ABSTRACT

PETERSEN, T. P. Effects of slide board training on the lateral movement of college-aged football players. MS in Exercise and Sport Science-Human Performance, August 2000, 89pp. (J. Porcari)

The purpose of this study was to determine if training on the slide board would enhance lateral motion in collegiate football players. Forty-one collegiate football players (mean age 20.1 years) completed either a 10-week weight training (WT) or weight training plus slide board (WTSB) program. The following pre- and posttests were administered: the lateral shuttle run (LSR), the lower extremity functional test (L.E.F.T.), the cone test, the box test, and the squat and bench press tests. Following the pretesting evaluation, subjects were randomized into a WT group ($N = 17$) and a WTSB group ($N = 24$) based on their pretesting strength and agility scores. Both groups underwent 10-weeks of weight training, however, the WTSB group added a 3-day/week slide board training. Data were analyzed using a 2-way ANOVA with repeated measures. It was found that there were significant differences ($p < .05$) in the pre- and posttests within both groups for the squat and bench press, the LSR, L.E.F.T., and cone test performances, but differences between groups were not significant ($p > .05$). For the box test, there were different responses between groups from pre- to posttesting. The WT had a significantly ($p < .05$) lower score on posttesting than pretesting, and this decline in performance was significantly ($p < .05$) different from the responses of the WTSB group. In conclusion, it appeared that slide board training had no beneficial effect for collegiate football players.

EFFECTS OF SLIDE BOARD TRAINING ON THE LATERAL MOVEMENT OF COLLEGE-AGED FOOTBALL PLAYERS

A MANUSCRIPT STYLE THESIS PRESENTED

TO

THE GRADUATE FACULTY

UNIVERSITY OF WISCONSIN-LA CROSSE

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MASTER OF SCIENCE DEGREE

BY

TIANNA S. PETERSEN

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THESIS FINAL ORAL DEFENSE FORM

Candidate: Tianna Sion Petersen

We recommend acceptance of this thesis in partial fulfillment of this candidate's requirements for the degree:

Master of Science: Exercise and Sport Science – Human Performance

The candidate has successfully completed the thesis final oral defense.

Thesis Committee Chairperson Signature — Date: 4/24/00

Thesis Committee Member Signature — Date: 4/24/00

Thesis Committee Member Signature — Date: 4/25/00

This thesis is approved by the College of Health, Physical Education, and Recreation.

Associate Dean, College of Health, Physical Education, and Recreation — Date: 5/23/00

Director of University Graduate Studies — Date: 5/23/00

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INTRODUCTION

Background

In the past decade strength training has become an integral component for training athletes. As a broad definition, Caldwell (2) refers to strength training as training the ability of the muscle to exert force. He further refers to strength training as muscle resistance training, or "applying maximum stress on a muscle - loading it to capacity - in order to build strength, power, and endurance." Hage (5) has also stated that training for strength, power, and endurance are essential for athletic participation. However, in recent years the concept of strength training has been further defined and the idea of functional strength has been introduced (10). Maclean (10) reported that the primary goal of functional strength training is "to develop sport-specific strength and lateral stability in movement patterns required by a particular sport." One specific sport that requires lateral movement is football, where the players cut in and away from their opponents (3).

In football, training can be categorized into four seasons: preseason, in-season, postseason, and off-season. Gaunya (4) called this approach "the quadratic training cycle." In "American tackle football" post- and off-season training generally goes from February to May, and May to July, respectively (1). Arnheim (1) and Hage (5) suggest that particularly during the off-season one should choose activities that embody strength, endurance, flexibility, weight gain, sport-specific skills, and lateral movement.

Lateral movement is motion in the frontal plane. The frontal plane, as defined by Kreighbaum and Barthels (8), is the plane that divides the body into front and back parts. When the body is moving along this plane it will pass from side to side. Maclean (10) revealed that primary movement in the frontal plane makes up 60 to 90% of many sport-specific activities. Some activities whose primary movements are in the frontal plane would include tennis (serve reception), baseball (infielder's starting position), basketball (defensive positions), downhill skiing (moving laterally), and football (three-point stance - especially in linemen and defensive backs). During the off-season, many authors have stated that training should emphasize agility, laterality, and weight training. Vick (13) set up an off-season football quickness program, with objectives that included: development of quick feet, developing good lateral movement, stressing quick movement, building endurance, working large muscle groups as quickly as possible, and discussing attitude on how to perform maximally for short lengths of time. Thus, the focus for a model program would incorporate the specificity of training principle; in other words, to specifically train and adapt the individuals to a particular movement within a sport.

Specificity of training, as defined by Kroll (9), refers to matching the conditioning or strength demands of the sport to the training techniques. Similarly, the Specific Adaptation to Imposed Demand (SAID) principle states that the body will train the specific muscles involved in the desired performance in the most effective way (8). In other words, specific exercise for lateral movement will elicit specific adaptation, thus creating specific training effects (11). Since a detailed training mode has not been created specifically for lateral movement, the need for a sport specific training mode that

will enhance lateral movement was needed. In an attempt to address this issue Training Camp International, Inc. (12) of Bala Cynwyd, Pennsylvania along with other companies such as Reebok of Stoughton, Massachusetts and Improve Human Performance, Inc. (7) of Englewood, Colorado, have developed slide boards, which provide this side-to-side, or lateral movement. Recently, slide boards and slide board training have become a focus of fitness companies and have been introduced into the general population.

Little research has been done on the effectiveness of training with slide boards. The Training Camp (7) compared the metabolic costs of treadmill versus sliding exercise and found that slide board users utilize twice the amount of oxygen on the slide board compared to walking on the treadmill at a comparable cadence. Only one study has investigated the effect of training on the slide board (6). Harmer and Nethery (6) concluded that slide board training improved agility and cardiovascular efficiency. However, the study was performed using a small sample size (6 subjects), and did not have a control group.

The purpose of this study was to determine if training on the slide board would enhance lateral motion in collegiate football players. Football players were chosen as subjects since football requires a high degree of lateral motion.

METHODS

This section discusses the subject selection, testing procedures, and statistical analysis of the data.

Subject Selection

The University of Wisconsin-La Crosse Institutional Review Board for the Protection of Human Subjects approved the protocol. Permission was obtained from the head coach of the University of Wisconsin-La Crosse football team to solicit players' participation in this study. This study was limited to players without a recent groin, ankle, or adductor injury. Fifty subjects initially began the study. The subjects were randomized into a weight training group (WT) (N = 25), and a weight training plus slide board group (WTSB) (N = 25), based on their pretesting squat press and agility scores. This was done to ensure equality amongst the two groups at the start of the study.

Testing Procedures

The study was divided into four phases: pretesting, practice, training, and posttesting.

Pretesting. For the pretesting, the subjects completed six tests on two separate days. The tests included: two strength tests (squat and bench press), two lateral motion tests (lateral shuttle run (LSR) and the lower extremity functional test (L.E.F.T.), and two sport-specific tests, the cone and the box jump tests. All the tests were performed in the same order for all subjects, which were squat, bench press, LSR, cone, box, and L.E.F.T.

Day 1. On the first day, subjects reported to the University of Wisconsin-La Crosse Strength Center, completed an informed consent form (see Appendix A), were weighed, had their height measured, and completed the strength tests.

Maximal Squat Test. The standard tests for strength that were used were the 1 repetition maximum (1 RM) squat and bench press tests. In order to perform the 1 RM

squat test, the subject was allowed an adequate amount of time to warm up. For instance, the subjects were allowed one set of 10 repetitions with a light weight. Then they squatted at 70% of their maximum weight and would go up incrementally in weight by 15 lbs. Next, the 1 RM squat test was performed. It consisted of placing the bar on the shoulders behind the head; feet shoulder width apart, and squatting the maximum weight possible, one time.

