Volume 28, Number 3, pages 20–27

Keywords: lacrosse; preseason training; complex training; interval weight training

A Preseason Resistance Training Program for Men's Lacrosse

Troy A. Burger, MS, ATC, CSCS, PES, Molly E. Burger, MS, ACSM-HFI, CSCS
Limestone College, Gaffney, South Carolina

summary

Despite the recent popularity and growth of lacrosse, there has been a lack of specific training programs for the sport. This article provides one example of a preseason resistance training program for male lacrosse athletes. The program utilizes a variety of training strategies, including complex and interval weight training, specific to the energy demands of each position.

Often called "the fastest game on two feet," lacrosse is a sport growing in popularity across the country for youth, high school, college, and professional competitors (12). Since 1999, participation in lacrosse youth leagues has increased by almost 250% (12). Lacrosse has been shown to have the fastest growth rate of any high school sport, with more than 140% growth in men's teams and 250% growth in women's teams over the past 10 years (12). Similarly, collegiate-level lacrosse is exploding, with lacrosse topping the chart of fastest-growing college sports with an almost 55% increase for both men and women (12). Many colleges continue to add lacrosse for varsity competition. In 2004, the Carolinas-Virginia Athletics Conference included women's lacrosse as a conference sport.

The growth of the sport also is evident in record 2005 spectator attendance. A crowd of 44,920 attended the National Collegiate Athletic Association Men's Division I Final, and 19,432 fans watched the National Lacrosse League Championship (12). Likewise, women's lacrosse is growing in spectator support, with a crowd of 6,820 watching the 2005 International Federation of Women's Lacrosse Associations World Cup in Maryland, the largest spectator attendance at any women's lacrosse game in the United States (12).

Despite this popularity and growth of lacrosse, training programs for the sport are limited. Lacrosse combines elements of basketball, soccer, and hockey (12). However, no specific training programs for the sport have been researched or promoted by strength and conditioning professionals. This article will focus on a preseason resistance training program for male lacrosse athletes. Table 1 depicts where this mesocycle would fall in a year-round, periodized training program.

We prefer to split the preseason resistance training program into 3 groups (goalies, attack and defense, and midfielders; see Table 2) to better target the sport-specific demands of each position on the field. Goalies (Figure 1) typically have a space of 35–40 yds to protect, but most often stay within the crease, or immediately in front of the goal. The movements required of the goalie are primarily explosive, reactive movements responding to a shot on the goal. Because of this, the focus of training is to increase the goalie's rate of force production (1, 8) and the ability to explosively change positions. The other lacrosse positions also need to develop power and increased rate of force development, so the goalie training program will serve as the foundation for all other position training programs.

The goalie preseason program will focus on power development using a progressive model of heavy-resistance

Table 1
Annual macrocycle

Preseason	TRANSITION	In-season	Postseason	EVALUATION	Off-season 1	TRANSITION or ACTIVE REST	Off-season 2	TRANSITION or ACTIVE REST
Power development Increase movement speed Incorporate advanced training techniques 1. Complex training 2. Interval weight training		Low volume maintenance program Length of the season may include championship mesocycle Mesocycles using undulation periodization, day-to-day adjustments	Active rest, 2–3 wks		Early reconditioning "General training" Later basic strength development 1–2 (4-wk cycles)		Strength development 1–2 (4-wk cycles) Off-season 1 & 2 May blend basic and peak strength development	
Basic conditioning focus in relationship to resistance training								
Sport-specific conditioning & injury prevention		Largely from sport practice and play 1 day of basic conditioning 1 day of speed work Short sessions in practice or weights	Recovery Encourage activity & cross-training		Cardiovascular fitness (limited running) progressing to... Cardiovascular fitness (running focus) progressing to... Interval running, long duration (improving glycolytic capacity) progressing to... Higher intesity, short-duration sprints & change of direction drills (early preseason)			

training and plyometrics (1–3, 8, 9). The focus of this 6–8 weeks of training will be neuromuscular adaptation. The key to power development is to use exercises with higher movement speed, as opposed to the high-load, slow movement speeds used in off-season strength development (1, 2, 9). Strength and power require changes in different mechanisms, although researchers admit that this is not completely understood (2, 9).

