The Importance of Exercise Machines in Strength Training

Editor's Note: The NSCA does not advocate the exclusive use of exercise machines in a strength and conditioning program. However, the Association does recommend the use of appropriate exercise machines in conjunction with free weights and explosive exercise to achieve specific training results.

NSCA: What is your philosophy concerning the use of exercise machines in a strength training program and what are the benefits of using machines?

Huegli: Exercise machines are used in a number of ways that suit my philosophy. Their use fits into the following areas: insurance policy exercises, supplemental, injury alternative, conditioning and rehabilitation exercises and a circuit training regimen.

The insurance policy exercises consist of machines that effectively train the neck and knee joint areas, with the intent of eliminating injury or reducing the severity of injury.

Free weight training does not provide all of the balance of strength that I strive for. Therefore, the supplemental exercises complement and round out the training program. Training adjustments are made when athletes are injured. For example, if an athlete has an injured hand and is unable to hold a bar to bench, a machine is used so the athlete can safely push with the heel of the hand instead of grasping the bar.

The benefit of using machines when performing circuit training is the ability to move quickly from station to station and easily adjust the resistance.

Mannie: Ours is a comprehensive system that, while structured, allows for flexibility in the use of equipment. Emphasis is on safety, efficiency, productivity, progression and intensity, rather than the mode itself. Proper technique and an aggressive training approach are impressed upon our athletes.

In terms of morphological enhancements, the human musculature responds favorably to progressive overload. The source of this overload is not as important as the proper application. Our emphasis is placed on stimulating the target muscle complex with constant tension throughout the fullest ROM safely possible.

Our athletes utilize five basic workout plans that, while varying in exercises, equipment and exercise order, remain constant as to areas of the body being worked (i.e., neck, legs/hips, low back, chest, upper back, shoulders, arms/forearms/hands and abdominals). Free weights are used in conjunction with machines. Our philosophy combines the synergistic influence of certain free weight exercises with the isolation and variable resistance advantages of certain machines.

Our facility houses 27 machines (mostly Hammer units) with a full range of free weights and accessories. The machines provide the ability to target certain muscles in a safe and intense manner with resistance that adjusts to the athlete needs along the strength curve. This is an important advantage which free weights do not provide. While it is difficult to accommodate everyone's strength curve due to biomechanical differences in body structure, machines do a good job of fulfilling this need. In any case, some accommodation is better than none.

Machines also offer trainees a safer mode for performing certain exercises. For instance, a bent-over barbell row, a good exercise for the upper back musculature, can be stressful to the lumbar spine region. A seated machine row is a safer and possibly more productive alternative.

There are instances when machines are necessary. The neck, hamstrings, hip flexors, hip abductors, hip adductors and femoral rotators are examples of muscle complexes which require machine intervention (or manual resistance) for adequate stimulation.

Rehabilitation and special needs situations (e.g., hand injuries, range limited injuries, etc.) also require the use of machines in a strength training program.

I do not believe that one modality (free weight or machine) has a distinct advantage in producing lean tissue increases, strength, power, explosiveness, skill transfer to a sport technique, or any other physical enhancement. There is little research suggesting the superiority of machines. While testing protocols are specific to the modes in question, morphological and neurological augmentation will be realized in any sound resistance program, regardless of the equipment preference.
Peterson: Exercise machines are used extensively in addition to free weight exercises. Although free weights are the main element in our program, exercise machines are used to their fullest advantage. They provide the program and athlete several benefits. Machines can provide exercise variety, which is important for stimulation. They are safe to use because the movement is balanced and no spotter is usually necessary.

Also, machines work certain body parts better than free weights (hamstrings, calves, hips, ankles). Another benefit is that machines are more convenient for certain forms of training (circuits, burn-sets).

Thomson: My philosophy for using exercise machines is to ensure that supplemental exercises, injury preventive and single joint exercises are worked to allow a whole body program to be completed.

Using machines with speed-strength exercises allows the athlete to cover small muscle groups that are sometimes neglected.

Williams: The strength training programs designed for Liberty University athletes require a combination of free weights and machines, with the core of the programs involving free weights. Machines are used for some specific exercises that are difficult or impossible to do with free weights.

What exercise machines do you use in your strength training program and why?

Huegli: Our program utilizes the leg extension, leg curl, high and low pulley machines, a pull-up machine, neck and shrug machines, rear deltoid, multi-hip, chest press, military press and shuttle machines.