Maximal Bench Press Test. In order to perform the 1 RM bench press test, the subject was allowed an adequate amount of time to warm up. For instance, the subjects were allowed one set of 10 repetitions with a light weight. Then they bench pressed at 70% of their maximum weight and would go up incrementally in weight by 15 lbs. Next, the 1 RM bench press test was performed. It consisted of lying in a supine position on a bench and benching the maximum amount of weight as possible, one time.

Day 2. On the second test day, the subjects reported to the University of Wisconsin-La Crosse field house where lateral motion and sport-specific tests were administered. The standard tests that were used to test lateral motion were the lateral shuttle run (LSR) and the lower extremity functional test (L.E.F.T.).

Lateral Shuttle Run. The subject began the test in the center of a 10-foot span with the feet shoulder width apart and to the left of a centerline (see Appendix B). At the start, time began as the subject's foot crossed the line. Next, the subject would shuffle to the right 5 yards, to the left 10 yards and back 5 yards through the finish line. Time was recorded to the nearest .01 seconds.

Lower Extremity Functional Test. The L.E.F.T. test has subjects complete a diamond shaped course (30 ft in length and 10 ft across). The L.E.F.T. test consists of a sprint up and back, a retro (backward) run up and back, side shuffles around the cones to the right then left, cariocas to the right and left of the cones, figure 8's to the right and left of the cones, 45 and 90 degree cuts to the right and left, crossovers to the right and left, and finishing with the sprint and retro run again through the starting line (see Appendix C). Time was recorded to the nearest .01 seconds.

The standard tests that were used to test sport-specificity were the cone test and the box jump test.

Cone Test. The Cone Test was timed from the first movement and involved moving laterally around five cones that were set in a W-shaped formation and then shuffling back through to the finish line (see Appendix D).

Box Jump Test. The Box Jump Test required the subject to jump on and off a box, which was 28 inches high using a two-foot take-off. The test lasted 30 seconds and the score was counted by each time the subject jumped on top of the box within the allotted time (see Appendix E).

Practice. Prior to the start of the slide board training, the WTSB group had an adjustment or familiarization period consisting of three practice days. This familiarization period offered the subjects a chance to become accustomed to the training techniques and proper body positioning while using the slide boards.

Training. The training program was 10 weeks in duration. The WT group performed a two day per week leg strengthening program designed by a NCSA certified

strength and conditioning instructor (see Appendix F). The WTSB group used the same leg training program as the WT group, plus completed slide board training three days per week. The exact slide board protocol is in Appendix G.

The protocol for slide board training included a 3-5 minute warm-up period, a session lasting between 15-20 minutes, and a 3-5 minute cool down period. The sessions were held three days per week for 10 weeks, while sliding at a music cadence of 130-135 beats per minute, as suggested by the Training Camp International, Inc. (12) and the Cooper Institute for Aerobics Research (3).

The Reebok Slide Trainer was used for this study. The Slide Trainer consists of a 6-foot portable board that has a durable slide surface, a nonskid backing, angle bumpers, to enable the participant to maintain the proper biomechanical alignment, and booties which are nylon and slip over any type of tennis shoe or cross-trainer. Finally, the Reebok Slide Trainer has unique graduated end ramps (10-degree angle) that minimize the impact on the ankle, knee, and hip joints (3).

Posttesting. After the 10th week of training the subjects were posttested following the same procedures as the pretesting.

Statistical Analysis

Standard descriptive statistics were used to characterize the subject population. Differences between and among groups were investigated by using a 2-way ANOVA with repeated measures. Pairwise differences were determined using Tukey's post-hoc tests. Alpha was set at $p < .05$ to achieve statistical significance.

RESULTS

Forty-one of the original 50 players completed the study. The factors that contributed to the loss of subjects included poor attendance, lack of motivation, and one subject left school for personal reasons. Players included 6 wide receivers, 6 running backs, 4 tight ends, 8 linebackers, 14 defensive backs, 1 kicker, 1 quarterback, and 1 offensive lineman. Average attendance was 28 out of a possible 30 sessions (see Appendix H).

The descriptive characteristics of the subjects who completed the study are shown in Table 1. There were no significant ($p > .05$) differences in age, height, or weight between the groups at the start of the study.

Table 1. Descriptive characteristics of subjects in the WT (N = 17) and WTSB (N = 24) groups

Variable	Mean + SD	Range
Age (yr.)		
WT	20.3 ± 1.53	18.0 - 24.0
WTSB	20.0 ± 1.46	18.0 - 24.0
Height (in.)		
WT	72.2 ± 2.49	68.0 - 76.0
WTSB	71.9 ± 2.43	67.0 - 76.0
Weight (lb.)		
WT	207.5 ± 29.53	163.0 - 280.0
WTSB	202.4 + 30.21	156.0 - 275.0

The results of the training study are presented in Table 2. There were no significant ($p > .05$) differences between groups for any of variables at the start of the study. Therefore, it was concluded that the groups were well matched prior to training. Both groups had significant ($p < .05$) increases in squat and bench press strength from pre- to posttesting. However, the changes were not significantly ($p > .05$) different between groups. This was expected, as both groups participated in an identical strength training program. For the cone test, the LSR, and the L.E.F.T, both groups had significant ($p < .05$) improvements in performance from pre- to posttesting. Once again, however, the changes between groups were not significantly ($p > .05$) different.

Table 2. Comparisons of WT and WTSB groups from pre- to posttests

Variable		Pretesting Mean ± SD	Posttesting Mean ± SD
Squat (lbs.)			
	WT	354.1 ± 41.95	374.1 ± 53.54*
	WTSB	365.2 ± 47.45	386.0 ± 53.67*
Bench (lbs.)			
	WT	273.8 ± 45.67	283.8 ± 52.49*
	WTSB	271.7 ± 47.59	278.8 ± 44.68*
Box Test (# of jumps)			
	WT	35.0 ± 3.69	32.9 ± 3.57
	WTSB	35.5 ± 4.06	35.6 ± 4.30*#
Cone Test (sec.)			
	WT	20.3 ± 1.05	19.7 ± 0.68*
	WTSB	19.8 ± 0.94	19.4 ± 1.11*
LSR (sec.)			
	WT	5.26 ± 0.351	5.12 ± 0.270*
	WTSB	5.16 ± 0.249	4.95 ± 0.240*
LEFT (sec.)			
	WT	100.2 ± 5.61	94.2 ± 3.61*
	WTSB	99.6 ± 8.01	91.8 ± 7.12*

* Significantly different than pretesting ($p < .05$)
# Significantly different than the change for the WTSB group ($p < .05$)

There was a slight tendency for the WTSB group to show greater improvement in the Cone test and the LSR. However, the differences were not significant ($p > .05$).

For the box test, there were different responses between groups from pre- to posttesting. The WT group had a significantly ($p < .05$) lower score on the posttesting than the pretesting. This decline in performance was significantly ($p < .05$) different than the response of the WTSB group, which did not change ($p > .05$) from pre- to posttesting.

DISCUSSION

The purpose of this study was to determine if slide board training would enhance the lateral movement ability of collegiate football players. After 10 weeks of training, we found that both groups significantly improved in LSR, L.E.F.T., cone, squat, and bench press scores. However, there were no significant differences between groups, with the exception of the box test where the WT group actually decreased in performance. Since both groups increased in performance and there was no difference between groups, it was concluded that slide board training had no benefit in this group of subjects. It appears that all of the changes were related to the fact that both groups increased in their strength. In this study we chose to include strength training for both groups, because most collegiate football players lift during the off-season. It appears that the increase in strength exhibited by both groups resulted in improvements in performance scores, and slide board training did not enhance these benefits.

