Plyometrics is a mandatory course for all varsity sports athletes at Johnson County Community College, and is a course for regular students who need to take physical education classes.

The JCCC plyometrics classes are divided into beginning and intermediate plyometrics. The differences are small, because our main goal is to build up the tendon-ligament muscle system and this takes time and patience. Our philosophy of plyometrics at JCCC is to improve the quality of the entire neuromuscular system, to help athletes increase their speed, explosiveness and power without injury. As the supervisor of the JCCC all-sports conditioning program, I implement my philosophy about the use and benefit of plyometrics exercises. We help our athletes develop, improve and build up their neuro-tendon-muscular system step by step, slowly reducing the risk of sport-related muscle and tendon injuries.

I believe plyometrics should be an integral part of the daily workout. They should be done in the last part of a workout with a maximum length of 10 to 15 minutes. The comprehensive plyometrics program should be performed twice a week.

With regard to plyometrics, I insist on:

1. a very complete general warm-up followed by short dynamic and static stretching;
2. implementing the principle of specificity and progressivity;
3. correct body positions in plyometrics;
4. mandatory stretching, flexibility and cool-down exercises at the end of a program.

Starting in the spring of 1988 we developed a "group coached" plyometrics class which is very successful and popular among the students. In this class we can work with a large number of athletes; there are many exercises, and the class is very efficient, intensive and enjoyable.

We start with a dynamic group warm-up of five to 10 minutes. Then we divide the class into three equal groups (Photo 1):

1. basic plyometrics (including medicine ball, jumping, hopping, bounding drills)
2. free weight plyometrics (dumbbells, barbells)
3. aerobics (plyometrics to music with ropes, medicine balls or other

Photo 1. The class works with full steam
left - dumbbell high pull snatch
middle - jump rope
right - over medicine balls, feet together (parallel feet) bounding forward.
apparatus, giving some fun to the class).

There are many benefits to this combination class: the class is very active, very intensive; each teacher/coach can concentrate on a 10 to 12 minute program and the athletes perform different exercises with different teacher/coaches. Motivation to work out is very high. The maximum work in this combination class is 40 to 45 minutes including the five to 10 minutes in the group warm-up program. At the same time, we maintain the regular plyometric "every day after workout" program, as well as general conditioning programs for each specific sport.

Warm-up:

Walk: walk with high knees, hands on the waist; walk on heels; walk on outside edges of feet; arms extended overhead; walk on toes; regular running for 30 to 60 seconds; high knees running 15 seconds; high heels running 15 seconds; straight legs running 15 seconds; skipping with straight arms 15 seconds; skipping with arms rotating forward 15 times, backward 15 times; crossover steps running with toes pointing inside; crossover steps running with toes pointing outside; 15 seconds with toes inside and 15 seconds with toes outside; backward run 15 seconds with the coach's clap changing the direction (forward or backward).

Standing exercises: Neck rotation; bending; twisting

Shoulder exercises: rotation with arms bent to the shoulders; same arm position but elbows raising up and down (chicken wings); straight arms rotation forward and backward; straight arms raising (up and down) side to side. All of the above exercises with 10 reps; in front of the chest scissors for one minute (small, large, up and downs); trunk bending (forward, side to side) one minute; diagonal straight arms in front of the chest; right leg raise up to left hand and then alternate, eight reps on both sides; straight arms overhead and trunk rotation; bending forward with straight knees and hyperextending backward, with six rotations both ways; sit-ups variation 30 times; windmill 12 times; split jump 20 times with straight arms in front of the chest; flat foot squat 10 times; squat jump 10 times; lunges 10 times with both legs.

This is only a sample, and it is up to the coach's imagination to vary the warm-up part of the program. The warm-up should take no longer than 10 minutes, and I consider it the best "dynamic stretching" for a plyometrics or general conditioning class or workout.

After this five to 10 minutes of general warm-up, we start the specific program that we adjust to the athlete's sport.

The team-teaching plyometrics classes are in a direct relationship with the goals which we follow with the respective athlete's group. Because a semester is so short, we have to adapt our program to each sport's competition calendar. We have a very close relationship with each varsity sport's coach because they are also teachers at JCCC. We discuss our goals on a daily basis with each respective group, while still trying to maintain the principles of plyometrics and hard work, keeping the challenge of injuries to a minimum.

We offer a summer program which is very simple and easy to practice anywhere. When the athletes come back to school in the fall, we re-involve their participation, and after the first five classes, we pretest. After this pretest, if we feel it necessary, we do an individualized middle test. At the end of the course we do the final test in all 10 events. The athlete should improve in each event. If an athlete is making progress or stays at least on the same level as before, he gets five points for each test event. If the athlete does not improve, he does not get the points for it. If someone has an injury but still can compete in five different events, we give him one point for each improvement. If an athlete has a confirmed injury by a physician or the head trainer, we take into consideration his attendance and the daily observable behavior. (For observable behavior we have a special sheet with the name of each student-athlete, and each teacher gives a daily grade between 0-10. For observable behavior the athletes get points which could influence his or her grade). Because there are several varsity sports at JCCC, the test results are analyzed, and if an athlete needs improvement in a certain area where the whole "group teaching" plyometric class does not, he or she will receive special attention in the respective sport's general and special conditioning program. Again, we take into consideration the stage of the preparation of the athletes, their age and if it is a mixed or a unisex class.

