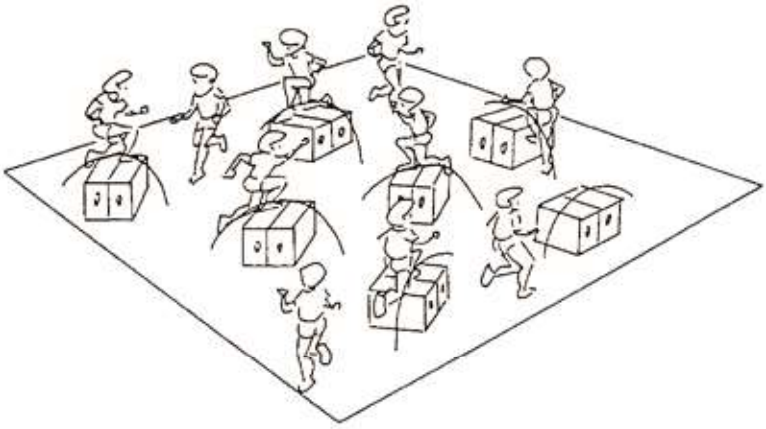
Loading:

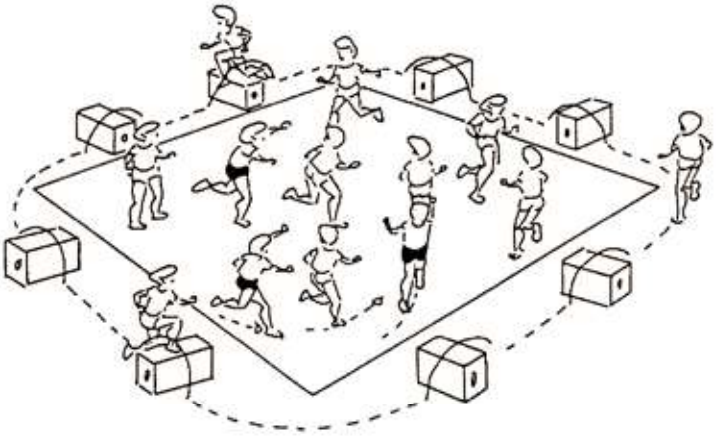
Exercise	Distance	Height	Number	Reps	Sets	Loading
Ankle flips	1.00-1.20 m	20-40 cm	5-10	3-5	3-6	Low
Double legged	1.40-1.80 m	60-90 cm	3-6	3-5	3-6	Medium
Single leg take off with lead leg landing	3-4 m (1 Step) 7-8 m (3 Steps)	40-60 cm	4-6	3-5	2-4	Medium
Single leg take off with take off leg landing	3-4 m (1 Step) 7-8 m (3 Steps)	50-90 cm	4-6	2-4	2-4	High

4. GAMES

GAME 1

A variety of boxes and other objects are set up in a marked off area. The athletes move freely within the area jumping over each object as they come to it. The jumping movements can be varied (landing on the take off leg, swing leg or both legs).





GAME 2

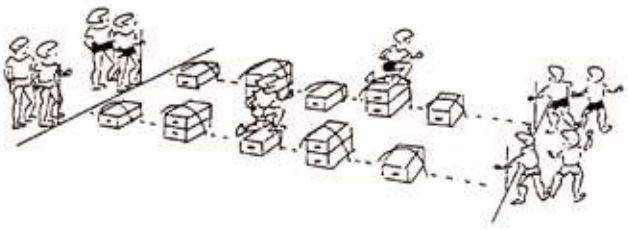
An obstacle course is set up around a square area. A number of 'hunters' are designated. Their task is to 'capture' the other athletes. Captured athletes must run a lap of the obstacle course before being allowed back inside the square. The goal of the hunters is to get all the other athletes out of the square at the same time.