The only other study, which evaluated the claims that low impact, closed kinetic chain activity that targets large muscle groups in lateral motion of slide board training enhance agility and cardiovascular efficiency, was by Harmer and Nethery (6). They did find a significant increase in both agility and cardiovascular efficiency following their 6-week training program. In the 6-week training program, each session consisted of 3 sets

of continuous sliding at a self-imposed slide rate with 2 minutes rest between each set. The duration of each set was increased over the course of the study from 3 to 5 minutes. However, they had a limited number of subjects (N = 6) and did not have a control group. In our study, had we not included a control group, we also would have concluded that slide board training was beneficial. In conclusion, the results of this study demonstrate that the slide board did not serve as an effective training technique to enhance lateral agility in this group of football players.

PRACTICAL APPLICATIONS

It appears that slide board training was no more effective than weight training alone in developing lateral agility in collegiate football players. However, further investigation is needed. A study should be done using four groups: a control group, a weight training only, a slide board only, and a slide board and weight training group. In this way it can be determined if slide board training, in the absence of concurrent weight training, can independently enhance lateral motion and agility.

Also, the slide board may be applicable in a corporate or fitness setting. There could be slide board classes specific to those interested in strength and weight loss. Since the slide board is working the primary muscle groups, which include the hip extensors (gluteals), the knee extensor muscles (quadriceps), calves, and the abductors and the adductors there could be a focus on women and weight loss. Typically women gain weight in these areas and could use this device as a supplemental exercise to a diet/exercise program that would add variety to the program.

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APPENDIX A

INFORMED CONSENT

INFORMED CONSENT
University of Wisconsin-La Crosse
La Crosse, WI 54601

Project Title: Effects of slide board training on the lateral movement of college-aged football players.

Principal Investigator: Tianna S. Petersen

Subject name: _____

You are invited to participate in this research study and your written consent is needed prior to your participation. This investigation is open to the members of the University of Wisconsin-La Crosse football team who meet the following condition: no injuries to the lower extremities (groin, ankle, and knee) that could inhibit one to move laterally on the slide board. Please read this consent document carefully and sign your name in the space provided below.

Purpose: To evaluate the effect of slide board training on lateral motion.

Procedure: You will be placed in one of two groups. Group I will be a weight training (WT) group that will implement a leg workout twice a week. Group II will also weight train plus train on the slide board (WTSB) three times per week. Both groups will pre and post tested. The pre-testing will be over a two-day period. The first day will consist of a maximum bench and squat test, as well as recording their height, weight, age and position in football. The second day will consist of four testing stations: the Cone Test, the Box Test, the 5-yard Lateral Shuttle Run and a Lower Extremity Functional Test (L.E.F.T.). The Cone Test will be timed from the first movement moving laterally around five cones that will be in a "W" formation and then shuffling back through the starting line. The Box Test will require you to use a two feet take off, hopping on the box then off to the other side and then back on and off again. The Box Test lasts 30 seconds and the clock begins when you jump to the top of the box. The 5-yard Lateral Shuttle Run will be timed and requires you to shuffle to the right 5 yards, immediately to the left 10 yards and back to the right 5 yards shuffling back to the starting line. The Lower Extremity Functional Test is diamond shaped (30 ft in length and 10 ft across). This test will be timed from the time the person begins to sprint to the top cone. The L.E.F.T. test consists of a sprint up and back, a retro (backward) run up and back, side shuffles around the cones to the right then left, Cariocas to the right and left of the cones, figure 8's to the right and left of the cones, 45 and 90 degree cuts to the right and left, crossovers to the right and left, and finishing with the sprint and retro run again through the starting line. The training program will be 10 weeks in duration for both groups and will begin on January 31, 1994 and end April 30, 1994. If you are in the weight training/slide board

group, you are asked to attend a 30-minute training session three times per week. Subjects missing more than three classes will be eliminated from the study.

Risks or Medical Injury: As with all physical activities there exists the possibility of injury. Slide board participants could experience muscle soreness or fatigue in the adductor, abductor, quadriceps, and gluteal (posterior) areas. Potential injury could occur in groin, knee, ankle, and toe areas. If an injury does occur during the study, the researchers or the University of Wisconsin-La Crosse will provide no compensation. To minimize possible injury, the subjects will stretch before and after as part of the workout.

Benefits: The main reason for this study is to determine the effects that slide board training has on lateral motion. The information that the researchers gather will be used in evaluating this product. Reebok will publish this information and give credit to those who participated in this study. Furthermore, the subjects will benefit from a structured training oriented toward their specific sport.

Questions and Answers: Questions you may have regarding any of the procedures are welcomed and encouraged. If you have any doubts or concerns, PLEASE ask any of the investigators for a further explanation.

I,_____, being of
(Signature of Subject)
sound mind and body at the age of____, do hereby consent to, authorize and request the persons named above (and co-workers, agents, and employees) to undertake and perform on me the proposed procedures, treatment, research or investigation (herein called "Procedure"). I have read the above document, and I have been fully advised that the nature of the Procedure and the possible risks and complication involved in it, all of which risks and complication I hereby assume voluntarily. I hereby acknowledge that no representations, warranties, guarantees or assurances of any kind pertaining to the Procedure have been made to me by the University of Wisconsin-La Crosse, the officers, administration, employees or by anyone acting on their behalf.

Signed at _____, this _____ day of _____, 1994, in the presence of the witnesses whose signatures appear below opposite of my signature.

Witnessed by:

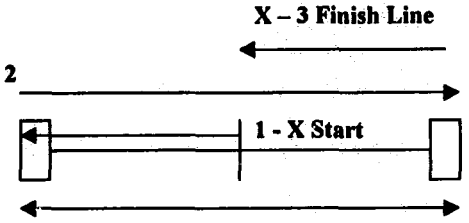
_____ _____

(Subject's signature)

APPENDIX B

LATERAL SHUTTLE RUN DESIGN

LATERAL SHUTTLE RUN (LSR)



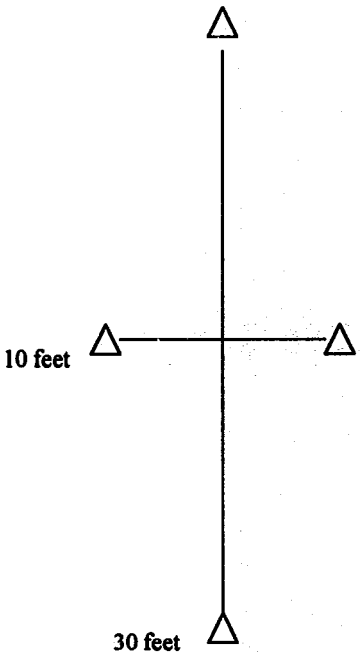
1 cm = 1 foot

APPENDIX C

L.E.F.T. TEST DESIGN

LOWER EXTREMITY FUNCTIONAL TEST (L.E.F.T)

(.25 in = 2 feet)



START

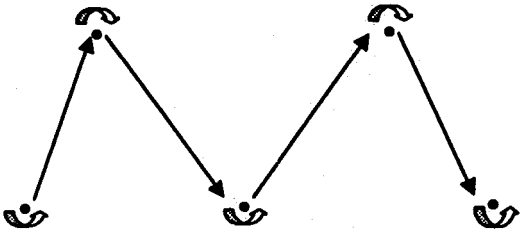
1. Sprint up and back
2. Retro run up and back
3. Slide - right, then left
4. Cariocas – right, then left
5. Figure 8's: right, then left
6. 45° & 90° cuts right, left
7. Crossovers – right, left
8. Sprint up & back, then Retro run up & back.