The program to follow is 8 weeks long. The entire body will be trained each day, using 3 training sessions per week. Training sessions will alternate between high, low, and medium workloads by adjusting the volume and intensity of

Figure 1. Lacrosse goalie.

Table 2
Resistance training programs for men's lacrosse by position

	Goalies	Attackmen and defensemen	Midfielders
Microcycle 1 (2 weeks)	*Monday* Structural exercises (supersets, 3–5 min rest) Clean pull, 3 × 5, 82% Medicine ball OH throw, 3 × 10 1. Squats, 3 × 5, 82% Squat jumps, 3 × 10 2. Push-press 3 × 5, 82% Medicine ball 2-hand OH throw (Figure 5), 3 × 10 Supplemental: (2–3 min rest) 1. Pull-ups, 3 × 5 2. Romanian deadlift, 3 × 5, 82% 3. Hammer jammer rotation and press, 3 × 8 Core stabilization: Choice of dynamic exercise, 3 × 8, 1 min rest Rotator cuff circuit: 3 × 15, 1 min rest *Wednesday* Structural exercises: 3 × 5, 3–5 min rest, 70% 1. Snatch pull 2. Split squat 3. Jerk Supplemental: 3 ×10, 2–3 min rest 1. Cord alternating arms standing row 2. Ball single leg curl 3. Cord alternating arms standing press Core stabilization: Choice of static exercise 3 × 8, 1 min rest Rotator cuff circuit: same as Monday *Friday* Structural exercises: 3 × 5, 3–5 min rest, 75% 1. Power clean 2. Front squat 3. Incline press Supplemental: 3 × 10, 2–3 min rest, 60% 1. One-arm row 2. Leg curl 3. Dips Core stabilization: Choice of dynamic exercise, 3 × 8, 1 min rest Rotator cuff circuit: same as Monday	*Monday, Wednesday, Friday* Same as goalie microcycle 1	*Monday* Same as goalie microcycle 1 *Wednesday* Same as goalie microcycle 1 *Friday* (IWT) 1. Power clean, 3 × 5, 75% Bike, 2 min, 90% HR max 2. Front squat, 3 × 5, 75% Treadmill, 2 min, 90% 3. Incline press, 3 × 5, 75% Upper body erg, 2 min, 90% • Perform free exercise immediately after structural exercise without rest • Rest 3–5 min following each free exercise Supplemental: IWT Circuit 1. One-arm row × 8, 65% 2. Leg curl × 8, 65% 3. Dips × 8 4. Crunches × 8 5. Cross-trainer 2 min • Circuit to be performed 3 times • Rest 1 min between each exercise, 2 min between circuits Rotator cuff circuit: 3 × 15
Microcycle 2 (2 weeks)	*Monday* (complex training) Same as microcycle 1 *Wednesday* Structural exercises (supersets, 3–5 min rest) 1. Snatch pull 3 × 5, intensity: 70% Balance reach (see Figures 6a, 6b), 3 × 12 2. Split squat, 3 × 5, intensity: 70% Wobble board squat (see Figure 7), 3 × 12 3. Jerk, 3 × 5, intensity: 70% Upper body step-ups (see Figure 8), 3 × 12 Supplemental, core: same as microcycle 1 Rotator cuff circuit: 3 × 20 *Friday* (complex training) Structural exercises (supersets, 3–5 min rest) 1. Power clean, 3 × 5, 75% Medicine ball jump to box (see Figures 9a, 9b), 3 × 10 2. Front squat, 3 × 5, 75% Band squat jumps, 3 × 10 3. Incline press, 3 × 5, 75% Plyometric push-ups, 3 × 10 Supplemental, core: same as microcycle 1 Rotator cuff circuit: 3 × 20	*Monday* Same as goalie microcycle 2 *Wednesday* Same as goalie microcycle 2 *Friday* (IWT) Power clean, 3 × 5, 75% Bike, 2 min, 90% HR max Front squat, 3 × 5, 75% Treadmill, 2 min, 90% Incline press, 3 × 5, 75% Upper body erg, 2 min, 90% • Perform free exercise immediately after structural exercise without rest • Rest 3–5 min following each free exercise Supplemental, core, rotator cuff: Same as goalie microcycle 2	*Monday* Same as goalie microcycle 2 *Wednesday* Same as goalie microcycle 2 *Friday* (IWT) 1. Power clean, 3 × 5, 75% Bike, 3 minutes, 90% HR max 2. Front squat, 3 × 5, 75% Treadmill, 3 min, 90% 3. Incline press, 3 × 5, 75% Upper body erg, 3 min, 90% • See instructions microcycle 1 above Supplemental: IWT circuit (microcycle 1 above) Rotator cuff circuit: 3 × 20