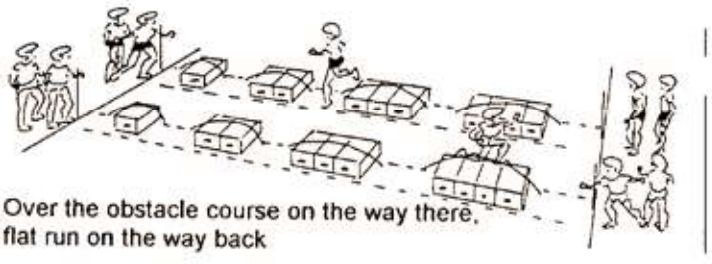
Note: The duration of this exhausting task must be limited to a number of 'rounds'. A new team of hunters is designated, for each new round.

GAME 3

An obstacle course is set up for each team. The members of each team are split into two groups which are positioned at opposite ends of the course. The first runner completes the course and starts the starts the second runner with a hand slap, etc. The race is over when all runners are back to their original position.

Variation: Running over obstacles in one direction and sprint on the flat in the opposite direction. Make the obstacles higher from jump to jump.

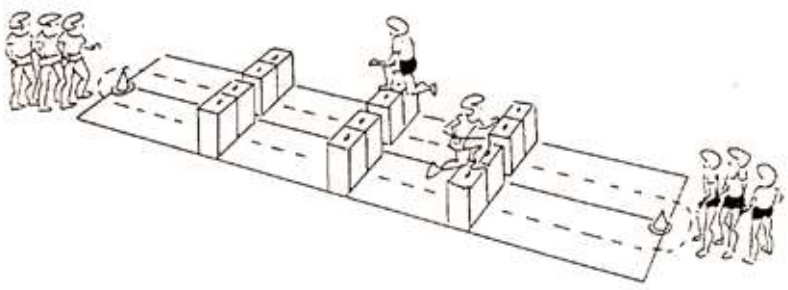




Over the obstacle course on the way there, flat run on the way back

GAME 4

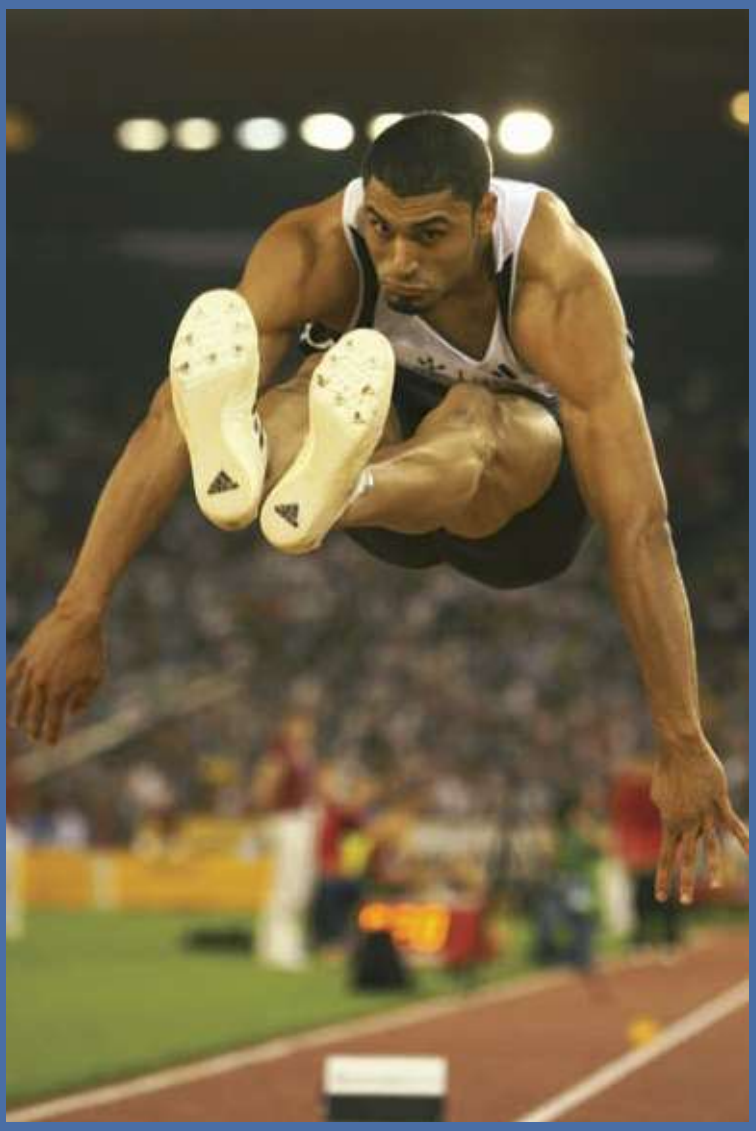
Two teams start at the opposite end of a double course. The teams try to catch up with each other. The race is won when a member of one team touches the back of a runner from the other team.