The leg extension, leg curl, neck and shrugs are part of our insurance policy exercises. The rear deltoid, chest press, high/low pulley machines effectively train muscles in an easy and stable way. They are easy to set up, the weight is adjustable from lifter to lifter or set to set, and they provide good stability and balance. Our athletes have the option of choosing these machines or free weight/dumbbells, and most choose the machines.

The pull-up, multi-hip and shuttle machines are specialty machines that are effective and convenient. The pull-up machine provides assistance to the athlete who cannot complete a set of pull-ups; the multi-hip machine trains hip strength, flexibility and stability more efficiently than free weights; the shuttle is a horizontal jumping machine that provides elastic resistance to the lower body without gravity’s effect on the joints of the knee and back. It also provides plyometric training without a lot of gravitational stress on the ankles, shins and knees.

Mannie: We have incorporated numerous machines for variety, variable resistance, isolation and special needs. Our complete line-up of machines, by area of the body exercised, is as follows:

**Area(s) of Movement**

- **Legs/hips/low back:**
  - Hamstring leg press
  - Hammer leg extension
  - Nautilus leg press
  - Nautilus leg extension

- **Shoulders:**
  - Hammer shoulder press
  - Hammer shoulder extension

- **Chest:**
  - Hammer chest press
  - Hammer chest extension

- **Back:**
  - Hammer back press
  - Hammer back extension

- **Arms:**
  - Hammer arm curl
  - Hammer arm extension

Peterson: We have 85 different machines, including several for each muscle group. They are all used extensively during the year, training with lying and seated curl, standing and seated calf, hip extension-flexion, abduction and adduction and internal and external shoulder rotation. These machines are used because of the benefits they provide.

Thomson: Most programs use the latissimus dorsi pulldown-seated row, seated chest press, 4-way neck, double shoulder press, low back extension, shrug, leg extension, leg curl and multi-hip and leg sled.

When working with free weights to accomplish the core of the program, exercise machines can give additional development to the muscle groups being trained on a particular day. Machines also help with athletes with certain restrictions.

Williams: The lat and cable row machines are used to develop the upperback and the leg extension and leg curl machines are used for knee flexion and extension. Athletes who can’t do regular barbell squats perform leg presses or squats on the Bear jump-squat machine. The Bear is used by most of our athletes to perform various jumping movements and standing toe raises. The glute-ham machine is used by all of our athletes for hamstring and lower back development, while the max
torso machines are used to develop strength for rotational movements.

Is there a training period during the year in which exercise machines are used more? If so, what time of year, what exercises, and why?

Huegli: We do a circuit with pneumatic machines during the soccer and basketball seasons. The exercises include the chest press, seated row, military press, lateral shoulder raise, leg press, leg extension, leg curl and abdominal machines.

During the season we want to control intensity and duration of training time. This strength conditioning enables us to control the length of the training interval, intensity and rest interval. The pneumatic machines offer a variety of speeds and intensities that provide flexibility for training in-season.

Mannie: Ours is a year-round regimen, with little deviation from the off-season to in-season program. We may reduce the volume to some degree and the frequency from three non-consecutive days to two non-consecutive days, but the equipment and intensity remain constant. Accountability is an important aspect of our program and consistency in program design is paramount in monitoring progress. This approach also insures the comprehensive nature of our program.

Peterson: We use exercise machines more often during our in-season programs, especially for athletes in certain sports such as wrestling, swimming, tennis and softball who perform some circuit programs. Circuit programs are more efficient and safe when done with machines. The exercise machines used varies for each sport and a variety of machines are used throughout the in-season program:

<table>
<thead>
<tr>
<th>In-Season Circuit-Wrestling</th>
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<tbody>
<tr>
<td>3 weeks                3 weeks       3 weeks</td>
</tr>
<tr>
<td>Leg press   Back squat   Smith squat</td>
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<tr>
<td>Lying leg curl Seated leg curl Lying leg curl</td>
</tr>
<tr>
<td>Leg extension Smith lunges Bear machine</td>
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<tr>
<td>Standing calf Seated calf Fly</td>
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</tbody>
</table>

Dick Peterson

Vertical bench Incline Push-ups
Smith incline Cable crossover Chains
Seated rows Pullover T-bar rows
Lat pull down Rowing machine Lateral raise
Shoulder press Smith press Arm curl
Arm curl down Cable curls Tricep push
Tricep press Tricep extension

Thomson: Depending on the sport, (using football as an example), machines will be used most during the winter and summer phases, with the exception of certain injuries during the in-season program.