Table 2 continued
Resistance training programs for men's lacrosse by position

	Goalies	Attackmen and defensemen	Midfielders
Microcycle 3 (4 weeks)	*Monday* (complex training) Same as microcycle 1 & 2 2–3 reps on clean pull, squat, and push-press, 88% *Wednesday* Same as microcycle 2 Use 2–3 reps on snatch pull, split squat, and jerk, 75% *Friday* (complex training) Same as microcycle 2	*Monday* (complex training) Same as goalie microcycle 3 *Wednesday* Same as goalie microcycle 3 *Friday* (IWT) Same as midfielder microcycle 1 Friday IWT + IWT circuit	*Monday* (IWT) 1. Clean pull, 3 × 3, 88% Bike, 3 min, 90% HR max 2. Squat, 3 × 3, 88% Treadmill, 3 min, 90% 3. Push-press, 3 × 3, 88% Upper body erg, 3 min, 90% • See instructions microcycle 1 above Supplemental (2–3 min rest) 1. Pull-ups, 10, 3, 3 2. Romanian deadlift, 3 × 5, 82% 3. Hammer jammer rotation and press, 3 × 8 Core stabilization: Choice of dynamic exercise, 3 × 5, 1 min rest Rotator cuff circuit: 3 × 20 *Wednesday* (plyometric and stabilization) Perform as supersets, 3–5 minutes rest 1. Squat jump, 3 × 8–10 Balance reach, 3 × 12 2. Speed-skate hops (see Figure 10), 3 × 8–10 Wobble board squat, 3 × 12 3. Medicine ball 2-hand OH throw, 3 × 8–10 Lateral upper body step-ups (see Figure 11), 3 × 12 Supplemental, core, and rotator cuff same as goalie microcycle 1 *Friday* (IWT) 1. Power clean, 3 × 5, 75% Bike, 3 min, 90% HR max 2. Front squat, 3 × 5, 75% Treadmill, 3 min, 90% 3. Incline press, 3 × 5, 75% Upper body erg, 3 min, 90% • See instructions microcycle 1 above Supplemental: IWT circuit (microcycle I above) Rotator cuff circuit: 3 × 20

OH = overhead; IWT = interval weight training; HR max = maximum heart rate; erg = ergometer. Percentages are based on 1 repetition maximum (weight exercises) and HR max (free exercises).

training. We have incorporated complex training strategies, using the combination of heavy resistance training and plyometric training in the same training session (3, 5).

As with goalies, attackmen (Figure 2) and defensemen (Figure 3) must develop the ability to sprint, jump, and change direction. Thus, the basic resistance training plan for these positions is based on the previous goalie training. These athletes place a higher demand on their glycolytic energy system than goalies do, because of the intermittent sprinting performed as a demand of their positions (4, 7, 8). To more closely match the metabolic demands, we have added interval weight training (IWT) to their training programs. Interval weight training is the process of executing a major multijoint exercise (clean, power clean high pull, or squat) followed immediately by 2–3 minutes of intense anaerobic free exercise (stationary biking, stair climbing, or treadmill) (10). It is hypothesized that this type of training will develop anaerobic power (10). Interval training has been recommended in the conditioning of sports such as soccer (6). Soccer is an activity that slides along an aerobic-anaerobic continuum, depending on the intensity and duration of the work-recovery cycle (6, 7). When we compared the energy system utilization of soccer to lacrosse—there were no training articles about lacrosse from which to draw—it became evident that not only do the 2 sports use fields of similar size, but the energy demands of the

Figure 2. Lacrosse attackman.