5. SAFETY AND ORGANISATION

- It is important to ensure that all approach areas are safe, particularly at take off points.
- Landing pits should be dug over before use and cleared of rocks and debris. They should also be dug over and raked at frequent intervals during use.
- Foam landing units should be thick and dense enough to prevent athletes 'bottoming out'. They should be fastened together securely to prevent athletes falling between two units.
- In those high jump and pole vault exercises where the athletes land on their feet, a well-dug sand pit is safe and acceptable.
- Only circular cross section bars should be used. Use ropes or rubber bands for beginners.
- When working with larger groups in the early stage of training sessions should be designed to maximise activity with several athletes being active at the same time. Long breaks are boring, particularly for youngsters.

LONG JUMP

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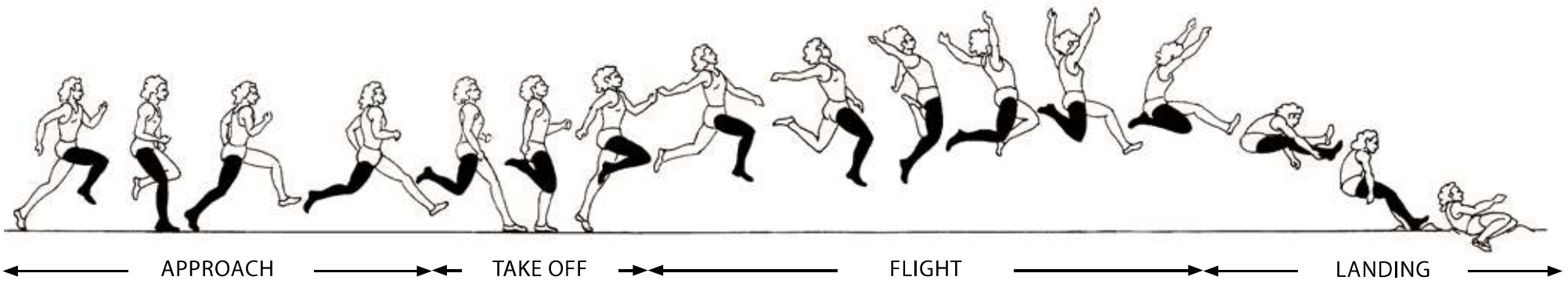
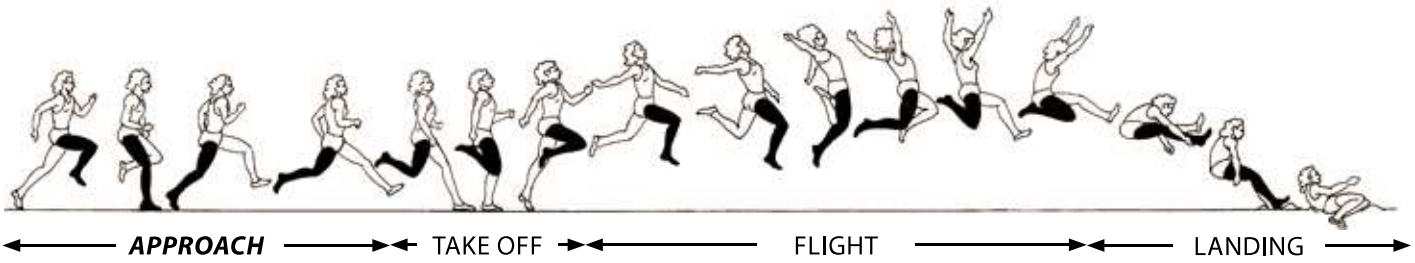


Long Jump – Whole Sequence

Phase Description

The long jump is divided into the following phases: APPROACH, TAKE OFF, FLIGHT and LANDING.