APPENDIX D

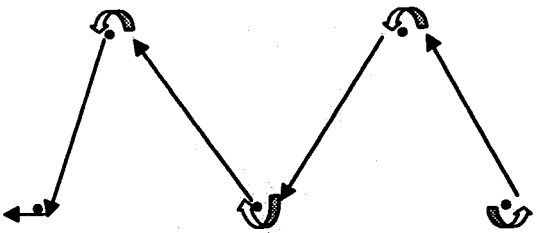
CONE TEST DESIGN

CONE TEST

START VIEW



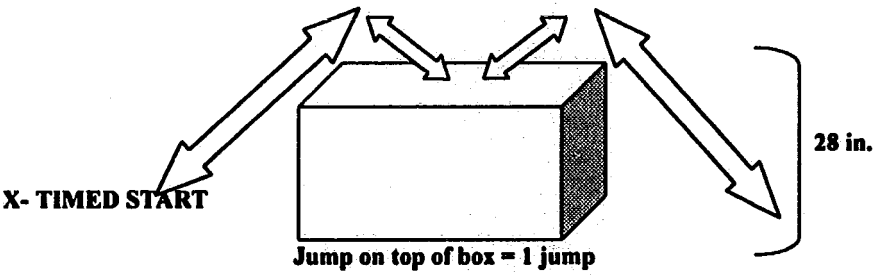
FINISH VIEW



APPENDIX E

BOX JUMP TEST DESIGN

BOX JUMP TEST



APPENDIX F

WEIGHT PROGRAMS

Phase I= "HYPERTROPHY"

Goal = establish base to build max. potential strength off of
= moderate stress of tendons, ligaments, and muscle tissue
= force better recovery for phases that follow

Schedule: M-T-Th-F (4x/week)
Rest Periods: 45 secs. - 1 min.

Monday, January 3, 1994

CHEST:	Bench Press	(1 x 12) 45-50 %
		(2 x 10) 60%
	Incline Dumbbells	(2 x 10) 20% of Bench max.
	Pec Deck	(2 x 10)
	Dumbbell Pullovers	(2 x 8-10)
SHOULDERS:	B-N or Military Press	(2 x 8)
	Upright Rows	(2 x 10)
	Bent-over Fly's	
	Lateral Raises "Superset"	(2-3 x 7)
	Str. Arm Fly's	
TRICEPS:	Close-grip Bench	(12-10-8) elevate in wt.
	Triceps Ext.	(2-3 x 10)
	Push-up / small hand base	(100 total in any increments.)
ABS:	Body Crunch	(2 x 15-25)
	Half Sit-ups	(1 x 30-50)
	Oblique Knee Crossovers	(2 x 15-20/each side)
	Oblique Knee Crossovers/footdown	(2 x 10-15/each side)

Phase I= "HYPERTROPHY"

Goal = establish base to build max. potential strength off of
= moderate stress of tendons, ligaments, and muscle tissue
= force better recovery for phases that follow

Schedule: M-T-Th-F (4x/week)
Rest Periods: 45 secs. - 1 min.

Tuesday, Jan. 4, 1994

LEGS:	**Squats**	**(1 x 15) 45-50 %** **(1 x 12) 55%** **(2 x 10) 60%**
	Leg Ext.	**"Superset" (2-3 x 8 each)**
	Leg Curls	
	Str. Leg Deadlifts	**(2 x 8)**
BACK:	**Seated Rows**	**(2 x 10)**
	Hyper-extensions	**(2 x 10)**
LATS:	**Lat. Pulldowns/front**	**(2 x 10)**
	Lat. Pulldowns/rev. grip	**(2 x 10)**
BICEPS:	**E-Z Bar Curls**	**(2 x 10)**
	Reverse Curls	**(2 x 10)**
ABS:	**Body Crunch**	**(2 x 15-25)**
	Half Sit-ups	**(1 x 30-50)**
	Oblique Knee Crossovers	**(2 x 15-20/each side)**
	Oblique Knee Crossovers/footdown	**(2 x 10-15/each side)**

Phase I= "HYPERTROPHY"

Goal = establish base to build max. potential strength off of
= moderate stress of tendons, ligaments, and muscle tissue
= force better recovery for phases that follow

Schedule: M-T-Th-F (4x/wee~.)
Rest Periods: 45 secs. - 1 min.

Thursday, Jan. 6, 1994

CHEST:	Incline Press	(1 x 10) 50% (3 sets to fatigue; 70% of max; 1 min rest period between sets; record below)
	#1=	
	#2=	
	#3=	
	Flat Bench or Decline Dumbbells	(3 x 10) 20% of Bench max.
SHOULDERS:	Bar Shrugs	(3 x 10)
	Seated DB Press	(3 x 8-10 each)
TRICEPS:	Triceps Ext.	(3 x 12-15)
	1-Arm Cable Ext.	(2 x 8)
ABS:	Body Crunch	(2 x 15-25)
	Half Sit-ups	(1 x 30-50)
	Oblique Knee Crossovers	(2 x 15-20/each side)
	Oblique Knee Crossovers/footdown	(2 x 10-15/each side)

Phase I= "HYPERTROPHY"

Goal = establish base to build max. potential strength off of
= moderate stress of tendons, ligaments, and muscle tissue
= force better recovery for phases that follow

Schedule: M-T-Th-F (4x/week)
Rest Periods: 45 secs. - 1 min.

Friday, Jan. 7, 1994

LEGS:	Squats	(3 x 10) 60%
	Leg Sled	(2-3 x 10) "choose wt."
	Leg Curls	(2 x 15)
BACK:	Seated Rows	(2 x 8)
	Bent-over Rows	(2x 10)
LATS:	Pullovers/reg. overhand grip	(2 x 10)
	Lat. Pulldowns/behind head	(2 x 10)
BICEPS:	Str. Bar Curls	(2 x 10)
	DB Curls	(2 x 8 each)
ABS:	Body Crunch	(2 x 15-25)
	Half Sit-ups	(1 x 30-50)
	Oblique Knee Crossovers	(2 x 15-20/each side)
	Oblique Knee Crossovers/footdown	(2 x 10-15/each side)

Phase I= "HYPERTROPHY"

Goal = establish base to build max. potential strength off of
= moderate stress of tendons, ligaments, and muscle tissue
= force better recovery for phases that follow

Schedule: M-T-Th-F (4x/week)
Rest Periods: 45 secs. - 1 min.

Monday, January 10, 1994

CHEST:	Bench Press	(1 x 12) 50 %
		(2 x 10) 62-63%
	Incline Dumbbells	(3 x 10) 20% of Bench max.
	Pec Deck	(2 x 10)
	Dumbbell Pullovers	(2 x 8-10)
SHOULDERS:	B-N or Military Press	(2 x 8)
	Upright Rows	(2 x 10)
	Bent-over Fly's	
	Lateral Raises	"Superset" (3 x 7)
	Str. Arm Fly's	
TRICEPS:	Close-grip Bench	(12-10-8-8) elev. in wt.
	Triceps Ext./V-Bar	(2-3 x 10)
	Push-up/small hand base	(120 total in any increments.)
ABS:	Body Crunch	(2 x 20-30)
	Half Sit-ups	(1 x 40-50)
	Oblique Knee Crossovers	(2 x 25-30/each side)
	Oblique Knee Crossovers/footdown	(2 x 20-25/each side)

Phase I= "HYPERTROPHY"

Goal = establish base to build max. potential strength off of
= moderate stress of tendons, ligaments, and muscle tissue
= force better recovery for phases that follow

Schedule: M-T-Th-F (4x/week)
Rest Periods: 45 secs. - 1 min.

Tuesday, Jan. 11, 1994

LEGS:	Squats	(1 x 15) 50 % (1 x 12) 60% (2 x 10) 65%
	Leg Ext.	"Superset" (3 x 10 each)
	Leg Curls	
	Str. Leg Deadlifts	(2 x 8)
BACK:	Seated Rows	(2 x 10)
	Hyper-extensions	(2 x 12) use 10 lbs./hold on chest
LATS:	Lat. Pulldowns/front	(2 x 10)
	Lat. Pulldowns/behind head	(2 x 10)
BICEPS:	E-Z Bar Curls	(2 x 10)
	Hammer Curls	(2 x 10)
ABS:	Body Crunch	(2 x 20-30)
	Half Sit-ups	(1 x 40-50)
	Oblique Knee Crossovers	(2 x 25-30/each side)
	Oblique Knee Crossovers/footdown	(2 x 20-25/each side)

Phase I= "HYPERTROPHY"

Goal = establish base to build max. potential strength off of
= moderate stress of tendons, ligaments, and muscle tissue
= force better recovery for phases that follow

Schedule: M-T-Th-F (4x/week)
Rest Periods: 45 secs. - 1 min.