During the in-season phase, certain players (mostly linemen) have occasional problems with their hands, shoulders, etc. The use of certain machines aid in continued training while injured.

Williams: Most teams incorporate more machine exercises during the in-season because of the time restrictions. We have a conditioning circuit made up of hydraulic machines and a circuit with several Keiser machines all of which can be used to help maintain strength and conditioning in-season. Machines like the “Line buster,” “Bad Rad,” and the “Attacker,” which simulate specific football movements, are used in-season, primarily by the linemen.

What role do exercise machines play in the re-conditioning of an athlete following an injury (i.e., functional use, safety, alternative exercise, etc.)?

Huegli: Exercise machines are very prominent in the reconditioning of an injured athlete. Injured athletes maintain cardiovascular conditioning or recondition using exercise bikes, stair climbing machines and upper body ergometers. If there are limits for the athlete because of the injury, they are defined by the trainer or team physician.

Machines also provide a great degree of control and stability. If an athlete has an injury that prevents a movement (i.e., the free bar bench or military press because of a hand injury), the machine will reduce the possibility of an accident, assume the role of stabilizing the muscles and allow the athlete to continue training.

Machines enable an injured athlete to continue training. In some cases that would be impossible if the program was dependent solely on free weights and dumbbells. Machines provide strict control and stability following an injury, and they allow coaching control for cardiovascular conditioning. Another consideration for using machines for rehabilitation or recovery includes the cross-over theory of recovery for injured athletes. It may be possible for an athlete with a knee injury, for example, to have a greater rate of recovery in the injured leg if weight training and conditioning are continued with the healthy leg.

Mannie: Machines are extremely useful in rehabilitation because it is easier to restrict and document the user’s range of motion. This documentation is important in assessing improvement in pain-free ROM.

Peterson: Exercise machines are of great use following an injury. Machines are beneficial since some major concerns are safety, control of movements, and minimal stress, especially to the joints. Many of our machines are equipped with range of maxim limiters so that specific areas of movement can be worked if needed. Also some of our reconditioning is done on isokinetic machines. Isokinetic strengthening is effective because it
allows the individual to train at a constant speed with a resistance that varies throughout the exercise motion. The athletes' effort and ability are the influencing factors on the resistance fence. Isokinetics are used because they place minimal strain on the injured joints and muscles.

Huegli: Only if I were making recommendations to someone who would not be training directly with me or with consistent, competent supervision. I would also use machines with extremely weak athletes that may not be able to use the bar.

Mannie: Safety is the biggest concern when dealing with beginners. For the most part, safety is an inherent feature with machine training. Although instruction and supervision are still critical, machines offer a less risky alternative to free weights.

Peterson: My philosophy does not change regardless of the ability of the lifter. The only exception to this is if there is a large number of novice lifters and teaching and supervision is being compromised. I would then use more machines and gradually introduce certain free weight exercises as safety and time permit.

Thomson: This is a very important part of the rehab process. It allows the athlete to safely progress and return to the full program. The use of machines allows the athlete to gain confidence and to use an alternative exercise until the regular exercise may be performed again.

Williams: Our exercise machines are in an area that acts as an extension to our training room. Machines are available for the rehabilitation of ankles, knees, lower back and shoulders. Injuries to fingers, hands and wrists are common and make barbell training difficult or impossible. In those cases, we have tried to maintain upper body strength with the pullover, peck deck and lateral raise machines.

Stationary bikes and stairclimbers are available to help maintain a high level of conditioning as well as knee rehabilitation.

Would your philosophy on the use of exercise machines change if you were introducing a novice lifter to strength training?

When purchasing an exercise machine, what are your primary considerations?

Huegli: There are many considerations:
1. How will the machine fit into the total program and philosophy?
2. Will the athlete use the machine, or is it too complicated?
3. How many of the machines are necessary for a program of our size?
4. What is the cost?
5. Do we have space for the machine, and how would it fit into the overall weight room configuration?
6. What kind of results can we expect to achieve by using the machine? Does it meet our needs?
7. Safety, durability and adjustability for the range of body sizes in our program.
8. Company reputation, not only with regard to quality, but business practices and repair or maintenance calls.