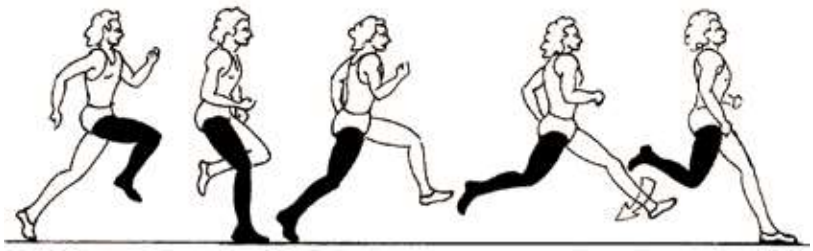
- In the approach phase the jumper accelerates to maximum controllable speed.
- In the take off phase the jumper generates vertical velocity and minimises the loss of horizontal velocity.
- In the flight phase the jumper prepares for landing. Three different techniques can be used: sail, hang and hitch-kick.
- In the landing phase the jumper maximises the potential distance of the flight path and minimises the loss of distance at the touchdown.



APPROACH PHASE

COACHES SHOULD:

- Observe that the athlete's acceleration and sprinting is optimal.
- Observe the overall rhythm of the action.
- Ensure that there is no slowing down.



HELP ATHLETES TO:

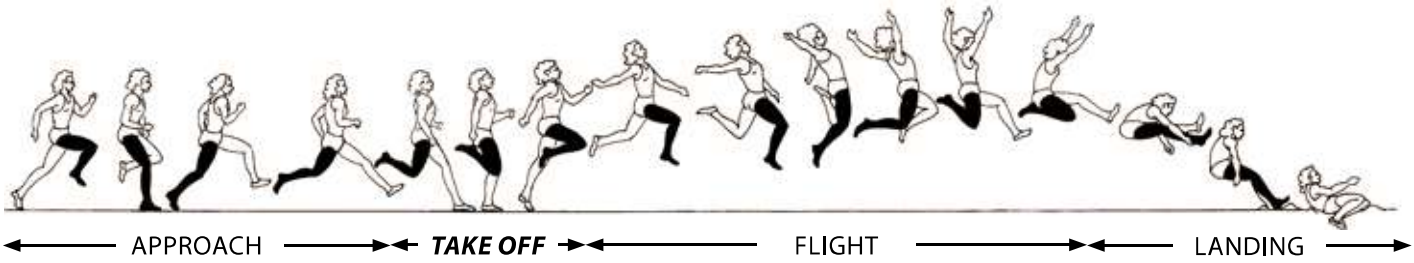
- Sprint strongly but relaxed with a forward visual focus.
- Determine the optimum number of strides for their approach.
- Develop a feeling for consistency in both speed and length.

Objective

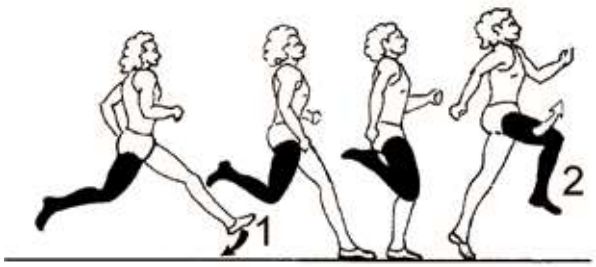
To achieve maximum controllable speed.

Technical characteristics

- Approach length varies between 10 strides (for beginners) and more than 20 strides (for experienced, elite jumpers).
- Running technique is similar to sprinting.
- Speed increases continuously until the take off board.



TAKE OFF PHASE



COACHES SHOULD:

- Observe from the front and side.
- Ensure that the visual focus is maintained forwards.
- Observe the speed and extension of the ankle, knee and hip joints.
- Observe the position of the free leg.