Figure 3. Lacrosse defenseman.

Figure 4. Midfielder facing off.

sports are similar, as well (7). Lacrosse is shown to place significant demand on the anaerobic energy systems, as does soccer (7). Based on the knowledge and support for this type of training in similar sports (11), IWT has been incorporated into the following programs.

Despite the lack of time-motion studies for lacrosse, it is apparent that midfielders have a larger portion of the field to cover and transition with the ball back and forth from defense to offense. The potential is for these athletes to tax their glycolytic system even more than the other positions, depending on how long they remain on the field. It stands to reason that midfielder training should incorporate additional time devoted to IWT (10). We combined the 2 previous programs to develop the midfielder training program. Microcycle 1 is unchanged for Monday and Wednesday, but on Friday, midfielders begin IWT. Microcycle 2 continues 1 day per week of IWT, and by cycle 3, the midfielders will perform 2 IWT sessions per week. Because of the intensity of the IWT, the athletes will perform a brief plyometric training session only on day 2 to keep from overtraining (10).

Face-off specialists (Figure 4) have an added level of complexity in the demands of their position. The face-off requires the athlete to have an explosive development of force, but often this is followed by the 2 athletes wrestling for position to rake or pull the ball for possession. This wrestling requires high levels of slow speed or peak strength (10), which is not as important for the other athletes on the field. For this reason, face-off specialists must have their programs adjusted to account for this demand. Removing the first set of free exercise from the IWT sessions and using a 3–5 repetitions maximum for the first 2 loaded sets allows the athlete to use a higher load and specifically work on maintaining peak strength.

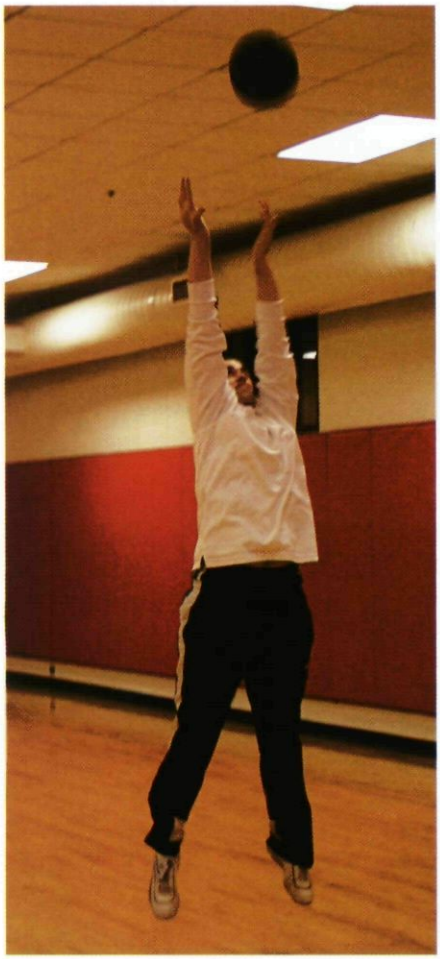

Figure 5. Medicine ball 2-hand overhead throw (pressing).

Figure 6. a. Balance reach (starting position); b. Balance reach (end position).

Figure 7. Wobble board squat.

This is an example of a preseason resistance training program for training men's lacrosse (training exercises are illustrated in Figures 5–11). Because men's lacrosse is growing in popularity, there is high demand for lacrosse-specific training programs. The techniques and theories are based on sound principles that are common in strength and conditioning today (linear periodization, complex and combined training, plyometric training, and interval training).