Mannie: We look for durable machines which offer variable resistance and can accommodate a 110 lb. tennis player as well as a 300 lb. offensive tackle. Although I am not a spokesperson for any particular equipment company, we are extremely pleased with our Hammer machines. These pieces meet the function requirements and are well-designed, affordable, and virtually maintenance free. They also offer a wide variety of machines for the various muscle groups, which is an essential component in our set-up.

Peterson: The following questions must be answered when purchasing machines:
1. Are they biomechanically correct?
2. Do they do what they are supposed to do?
3. Is it made of quality material?
4. Is there quality workmanship on every machine?
5. Are they safe?
6. Are they easy to use?
7. Does the company provide good service?
8. Will the company remain in business?

**Thomson:** I consider the benefits and needs of all athletes being trained by the strength staff. Also the cost, durability, size, warranty, etc.

**Williams:** The equipment has to be biomechanically safe; must be useable by individuals of different sizes and not cause unusual strain on the joints; durability and craftsmanship are important; the equipment must withstand heavy use; the type and amount of maintenance is important; the equipment should be easily maintained and have very few replacement parts; the price of the equipment is very important; it is important to buy top quality equipment that will last, rather than inexpensive equipment that will have to be replaced.

**For strength development of the upper body, what machine exercises would you recommend and why?**

**Mannie:** A short list of upper body machines includes the following:
1) 4-way neck machine
2) Chest fly or pressing unit
3) Pulldown and/or seated rowing machine
4) Lateral raise
5) Rear deltoid

Of course, as budget constraints permit, we would gradually purchase machines for the anterior and posterior aspects of the torso in a one-to-one ratio. By doing this, we provide a wide range of variety and achieve balance in our program.

**Peterson:** The following is a list of machine exercises that I would recommend for the upper body. They are listed according to the respective muscle groups. The low back and abdominals are important muscle groups but we develop strength in them through body weight and free weight exercises.

<table>
<thead>
<tr>
<th>Chest</th>
<th>Back</th>
<th>Shoulder</th>
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<tbody>
<tr>
<td>Chest press</td>
<td>Lat pull down</td>
<td>Shoulder press</td>
</tr>
<tr>
<td>Incline press</td>
<td>Seated row</td>
<td>Lateral raise</td>
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<td>Fly</td>
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<tr>
<td>Cable-crossover</td>
<td>Smith upright row</td>
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</table>

**Bicep**
- Arm curl
- Cable curls

**Tricep**
- Tricep press
- Tricep extension

These exercises are used because they are important machine exercises for strength development. Also, we select machines that have more than one exercise function. For example, Smith press can be used for chest, back, shoulder and tricep exercises.

**Thomson:** I recommend the bench, incline and military press, and specific machines for smaller muscles groups.

These machines can be used as an alternative on lighter training days, variety from the normal routine and good supplemental work.

**Williams:** The lat machines and low-cable rows are standard for working the upper back and arms and allow for variety. I particularly like the Keiser bench press and upper back (rowing) machines. The bench press machine provides more resistance as your arms lock out and, like all the Keiser equipment, you can train at high speeds which is more sport specific.

**For strength development of the lower body, what machine exercises would you recommend and why?**

**Huegli:** I recommend the leg extension, leg curl, multi-hip, leg press abduction-adduction and shuttle. The leg extension, leg curl and abduction-adduction exercises are intended to be insurance exercises because they help prevent injuries. The same can be said for the multi-hip (four-way hip machine). We want to prevent injuries by using these machines, but we want to strengthen muscle groups that are greatly involved in performance and injury prevention.

**Mannie:** A seated leg press with firm back support and allowance for a wide ROM is a must. This multi-joint exercise offers athletes a relatively safe way to target the hips and legs. Leg extension and leg curl units are needed for direct work of the quadriceps and hamstring. A hip and back unit is useful to isolate those areas.

**Thomson:** Hip abduction, adduction and hip flexion are movements that are important and can be performed manually if the budget doesn’t permit the purchase of these units.

**Peterson:** The lower body machine exercises are listed with their respective muscle groups.

<table>
<thead>
<tr>
<th>Quadriceps</th>
<th>Hamstrings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leg press</td>
<td>Leg curl</td>
</tr>
<tr>
<td>Back squat</td>
<td>Smith squat</td>
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<tr>
<td>Leg extension</td>
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</tr>
<tr>
<td>Hip</td>
<td>Calves</td>
</tr>
<tr>
<td>Multi-hip</td>
<td>Standing calf</td>
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<tr>
<td>Smith lunge</td>
<td>Seated calf</td>
</tr>
<tr>
<td>Hip and knee</td>
<td></td>
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</table>

These machine exercises are used for the same purpose that they are used for the upper body.