HELP ATHLETES TO:

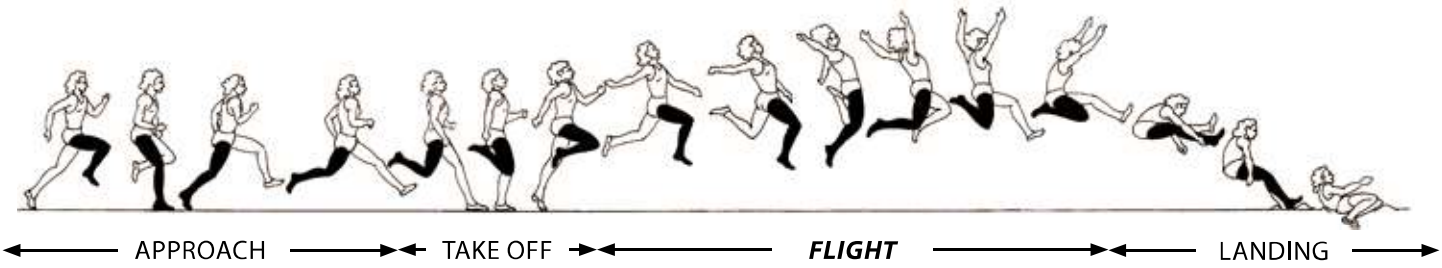
- Run fast and 'tall' off the board.
- Drive the free leg quickly through to the horizontal position and stop.
- Develop the strength so the take off leg does not collapse.

Objective

To maximise vertical velocity and to minimise loss in horizontal velocity.

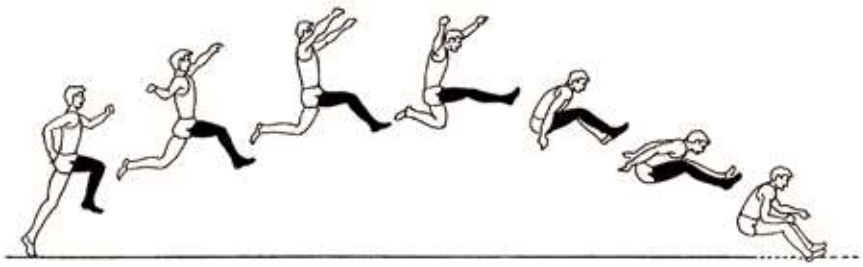
Technical characteristics

- Foot plant is active and quick with a 'down and back' motion. (1)
- Take off time is minimised, minimum bending of the take off leg.
- Thigh of the free leg is driven to the horizontal position. (2)
- Ankle, knee and hip joints are fully extended.



FLIGHT PHASE

Sail Technique



Objective

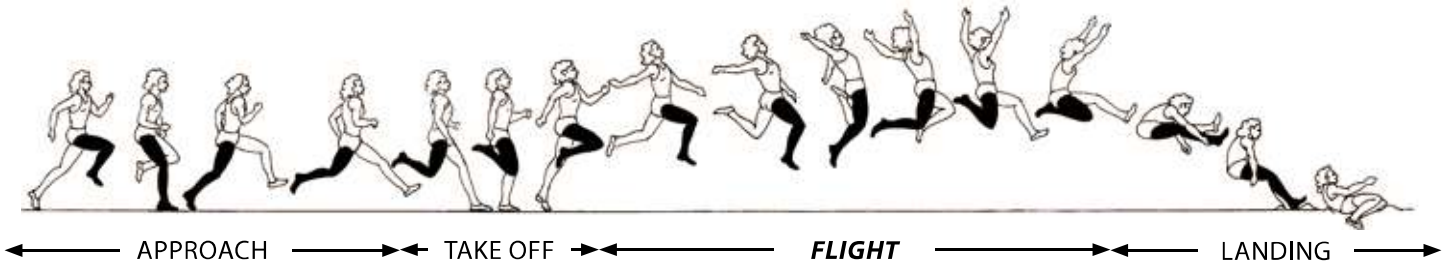
To prepare for an efficient landing.

Technical characteristics

- Free leg is held in the take off position.
- Trunk remains upright and vertical.
- Take off leg trails during most of the flight.
- Take off leg is bent and drawn forwards and upwards near the end of the flight.
- Both legs are extended forwards for landing.