Some aspects of the program, such as the repetition recommendations for plyometric exercises, need more discussion and research. We based the repetition recommendations in this program on a previous study that used a 10 repetition recommendation (3). It has been suggested, and makes logical sense, that fewer repetitions would be better for power development. The original proponents for complex training suggested that the benefits of the hyper-stimulated musculature following the heavy resistance exercise may be beneficial only for the first repetition or two (5). The use of higher reps

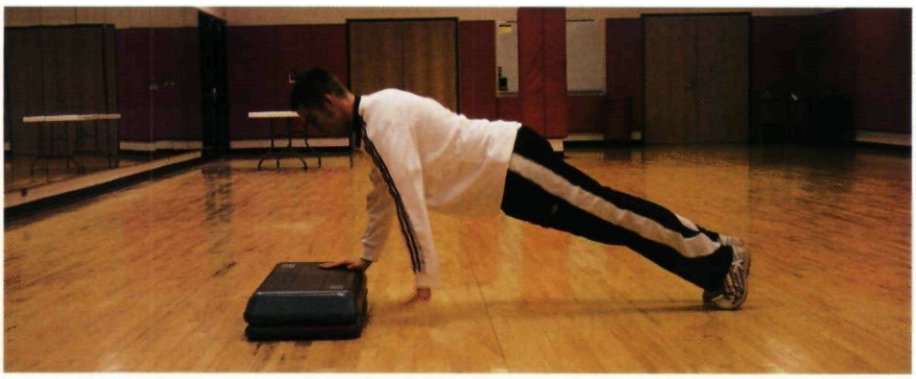

Figure 8. Upper body step-ups.

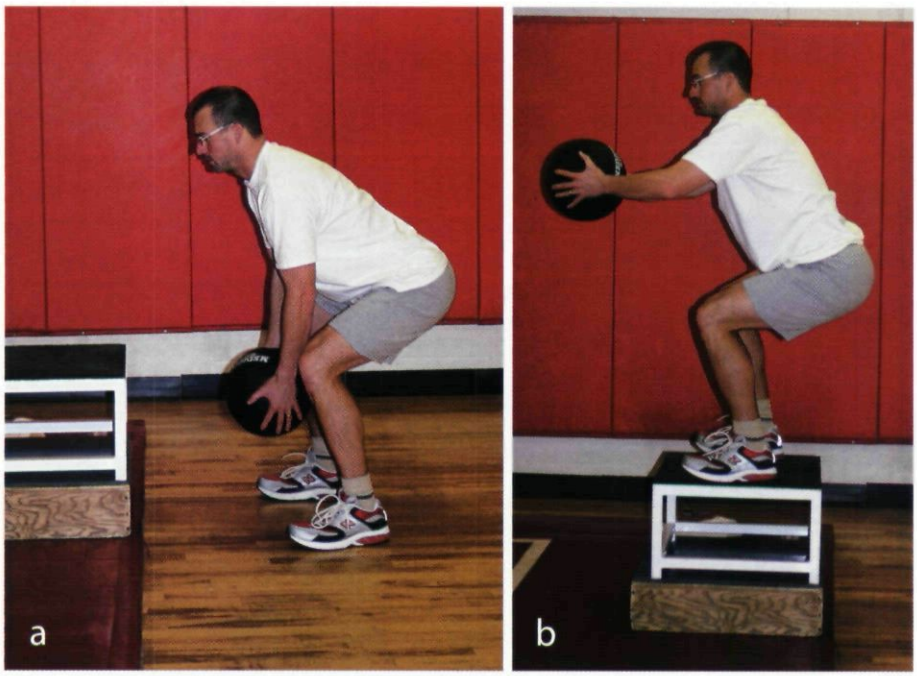

Figure 9. a. Medicine ball jump up to box (starting position); b. Medicine ball jump up to box (end position).

in this program was purely a coaching decision. As strength and conditioning coaches, we often have to sell the coaches and athletes on the program. If we can do this without jeopardizing the science used to develop the program, then there should be no problem. If the athletes focus on maximal effort for every repetition, and the program allows for enough rest, the first couple of repetitions would be maximally explosive and at the high movement speed needed. Additional repetitions can serve to make the athletes feel as though they have worked exhaustively, which many athletes and coaches feel must be accomplished in a good training session. More research in this area needs to be performed before specific recommendations for repetitions can be made definitively for power development using a combination of heavy resistance training and plyometrics.