Thursday, Jan. 13, 1994

CHEST:	Incline Press	(1 x 10) 50% (3 sets to fatigue; 70% of max; 1 min rest period between sets; record below)
	#1= #2= #3=	
	Wide Chest Fly's w/Dumbbells	(3 x 10)
SHOULDERS:	Bar Shrugs	(3 x 10) increase 10-20 lbs.
	Seated DB Press	(3 x 8-10 each) inc. 5 lbs.
TRICEPS:	Triceps Ext.	(3 x 12)
	1-Arm Cable Ext.	(2 x 8 each)
ABS:	Body Crunch	(2 x 20-30)
	Half Sit-ups	(1 x 40-50)
	Oblique Knee Crossovers	(2 x 25-30/each side)
	Oblique Knee Crossovers/footdown	(2 x 20-25/each side)

Phase I= "HYPERTROPHY"

Goal = establish base to build max. potential strength off of
= moderate stress of tendons, ligaments, and muscle tissue
= force better recovery for phases that follow

Schedule: M-T-Th-F (4x/week)
Rest Periods: 45 secs. - 1 min.

Friday, Jan. 14, 1994

LEGS:	Squats	(3 x 10) 60%
	Leg Sled	(2-3 x 10) "choose wt."
	Leg Curls	(2 x 15)
BACK:	Seated Rows	(2 x 8)
	Bent-over Rows	(2 x 10)
LATS:	Pullovers/reg. overhand grip	(2 x 10)
	Lat. Pulldowns/behind head	(2 x 10)
BICEPS:	Str. Bar Curls	(2 x 10)
	DB Curls	(2 x 8 each)
	1-Arm Isolations	(2 x 8 each)
ABS:	Body Crunch	(2 x 20-30)
	Half Sit-ups	(1 x 40-50)
	Oblique Knee Crossovers	(2 x 25-30/each side)
	Oblique Knee Crossovers/footdown	(2 x 20-25/each side)

Phase I= "HYPERTROPHY"

Goal = establish base to build max. potential strength off of
= moderate stress of tendons, ligaments, and muscle tissue
= force better recovery for phases that follow

Schedule: M-T-Th-F (4x/week)
Rest Periods: 45 secs. - 1 min.

Monday, January 17, 1994

CHEST:	Bench Press	(1 x 10) 50 %
		(3 x 8) 67-68%
	Incline Dumbbells	(3 x 12) 20% of Bench max.
	Pec Deck	(2 x 10)
	Dumbbell Pullovers	(2 x 8) elev. in wt.
SHOULDERS:	B-N or Military Press	(2 x 8)
	Upright Rows	(2 x 10)
	Bent-over Fly's	
	Lateral Raises	"Superset" (3 x 7)
	Str. Arm Fly's	
TRICEPS:	Close-grip Bench	(12-10-8-8) elev. in wt.
	Triceps Ext.	(3 x 10)
	Push-up/small hand base	(140 total in any increments.)
ABS:	Body Crunch	(2 x 30-35)
	Half Sit-ups	(1 x 50-60)
	Oblique Knee Crossovers	(2 x 30-35/each side)
	Oblique Knee Crossovers/footdown	(2 x 25-30/each side)

Phase I= "HYPERTROPHY"

Goal = establish base to build max. potential strength off of
= moderate stress of tendons, ligaments, and muscle tissue
= force better recovery for phases that follow

Schedule: M-T-Th-F (4x/week)
Rest Periods: 45 secs. - 1 min.

Tuesday, Jan. 18, 1994

LEGS:	Squats	(1 x 12) 50 % (1 x 10) 60% (2 x 8) 65%
	Front Squats	(2 x 10) 30-40% of Squat max.
	Leg Curls/1-legged	(2 x 10 each)
BACK:	1-Arm DB Rows	(2 x 10)
	Hyper-extensions	(2 x 15) use 20 lbs./hold on chest
LATS:	Pullovers/rev. grip	(2 x 10)
	Lat. Pulldowns/behind head	(2 x 10)
BICEPS:	Str. Bar Curls	(2 x 10)
	DB Curls	(2 x 10 each)
ABS:	Body Crunch	(2 x 30-35)
	Half Sit-ups	(1 x 50-60)
	Oblique Knee Crossovers	(2 x 30-35/each side)
	Oblique Knee Crossovers/footdown	(2 x 25-30/each side)

Phase I= "HYPERTROPHY"

Goal = establish base to build max. potential strength off of
= moderate stress of tendons, ligaments, and muscle tissue
= force better recovery for phases that follow

Schedule: M-T-Th-F (4x/week)
Rest Periods: 45 secs. - 1 min.

Thursday, Jan. 20, 1994

CHEST:	Incline Press	(1 x 10) 50% (3 sets to fatigue; 70% of max.; 1 min rest period between sets; record below)
	#1= #2= #3=	
	Dumbbell Pullover	(3 x 8)
SHOULDERS:	Lateral Raises	(3 x 10)
	Seated DB Press	(3 x 8 each)
TRICEPS:	Triceps Ext.	(3 x 12)
	1-Arm Cable Ext.	(2 x 8 each)
ABS:	Body Crunch	(2 x 30-35)
	Half Sit-ups	(1 x 50-60)
	Oblique Knee Crossovers	(2 x 30-35/each side)
	Oblique Knee Crossovers/footdown	(2 x 25-30/each side)

Phase I= "HYPERTROPHY"

Goal = establish base to build max. potential strength off of
= moderate stress of tendons, ligaments, and muscle tissue
= force better recovery for phases that follow

Schedule: M-T-Th-F (4x/week)
Rest Periods: 45 secs. - 1 min.

Friday, Jan. 21, 1994

LEGS:	Squats	(3 x 10) 65%
	Leg Sled	(2-3 x 10) "choose wt."
	Leg Curls	(2 x 12) incr. by 10 lbs.
BACK:	Seated Rows	(2 x 8)
	Bent-over Rows	(2 x 10)
LATS:	Pullovers/reg. overhand grip	(2 x 10)
	Lat. Pulldowns/behind head	(2 x 10)
BICEPS:	Str. Bar Curls	(2 x 10)
	DB Curls	(2 x 8 each)
	1-Arm Isolations	(2 x 8 each)
ABS:	Body Crunch	(2 x 30-35)
	Half Sit-ups	(1 x 50-60)
	Oblique Knee Crossovers	(2 x 30-35/each side)
	Oblique Knee Crossovers/footdown	(2 x 25-30/each side)

FOOTBALL "Phase I" - STRENGTH CYCLE

Week #1 (Jan. 24, 1994)

MONDAY

Bench Press	(1 x 10) 50-55% (3 x 8) 70-75%	CHEST
Incline Dumbbells	(2 x 10) 20% of Bench Max.	
Upright Rows	(2 x 8)	SHOULDERS
Seated Dumbbells	(2 x 6) each	
Triceps Ext./lying on bench	(2 x 8)	TRICEPS
Triceps Ext./straight bar	(2 x 8)	
Abdominals	Phase I (see chart)	

TUESDAY

Squats	(1 x 10) 50-55% (3 x 8) 67-68%	LEGS
Front Squats	(2 x 8) 40% of Squat Max.	
Leg Curls	(3 x 10)	
Calf Raises	(3 x 15); In's and Out's	
Bent-over Rows	(2 x 8)	BACK/LATS
Pullovers/rev. grip	(2 x 8)	
E-Z Bar Curls	(2 x 8)	BICEPS
Preacher Curls	(2 x 8)	
Abdominals	Phase I (see chart)	

WEDNESDAY

Incline Press	(2 x 10) 60-65%	CHEST
Pec Deck	(2-3 x 10)	
Shoulder Press	(2 x 8)	SHOULDERS
Bent-over Fly	(2 x 8)	
BAD-RAD	(2 x 8-10)	TRICEPS
Triceps Ext./V-Bar	(2 x 10)	
Abdominals	Phase I or II (see chart)	

THURSDAY "OFF" [Testing on Friday for maximal Squat and Bench Press tests.]