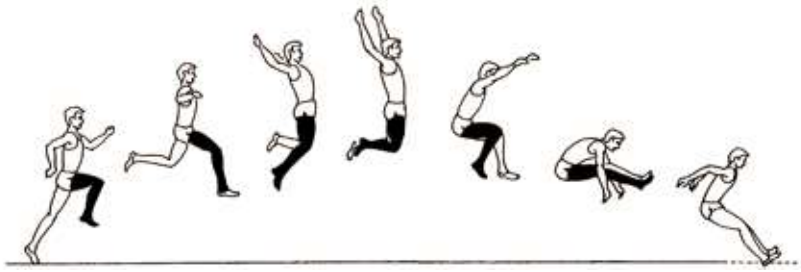
COACHES SHOULD:

- Help novice athletes to use the appropriate technique.
- Observe the action of the limbs and position of the trunk.
- Ensure that any technique changes/progressions are optimal for the athlete.



FLIGHT PHASE

Hang Technique



Good technique especially for jumpers in the 6 -7 metres range

Objective

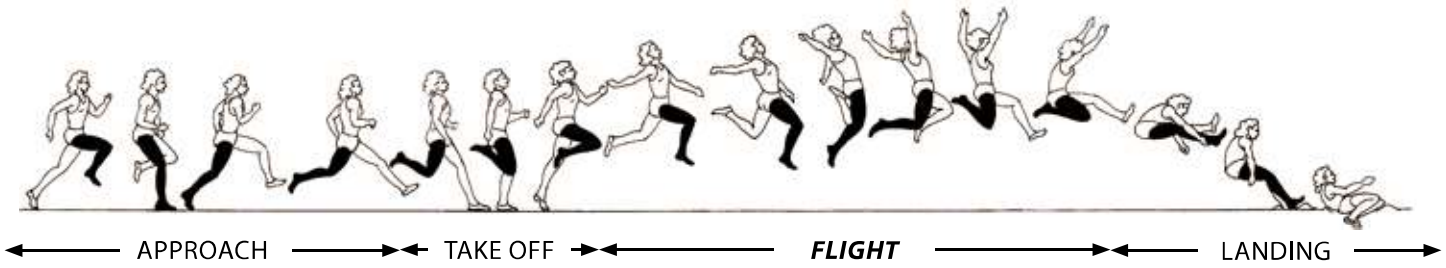
To prepare for an efficient landing.

Technical characteristics

- Free leg is lowered by rotating at the hip joint.
- Hips are pushed forwards.
- Take off leg is parallel to the free leg.
- Arms are in an upward-backward position.

HELP ATHLETES TO:

- Use the appropriate technique for them to control forward rotation.
- Not rush the action - take off explosively, then perform the action.
- Understand that the approach and take off principally determine performance.



FLIGHT PHASE

Hitch-kick Technique

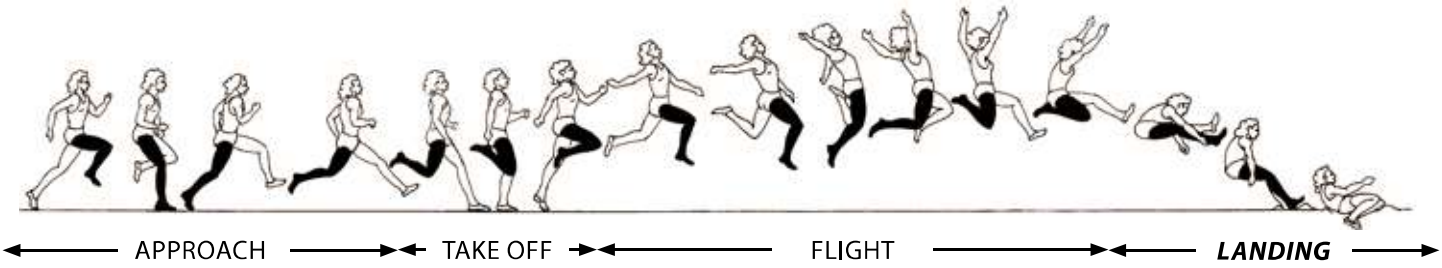
Advanced technique for elite jumpers

Objective

To prepare for an efficient landing.