Lacrosse might be compared to basketball and soccer, but strength and conditioning professionals need to examine the sport and design programs intended specifically for lacrosse. The specific metabolic demands of lacrosse positions should be more closely analyzed, including time-motion studies to substantiate the training recommendations. Because of the length of the lacrosse season and the fact that

Figure 10. Speed-skate hops.

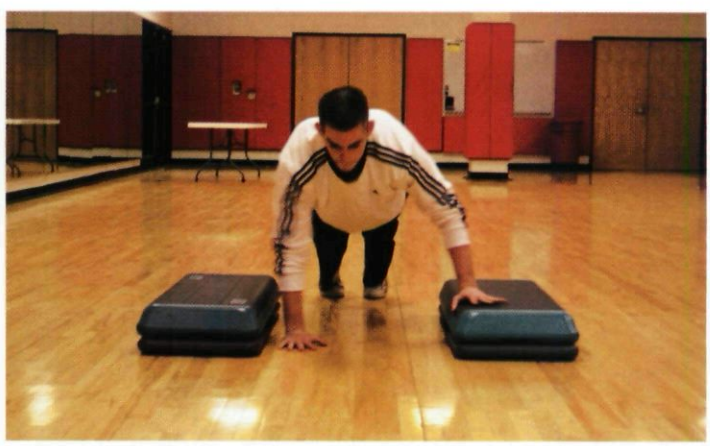

Figure 11. Lateral upper body step-ups.

many of the athletes also participate in a nontraditional season, it would be interesting to see some training programs that specifically use undulating periodization with lacrosse athletes. This is only one example of a preseason lacrosse program. We hope that this article will inspire the dissemination of information on strength and conditioning programs for lacrosse athletes. ♦

References

1. Baechle, T., R. Earle, and D. Wathen. Resistance training. In: *Essentials of Strength Training & Conditioning*. T. Baechle and R. Earle, eds. Champaign, IL: Human Kinetics, 2000. pp. 395–426.
2. Baker, D., G. Wilson, and R. Carlyon. Periodization: The effect on strength of manipulating volume and intensity. *J. Strength Cond. Res.* 8(4): 235–242. 1994.
3. Burger, T., T. Boyer-Kendrick, and D. Dolny. Complex training compared to a combined weight training and plyometric training program [abstract]. *J. Strength Cond. Res.* 14(3): S360. 2000.
4. Conley, M. Bioenergetics of exercise and training. In: *Essentials of Strength Training & Conditioning*. T. Baechle and R. Earle, eds. Champaign, IL: Human Kinetics, 2000. pp. 73–90.
5. Ebben, W.P., and P.B. Watts. A review of combined weight training and plyometric training modes: Complex training. *Strength Cond. J.* 20(5):18–27. 1997.
6. Hedrick, A. Soccer-specific conditioning. *Strength Cond. J.* 21(2):17–21. 1999.
7. Kraemer, W. Physiological adaptations to anaerobic and aerobic endurance training programs. In: *Essentials of Strength Training & Conditioning*. T. Baechle and R. Earle, eds. Champaign, IL: Human Kinetics, 2000. pp. 137–168.
8. McArdle, W.D., F.I. Katch, and V.L. Katch. *Exercise Physiology: Energy, Nutrition, & Human Performance* (5th ed.). Boston: Lippincott Williams & Wilkins, 2001. pp. 500–548.
9. McBride, J.M., T. Triplett-McBride, A. Davie, and R.U. Newton. A comparison of strength and power characteristics between power lifters, Olympic lifters, and sprinters. *J. Strength Cond. Res.* 13(1):58–66. 1999.
10. O'Shea, P. *Quantum Strength Fitness II*. Corvallis, OR: Patrick's Books, 2000. pp. 183–191.
11. O'Shea, P. *Quantum Strength Fitness II*. Corvallis, OR: Patrick's Books, 2000. pp. 193–236.
12. U.S. Lacrosse. *U.S. Lacrosse Participation Survey: A Review of National Lacrosse Participation 2004*. Baltimore: U.S. Lacrosse National Headquarters, 2005.

Burger

Troy Burger is an instructor of physical education and athletic training and is the strength and conditioning coach at Limestone College.

Burger

Molly Burger is an adjunct instructor in the physical education department at Limestone College.