FRIDAY

All of the players should meet at the Strength Center on Friday evening (at your designated time) for "Maximal Strength Testing." You will max. (1 RM) out on the Squat and Bench Press tests. Saturday, you will again report for "Agility" testing (at your designated times.) Please be on time!

Week #2 (Jan. 31, 1994)
MONDAY

Bench Press	(1 x 10) 50-55% (4 x 5) 80-85%	CHEST
Decline Dumbbells	(2 x 8) 20% of Bench Max.	
Incline Dumbbells	(2 x 8) 20% of Bench Max.	
Lateral Raises	(2 x 8)	SHOULDERS
Bar Shrugs	"Superset" (2 x 8)	
Dumbbell Shrugs		
Close-grip Bench	(10-8-6) elev. in wt.	TRICEPS
Triceps Ext.	(2 x 8)	
Abdominals	Phase II (see chart)	

TUESDAY

Squats	(1 x 10) 50% (1 x 5) 65% (1 x 5) 70% (1 x 5) 75% (1 x 5) 77-78%	LEGS
Front Squats	(2 x 8) 45% of Squat Max.	
Leg Ext./short arches	(2 x 10)	
Leg Curls	(8-8-8; superset for 3 sets)	
Calf Raises	(2 x 15); In's and Out's	
Lat. Pulls/front	(2 x 8)	
1-Arm Dumbbells Rows	(2 x 6-8) each	BACK/LATS
Hyperextensions	(2 x 12-15) 10 lbs.	
Str. bar Curls	(2 x 8)	BICEPS
Hammer Curls	(2 x 8) each	
Abdominals	Phase II (see chart)	

WEDNESDAY = OFF!

THURSDAY

Incline Press	(1 x 10) 50% (1 x 8) 65% (2 x 6) 75-80%	CHEST
Bench Press	(2 sets to fatigue/70%; record)	
Upright Rows	(2 x 6) Heavy!	
Str. Arm Fly's	(2 x 6) each	SHOULDERS
Dumbbell Kickbacks	(2 x 8-10)	
Triceps Ext./V-Bar	(2 x 8)	TRICEPS
Abdominals	Phase III (see chart)	

FRIDAY

Bent-over Rows	(2 x 8)	BACK
Seated Rows	(2 x 8)	
Lat. Pulls/front	(2 x 8)	
Lat. Pulls/rev. grip	(2 x 8)	LATS
Pullovers/rev. grip	(2 x 8)	
Str. Bar Curls	(2 x 8)	
E-Z bar Curls	(2 x 8)	BICEPS
Hammer Curls	(2 x 8)	
1-Arm Isolations	(2 x 8)	
Abdominals	Phase III (see chart)	

Week #3 (Feb. 7, 1994)

MONDAY

Bench Press	(1 x 10) 50-55% (1 x 8) 65% (1 x 5) 75% (3 x 4) 85-90%	CHEST
Incline Dumbbells	(2 x 8) 20% of Bench Max.	
Internal/External Rotation (surgical tubing)	(2 x 10) each / Red tubing	
Military Press	(2 x 8)	SHOULDERS
"Empty Cans"	(2 x 8)	
1-Arm Cable Ext.	(2 x 8) each	TRICEPS
Triceps Ext./lying on bench	(2-3 x 8)	
Abdominals	Phase III OR IV (see chart)	

TUESDAY

Squats	(1 x 10) 50-55% (1 x 8) 60% (1 x 6) 70% (3 x 3) 85-90%	LEGS
Step-ups	(2 x 5each) 50% of body wt.	
Str. Leg Deadlifts	(2 x 10)	
Leg Curls	(2 x 10)	
Calf Raises	(3 x 15); In's and Out's	
Bent-over Rows	(2 x 10)	BACK
1-Arm Dumbbell Rows	(2 x 8) each	
E-Z Bar Curls	(2 x 8)	BICEPS
Preacher Curls	(2 x 8)	
Abdominals	Phase III or IV (see chart)	

WEDNESDAY = OFF!

THURSDAY

Incline Press		(1 x 10) 50% (1 x 7) 65% (2 x 4) 80%	CHEST
Bench Press		(2 sets to fatigue/70%; record)	
Bent-over Fly's			
Lateral Fly's	21's	(2 x 7) each	
Str. Arm Fly's			SHOULDERS
B-N Press		(2 x 8)	
			TRICEPS
Close-grip Bench		(10-8-6) elev. in wt.	
Triceps Ext.		(2 x 10)	
Abdominals		Phase IV (see chart)	

FRIDAY

Hyperextensions	(1 x 15) no wt. (2 x 10) 10 kg wt.	BACK
Seated Rows	(2 x 8)	
Lat. Pulls/front	(3 x 6) Heavy!	LATS
Pullovers/regular	(2 x 10)	
E-Z Bar Curls	(1 x 10)	
E-Z Bar Curls/"cheat curls"	(2 x 5)"overload"	BICEPS
Hammer DB Curls	(2 x 6 each)	
Reverse Curls	(2 x 6-8)	
Abdominals	Phase IV (see chart)	

Week #4 (Feb. 14, 1994)

MONDAY

Bench Press	(1 x 10) 50-55% (1 x 7) 65% (1 x 4) 77-78% (4 x 4) 88%	CHEST
Incline Dumbbells	(2 x 8) 25% of Bench Max.	
Internal/External Rotation (surgical tubing)	(2 x 10) each	
Upright Rows	(2 x 10)	SHOULDERS
Bent-over Fly's	(2 x 10)	
French Curls	(2 x 8)	
Triceps Ext./Str. Bar	(2 x 8)	TRICEPS
Triceps Ext./V-Bar	(2 x 8)	
Abdominals	Phase IV (see chart)	

TUESDAY

Squats	(1 x 12) 45% (1 x 8) 55% (1 x 5) 70% (1 x 3) 85% (2 x 2) 90%	LEGS
Leg Sled	(2 x 10) Heavy!	
Glut-Ham Machine	(2 x 6-8)	
Leg Curls/1-legged	(2 x 8) each	
Calf Raises	(3 x 15); In's and Out's	
		BACK
Seated Rows	(10-8-6) elev. in wt.	
Hyperextensions	(3 x 10) 10 kg. wt	
Machine Curls	(3 x 8)	BICEPS
Abdominals	Phase IV (see chart)	

WEDNESDAY = OFF!