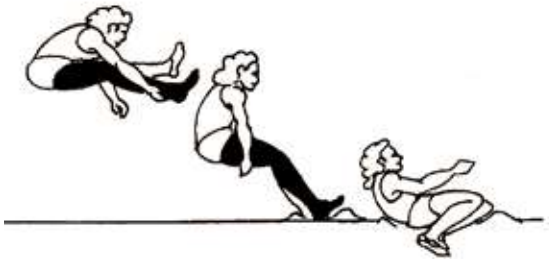
Technical characteristics

- Running action continues in the air supported by arm swing.
- Stride rhythm of the approach should not be changed.
- Running action must be finished at landing, with both legs extended forward.
- Variations: 1½ or 2½ or 3½ strides during the flight.



LANDING PHASE





COACHES SHOULD:

- Maintain the condition and safety of the prepared pit during practice.
- Observe the position of the legs prior to landing and the action at landing.
- Ensure that feet are level at touchdown.

Objective

To minimise the loss of distance.

Technical characteristics

- Legs are almost fully extended.
- Trunk is bent forward.
- Arms are drawn backwards.
- Hips are pushed forwards toward the touchdown point.

HELP ATHLETES TO:

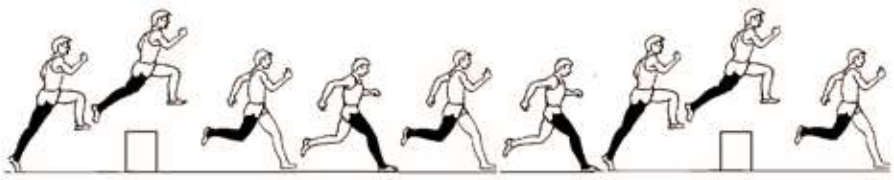
- Extend legs out in front with body bending into landing.
- Time the lowering and collapse of the legs at touchdown so that they do not 'sit back'.

LONG JUMP – Teaching Progression

STEP 1 CONSECUTIVE JUMPS OVER OBSTACLES

OBJECTIVES:

To take off from a short approach and improve the take off position.



- Use a short approach using either take off leg.
- Land on the free leg.
- Use a 3-stride rhythm.
- Height: 30-50 cm
- Distance: 6-8 m (increases with speed)

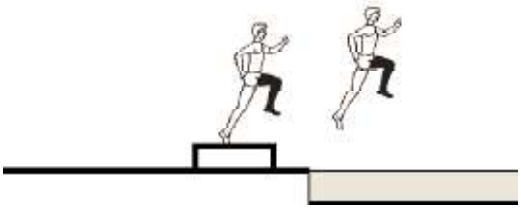
TIPS:

- Allow enough time for novices to determine their preferred take off leg.
- Look ahead rather than at the obstacle.
- Run and take off 'tall'.

STEP 2 TELEMARK JUMP OFF A PLATFORM

OBJECTIVES:

To get used to jumping off a platform and increase the time in the air.



TIPS:

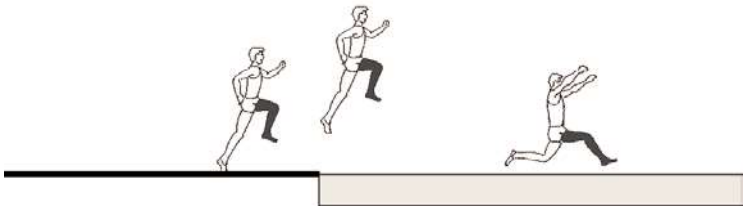
- If using approach from side of pit - adjust position of platform so you land in middle of pit.
- Keep your approach to 5-7 strides.
- Take off and 'hold' position.

- Use a 5–7 step approach.
- Hold the take off position in the air.
- Approach from the runway (small group) or side of the pit (large group).
- Land in stride position (telemark).
- Height of platform: 15-25 cm.