I have a great respect for the athlete's tendons, ligaments and muscles. When the tendons and ligaments become tired and are losing their flexibility and elasticity, severe injuries could occur. This is why in our plyometrics classes we work each body part in a certain order. For example: middle section, legs, upper body, two to three minutes each area; or upper body, middle section, legs, two to three minutes each area; or legs, upper body, middle section, two to three minutes each area.

Another benefit of this combination class is the intensity. The teachers/coaches work out continuously for 30 to 35 minutes while still keeping the athletes' tendons and ligaments fresh. In this way, the efficiency and intensity of a plyometrics class should be on a very high standard, and at the same time the athletes never get very tired. Recuperation is easier, and what is most important is that we can reduce the chances of injuries. In my 23 years of coaching I did not see any plyometrics-related injury when vigorously following the above mentioned rules. But, I saw and I see spectacular improvements in all of the athletes.
who practice plyometrics drills regularly.

**Plyometric Exercises**

**25-yard shuttle run:** Start from the middle, to right or to left side. On both sides, five yards away from the middle line, there is a medicine ball. The athlete who starts on the right should touch the medicine ball first on the right side, then run to the left side, touch the medicine ball, run back to the right side. We time him/her after passing the medicine ball in the right side. (Other variations of the shuttle run are illustrated in Figure 1.)

**30m sprint:** We begin timing when the athletes move.

**Box jump:** 24 inches for 30 seconds nonstop. Start from the floor.

**Jackknife:** 20 seconds. Start from lying on back with straight arms and legs. The athlete must touch his/her toes with his/her fingers, with relatively straight knees (Photo 2).

**Medicine ball throw forward:** Standing in short straddle, behind the start line. The athlete has to throw the medicine ball forward, from between his/her legs.

**Medicine ball throw backward:** Standing with the back to the start line in a short straddle. Raise the ball overhead, then bend forward, slightly bending the knees and with an energetic motion straightening the trunk and swinging the medicine ball overhead.

**Medicine ball push forward:** Sitting in straddle with straight knees (very important). The starting line is under the hip joint in such a way as to be slightly visible between the legs. Push the medicine ball forward with both hands together at the same time. We do not count pushing the ball with only one hand. I consider this the best test for arm explosive-

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ness. (Photo 3).

Figure 2 shows box jump variations used for conditioning and our plyometric classes. These exercises could be done with a start from either the right or left side, with two legs or one, on the top or over the boxes, forward, or sideways (Photo 4). It is also possible to combine boxes with other apparatus.

Some medicine ball exercises for basketball are shown in Figure 3.

An injury-free, perfectly executed depth jump must be learned in stages. The athlete should perfect the drop, landing and rebounding technique through progressive teaching. Beginning from a low box, first teach dropping and landing without rebound and holding the landing for three to five seconds. Then, after that

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Photo 3. Sitting with straddled feet, medicine ball overhead throw.

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Figure 2. Box Jump Variations.

Up and down, forward or backward

Side to side, up and down, or only right, or left side, or forward/backward

Over the box, side to side, with right or left shoulder, after a proper preparation forward-backward. First practice over a medicine ball.
is perfected, add a rebound after the held landing. Finally, teach the athlete landing and rebounding (touch and go), by jumping from a low box. After this phase of preparation, it is possible to continue with a longer series of combination boxes, medicine balls or hurdle jumps.

NOTE: Never try to rebound without teaching the correct body position on landing, being absolutely certain that the athlete has a properly developed muscular and tendon-ligament support. The body position in dropping from the box should be completely relaxed musculature, with a relatively vertical body position. The body position in landing should be to hold the hips and ankle joints in a vertical line, the shoulders being on the same level or slightly forward, with arms, shoulders and abdominal muscles contracted.

In rebounding, the center of gravity moves toward the toes, the arms backward and the shoulders forward, with the aforementioned muscle groups held in contraction.

Some exercises should be practiced from higher boxes, and depending on the athlete's preparation stage, the landing and rebounding phase should be emphasized. Never change to a higher box before a superior muscular-tendon development is evidenced. I personally feel it is best to increase the height of the box not more than one foot after perfecting each phase of the depth jump.

The depth jump should always be started on lower boxes, regardless of the athlete's preparation level. Begin by warming up the tendons, ligaments and muscles. After achieving the maximum height, variations of the depth jump can be done. For example, you might want to have the athletes repeat the same height, up to a maximum of 10 jumps, or to alternate different heights up to a maximum 12 jumps. Always practice the jump from the new height without rebounding. Figure 4 shows examples of depth jump exercises.

![Photo 4. Parallel feet box jump forward - right or left side.](image)

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A. Depth jump, no rebound.
B. Depth jump; stop 3-5 seconds; no rebound.
C. Depth jump; stop 3-5 seconds; rebound.
D. Depth jump and rebound.
E. Depth jump and rebound on a lower box.
F. Coach holds a ball or other object. The athlete can spike, volley, dunk or pass it, depending on the sport.
G. Exercise can be done forward or sideways several times consecutively, depending on goals and preparation level.
H. Athlete runs to a box, jumps onto it then off it, rebounds and then returns to starting point. Athlete may run between medicine balls on the way to the box as shown in diagram.
I. Athlete runs between the medicine balls going forward, backward, while turning, circling, etc.
J. Athlete runs, bounds, shuffles, zig-zag bounds with both feet together and other variations depending on the sport.

Figure 4. Depth Jump Exercises.