**Thomson:** I recommend the leg or hip sled, leg extension and curl, toe raise, low back extension, hip and back and multi-hip machines.

These machines are useful for any athlete who has certain restrictions on particular exercises and adaptations are needed.

**Williams:** The two machines that I recommend for legs are the glute-ham machine and the Bear Jump-squat machine. The glute-ham provides the ability to train the hamstrings with hip extension and knee flexion in the same exercise. It is also good for performing hyperextensions for the lower back. The Bear can be used for various jumping and squatting movements and standing toe raises. It develops explosive legs and improves the vertical jump.

Leg extension and leg curl machines and abduction and adduction machines are good for isolating muscles in the legs. Seated calf machines are good for the soleus muscle, and I recommend the D.A.R.D. for working the shins (dorsi-flexion).

In the absence of free weights, list 8-10 machine exercises you would
recommend for a three-day per week total body workout.

Huegli: I recommend the leg press, chest press, leg extension, dips, pull ups, leg curls, rowing, back extension and abdominal crunches (which may be performed without a machine). These exercises are fairly complete in working the total body. We use these exercises for various teams during the maintenance phases in circuit types of training. All of these exercises can be performed on a Universal Gym, and, if this is the only available piece of equipment, a reasonable amount of strength conditioning can be done. On a Universal, for example, circuits can also be arranged by assigning two people per station, with one jogging while the partner is performing the weight exercise.

Mannie: The machines I would recommend in this situation are as follows:
1. Four-way neck machine
2. Leg press
3. Leg curl
4. Leg extension
5. Hip and back
6. Abduction/adduction (one day per week)
7. Chest fly
8. Incline or decline press
9. Seated row
10. Shoulder press
11. Pulldown
12. Lateral raise
13. Rear deltoid
14. Dip
15. Gripper

Peterson: Wed.
Smith squat
Leg curl
Leg extension
Chest press
Incline press
Fly
Pullover
Smith upright row
Lateral raise
Cable curls
Tricep extension

Thomson: Leg press, bench press, military press, lat pulldown, leg extension and curl, upright row, pull up, bicep and tricep work, neck, shrug, pullover and low back extension.

Williams: Mon., Wed. and Fri.
Bearsquats/jump squats – alternate each workout
Glute-ham raise
Glute-ham hyperextensions
Standing toe raises
Bench press
Lat pulldown
Seated press
Rows
Shrugs or upright rows on a pulley Curls

In the absence of free weights, list 6-8 machine exercises for a Monday/Thursday and 6-8 machine exercises for a Tuesday/Friday split routine.

Huegli: For a four-day split routine I would organize the program for leg-body areas. For example, back, legs and biceps on Monday and Thursday. On Tuesday and Friday we would work the chest, triceps and abdominals. This is only one way to organize the split, and the machines may be grouped as follows:

Peterson: Mon./Thurs. Tues./Fri.
Leg press Pec-deck
Lat pulldown Tricep extension
Leg extension Chest press
Seated row Pull over
Leg curl Abdominal crunches
Bicep curl Dips
Back extension
Pull-ups Lateral shoulder raise
Torso rotator

Mannie: We use a three days per week system during off-season periods. However, if I were to recommend such a split routine, it would be as follows:

Peterson: Mon./Thurs. Tues./Fri.
Neck Leg press
Chest press Leg curl
Hi-row Leg extension
Behind neck press Iso-lateral
Iso-lateral leg press
Pulldown Hip/back

References for Mannie
2. Birk, T.J., Assistant Professor, Departments of Medicine and Rehabilitation Medicine, Medical College of Ohio. Conversation. 1993.
Roundtable Authors

Rick Huegli, C.S.C.S.
Strength and Conditioning Coach
University of Washington
Seattle, Washington

Ken Mannie, C.S.C.S.
Strength and Conditioning Coach
The University of Toledo
Toledo, Ohio

Dick Peterson, C.S.C.S.
Strength and Conditioning Coach
East Chicago Central High School
East Chicago, Indiana

Ron Thomson, C.S.C.S.
Strength and Conditioning Coach
Boise State University
Boise Idaho

Dave Williams, C.S.C.S.
Strength and Conditioning Coach
Liberty University
Lynchburg, Virginia

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