STEP 3 TELEMARK JUMP

OBJECTIVES:

To emphasise the take off movement and 'freeze' the take off position.



- Use a 5–7 step approach.
- Hold the take off position in the air.
- Approach from the runway (small group) or side of the pit (large group).
- Land in a 'stride' position (telemark).

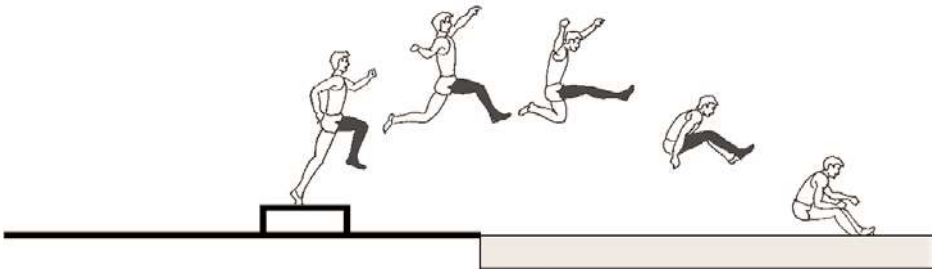
TIPS:

- If using approach from side of pit - adjust take off point so you land in middle of pit.
- Keep your approach to 5-7 strides.
- Take off and 'hold' position.

STEP 4 SAIL TECHNIQUE OFF A PLATFORM

OBJECTIVES:

To practise technique with assisted take off.



TIPS:

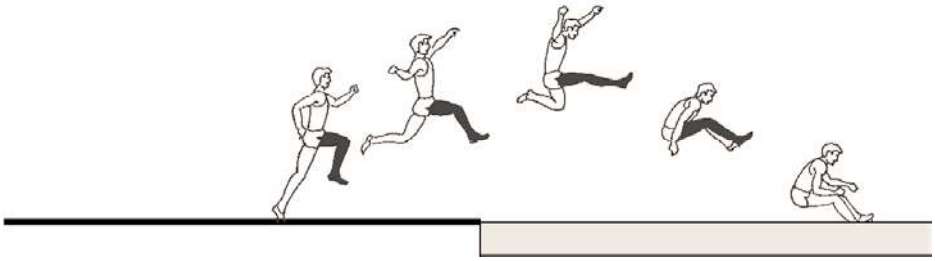
- Don't rush the action.
- Let the action in the air develop naturally.
- Relax into the landing.

- Use a 5-7 step approach.
- Hold the take off position in the air.
- Extend the free leg before landing.
- Draw the take off leg forwards-upwards.
- Land with feet level.

STEP 5 SAIL TECHNIQUE FROM A SHORT APPROACH

OBJECTIVES:

To practise the sail technique.



TIPS:

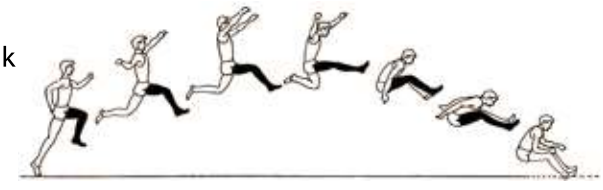
- Don't rush the action.
- Let the action develop naturally.
- Relax into the landing.

- Turn through 180° balanced on the heel of left foot, pivoting on to the ball of right foot.
- Continue turn another 180° balanced on the ball of the left foot while lifting the right foot.
- Place the right foot down to complete a 360° turn.

STEP 6 WHOLE SEQUENCE FROM A FULL APPROACH

OBJECTIVES:

To set approach length and link the complete movement.



- Use back straight of the track to determine the length of the approach.
- Sprint an appropriate number of strides three times and coach or partner marks spot.
- Average length is 'pigeon stepped' (foot lengths) out and then measured on runway.
- This approach and complete Sail technique is practiced and, if necessary, adjustments made to starting mark.

TIPS:

- Approach should only be as long as it takes to reach maximum controllable speed.
- Run the back straight as you would the approach on the runway.
- Focus ahead and don't look for the take off board.

JUMPS