THURSDAY

Incline Press	(1 x 10) 50%	
	(2 x 6) 75%	CHEST
Pec Deck "Negatives"	(2 x 8)	
B-N Press	(2 x 10)	
Military Press	(2 x 10)	SHOULDERS
Bar Shrugs	(2 x 10)	
BAD RAD or Close-grip Bench	(8-6-4-4) elev. in wt.	
Triceps Ext.	(2 x 10)	TRICEPS
Abdominals	Phase IV (see chart)	

FRIDAY

Squats	(1 x 15) 45%	
	(1 x 12) 55%	
	(1 x 10) 65%	LEGS
	(1 x 10) 68%	
Lunges	(2 x 6) each	
Leg Curls	(3-4 x 10)	
Calf Raises	(3 x 15); In's and Out's	
Bent-over Rows	(2 x 8)	BACK
Seated Rows	(2 x 8)	
Biceps/choice	(2 exercises; 2 x 8 each)	
Abdominals	Phase IV (see chart)	

Week #5 (Feb. 21, 1994)
MONDAY

Bench Press	(1 x 10) 50-55%	
	(1 x 8) 65%	
	(1 x 6) 75%	
	(1 x 3) 92-93%	CHEST
	(1 x 1) 97%	
	(1 x 10) 75%	
Incline Dumbbells	(2 x 6) 25% of Bench Max.	
Internal/External Rotation (surgical tubing)	(2 x 10) each	
Str. Arm Fly's/use plate	(2 x 8-10)	SHOULDERS
Bent-over Fly's	(2 x 8)	
Triceps Ext./lying on bench	(3 x 8) elev. in wt.	
Concentric/Isometric Contrac.		TRICEPS
	Superset (2 x 10)	
1-Arm Cable Ext.		
Abdominals	Phase IV (see chart)	

TUESDAY

Squats	(1 x 10) 50-55%	
	(1 x 8) 60%	
	(1 x 5) 70%	LEGS
	(1 x 3) 85%	
	(2 x 2) 92-93%	
Leg Ext.	(8-8-8; Superset for 2 sets)	
Str. Leg Deadlifts	(2 x 8)	
Calf Raises	(3 x 15); In's and Out's	
Bent-over Rows	(2 x 10)	BACK
Pull-overs/rev. grip	(2 x 10)	
E-Z bar Curls	(2 x 8)	BICEPS
Preacher Curls	(2 x 10)	
Abdominals	Phase V (see chart)	

WEDNESDAY = OFF!

THURSDAY

Incline Press	(1 x 10) 50% (1 x 7) 65% (2 x 4) 80% dead pause!	CHEST
Incline or Decline DB	(2 x 8) each	
Pec Deck "Negatives"	(2 x 8) each	
(NO SHOULDERS TODAY)		SHOULDERS
Triceps Ext./regular	(3 x 8)	
Triceps Ext./lying on bench	(2 x 8)	TRICEPS
BAD-RAD	(2 x 8)	
Abdominals	Phase V (see chart)	

FRIDAY

Squats	(1 x 10) 50% (1 x 5) 60% (1 x 5) 70% (1 x 5) 75%	LEGS
Step-ups	(1 x 8 ea.) 50% of Body wt. (2 x 5 ea.) 60% of Body wt.	
Calf Raises	(3 x 15); In's and Out's	
Hyper-extensions	(3 x 15) 10-20lb wt	BACK
Preacher Curls	(2 x 8)	BICEPS
Hammer DB Curls	(2 x 8 ea.)	
1-Arm Cable Ext.	(2 x 6 ea.)	
Abdominals	Phase V (see chart)	

Week #6 (Feb. 28, 1994)

MONDAY

Bench Press	(1 x 10) 50% (1 x 7) 65% (1 x 4) 80% (1 x 2) 90% (1 x 2) 97% (1 x 2) 102%	CHEST
Seated Dumbbell Press	(2 x 8) ea.	SHOULDERS
Upright Rows	(2 x 8) ea.	
Close-grip Bench	(8-6-4-4) elev. in wt.	
French Curls	(2 x 6) Heavy!	TRICEPS
Abdominals	Phase VI (see chart)	

TUESDAY

Squats	(1 x 12) 50% (1 x 8) 62-63% (1 x 5) 77-78% (1 x 3) 85% (1 x 2) 95-97%	LEGS
Front Squats	(2 x 8) 40-45% of Squat Max.	
Leg Curls	(2-3 x 15)	
Seated Rows	(2 x 8)	BACK
Lat. Pulls/front	(2 x 8)	LATS
Biceps / Choice	(2 exer; 2 x 8 ea.)	BICEPS
Abdominals	Phase VI (see chart)	

WEDNESDAY = OFF!

THURSDAY

Incline Press	(1 x 10) 50-55% (3 x 3) 70-75-80%	CHEST
Pec Deck	(2 x 10)	
B-N Press	(2 x 10)	SHOULDERS
Military Press	(2 x 10)	
Triceps / Choice	(3-4 x 8)	TRICEPS
Abdominals	Phase V (see chart)	

FRIDAY

Step-ups	(1 x 8 ea.) 50% of Body wt. (1 x 6 ea.) 55% (1 x 4 ea.) 60%	LEGS
Lunges	(2 x 5 ea.)	
Glut-Ham Machine	(2 x 6-8)	
Lat. Pulls/rev. grip	(2 x 8)	LATS
Str. Bar Curls	(2 x 6-8)	
E-Z Bar Curls	(2 x 6-8)	BICEPS
Hammer Curls	(2 x 6-8)	
Reverse Curls	(2 x 6-8)	
Abdominals	Phase VI (see chart)	

MAX. WEEK (March 7, 1994)

MONDAY

Bench Press ("re-max")

(1 x 12) 50%
(1 x 8) 60%
(1 x 4) 75%
(1 x 2) 85%
(1 x 1) 95%
(1 x 1) 102%

(Continue sets of 1 until failure; make each increment small)

WEDNESDAY

Squats ("re-max")

(1 x 12) 50%
(1 x 8) 60%
(1 x 4) 75%
(1 x 2) 85%
(1 x 1) 95%
(1 x 1) 102%

(Continue sets of 1 until failure; make each increment small)

Note: You now have completed "Phase I" in your off-season continuum. Please take the next week or so off during Spring Break to allow the body's tendons, ligaments, and muscles to heel up. Pick up "Phase II" before you go on Spring Break. You will start this Phase on Monday, March 21 (when you get back). "Phase II" will begin to add more in the "power & explosion" area. Be ready to go!

FOOTBALL "PHASE II" STRENGTH CYCLE

Week #7 (Mar. 21, 1994)
MONDAY

Bench Press	(1 x 10) 50-55%	
	(3 x 8) 70-75%	CHEST
Decline Dumbbells	(2 x 8)	
	"Superset"	
Pec Deck/Negatives	(2 x 8)	
B-N Press	(2 x 8)	SHOULDERS
Str. Arm Fly's		
	"Superset; 2 x 8 ea.)	
Bent-over Fly's		
BAD-RAD	(10-8-8-6) elev. in wt.	TRICEPS
Triceps Ext./Str. Bar	(2 x 8)	
Seated Calf Raises		CALVES
"Weak pt." training	(1 x 10 every other set during workout - 8 sets total)	
Abdominals	Phase IV (see chart)	

TUESDAY

Hang Cleans	(1 x 8) 50-55%	
	(3 x 6) 55-60% of pwr clean max	
Squats	(1 x 10) 50-55%	LEGS
	(3 x 8) 68-70%	
Front Squats	(2 x 8) 45% of Squat max.	
Leg Curls	(8-8-8; Single-leg/Dbl.-leg Superset for 2 sets)	
Calves Str. Leg	(2 x 8)	
Seated Rows	(2 x 10)	
	"Superset"	BACK/LATS
Hyper-extensions	(2 x 10)	
E-Z bar Curls	(2 x 8)	BICEPS
Preacher Curls	(2 x 8)	
Calves (heavy day)		
Abdominals	Phase IV (see chart)	

WEDNESDAY = OFF!

THURSDAY

Incline Press	(1 x 10) 50% (3 x 6) 75-80%	CHEST
Bench Press (Rest 1 min. between sets)	(2 set to fatigue/70%; record)	
Hang Cleans	(2 x 8) 50-55%	
B-N Press/Negatives	(2 x 8)	
Military Press/Negatives	(2 x 8)	SHOULDERS
Dips	(10-10-10)	
Triceps Ext./V-Bar	(3 x 10)	TRICEPS
Calves (repeat light)		
Abdominals	Phase IV (see chart)	

FRIDAY

Squats	(1 x 15) 40% (1 x 12) 50% (1 x 10) 55% (1 x 10) 60%	LEGS
Leg Extensions	(8-8-8; Superset single & dbl. leg for 3 sets)	
Leg Curls	(3 x 10)	
Seated Calves	(2 x 10)	
Seated Rows	(2 x 8)	
Lat. Pulls/rev. grip	(2 x 8)	BACK/LATS
Lat. Pulls/b-n	(2 x 8)	
Str. Bar Curls	(2 x 8)	
Dumbbell Curls	(2 x 8) each	BICEPS
Reverse Curls	(2 x 8)	
Calves (heavy day)		
Abdominals	Phase IV (see chart)	

Week #8 (Mar. 28, 1994)

(Repeat calf routine the same each week as shown in week 1)

MONDAY

Bench Press	(1 x 10) 50-55%	CHEST
	(3 x 5) 77-82%	
Incline Dumbbells	(3 x 8) 20% of Bench Max.	
Str. Arm Fly's	(2 x 6 ea.)	SHOULDERS
"Empty Cans	(2 x 8)	
Seated DB Press	(2 x 6 ea.)	
Close-grip Bench	(8-6-6-4) elev. in wt.	
Triceps Ext./Rope	(2 x 8)	TRICEPS
Abdominals	Phase IV (see chart)	

TUESDAY

Hang Cleans	(1 x 8) 50-55%	
	(1 x 6) 55-60%	
	(2 x 4) 60-62%	LEGS
Squats	(1 x 10) 50%	
	(3 x 5) 80-83%	
Leg Curls		
	Superset (2 x 10ea)	
Str. Leg Deadlifts		
Bent-over Rows	(10-8-6) elev. in wt.	
Seated Rows	(2 x 8)	BACK/LATS
Hyper-extensions	(2 x 15)	
E-Z Bar Curls	(2-3 x 8)	BICEPS
Preacher Curls	(2 x 5) Heavy!	
Calves (heavy day)		
Abdominals	Phase IV (see chart)	

WEDNESDAY = OFF!

THURSDAY

Hang Cleans	(2-3 x 8) 50-55% Overall	
Bench Press	(3 sets to fatigue @ 70%; record)	
Incline Press	(1 x 10) 50% (1 x 8) 65% (2 x 6) 75-80%	CHEST
Cable Lateral Raises/fr.	(2 x 6)	
Cable Lateral Raises/behind	(2 x 6)	SHOULDERS
Triceps Ext./Str. bar		TRICEPS
Triceps Ext./V-Bar	Superset (2 x 5ea)	
Triceps Ext./Rope		
Abdominals	Phase IV (see chart)	

FRIDAY

Squats	(2 x 10) 60%	LEGS
Lunges	(2 x 6 ea.)	
Step-ups	(1 x 6 ea.) 50-55% of Body wt.	
Leg Curls/1-legged	(2 x 8-10)	
	Superset	
Seated Calf Raises	(2 x 10-15)	
Lat. Pulls/fr.	(2 x 8)	BACK/LATS
Lat. Pulls/rev. grip	(3 x 8)	
Hammer Curls	(2 x 8)	BICEPS
Reverse Curls	(2 x 8	
Abdominals	Phase IV (see chart)	

Week #9 (April 4, 1994)
MONDAY

Bench Press	(1 x 10) 50-55% (1 x 5) 65% (1 x 5) 78% (2 x 3) 90-92%	CHEST
Incline Dumbbells	(2 x 8) 20% of Bench max.	
Pec Deck/Negatives	(2 x 8)	
Internal/External Rotations (surgical tubing)	(2 x 10) ea. (red tubing)	SHOULDERS
Seated Dumbbell Press	(2 x 8)	
Bent-over Fly's	(2 x 8)	
Triceps Ext./supine	(2-3 x 8)	
1-Arm Cable Ext.	(2 x 8) ea.	TRICEPS
Abdominals	Phase IV (see chart)	

TUESDAY

Hang Cleans	(3 x 4) 60%	OVERALL
Squats	(1 x 8) 60% (1 x 5) 70% (1 x 4) 80% (3 x 3) 85-88%	LEGS
Step-ups	(2 x 5) ea. 55% of Body Wt.	
Leg Curls	(2 x 10)	
Calf Raises	(3 x 15; In's & Out's	
Bent-over Rows	(2 x 6-8) Heavy!	BACK/LATS
1-Arm DB Rows	(2 x 8)ea.	
E-Z bar Curls	(2 x 8)	BICEPS
Preacher Curls	(2 x 8)	
Calves (heavy day)		
Abdominals	Phase IV (see chart)	

WEDNESDAY = OFF!

THURSDAY

Hang Cleans	(2 x 8) 55%	
Incline Press	(1 x 10) 50% (1 x 7) 65% (2 x 4) 80-85%	**CHEST**
Bench Press	(2 set to fatigue@70%; record)	
Bent-over Fly's **Lateral Raises** **Str. Arm Fly's**	(2 x 7)	**SHOULDERS**
Triceps Ext./Str. Bar **Triceps Ext./V-Bar**	(2 x 8) (2 x 8)	**TRICEPS**
Abdominals	Phase IV (see chart)	

FRIDAY

Squats	(1 x 10) 50% (1 x 7) 60% (1 x 5) 70% (1 x 4) 80% (2 x 3) 90%	**LEGS**
Leg Extensions	(2 x 10) Heavy!	
Leg Curls	(2 x 10) Heavy!	
Seated Rows	(2 x 8)	**BACK/LATS**
Hyperextensions	(1 x 15) no wt! (2 x 10) 10kg wt.	
E-Z bar Curls	(1 x 10)	**BICEPS**
E-Z bar Curls	(2 x 5) "overload"	
Hammer Curls	(2 x 6) ea.	
Reverse Curls	(2 x 6-8)	
Abdominals	Phase IV (see chart)	

Week #10 (April 11, 1994)
MONDAY

Bench Press	(1 x 10) 50-55% (1 x 5) 65% (1 x 5) 75%	CHEST
Internal/External Rotation (surgical tubing)	(2 x 10ea.)	
Upright Rows	(2 x 8)	SHOULDERS
Bent-over Fly's	(2 x 8)	
Triceps Ext./Str. Bar	(2 x 8)	TRICEPS
Triceps Ext./V-Bar	(2 x 8)	
Abdominals	Phase IV (see chart)	

TUESDAY

Squats	(3 x 8) 65-70%	LEGS
Leg Sled	(2 x 10)	
Leg Curls/1-legged	(2 x 8ea.)	
Calf Raises	(3 x 15); In's and Out's	
Seated Rows	(2 x 10)	BACK/LATS
Hyperextensions	(2 x 10) 10kg wt.	
Machine Curls	(3 x 8)	BICEPS
Abdominals	Phase IV (see chart)	

WEDNESDAY = OFF!

THURSDAY

Incline Press	(1 x 10) 50% (2 x 6) 75%	CHEST
Pec Deck/Negatives	(2 x 10)	
B-N Press	(2 x 10)	
Military Press	(2 x 10)	SHOULDERS
Bar Shrugs	(2 x 10)	
Close-grip Bench	(2 x 8)	TRICEPS
Triceps Ext.	(2 x 10)	
Abdominals	Phase IV (see chart)	

FRIDAY

Squats	(1 x 15) 45% (1 x 12) 55% (1 x 10) 65% (1 x 10) 68%	LEGS
Lunges	(2 x 6 ea.)	
Calf Raises	(3 x 15; In's & Out's)	
Bent-over Rows	(2 x 8)	BACK/LATS
Seated Rows	(2 x 8)	
Biceps/Choice		BICEPS
Abdominals	Phase III (see chart)	

Week #11 (April 18, 1994)

MONDAY		
Bench Press	(1 x 10) 50-55% (1 x 8) 65% (1 x 6) 75% (1 x 3) 90-92% (1 x 1) 98% (1 x 10) 75%	CHEST
Incline Dumbbells	(2 x 6) 25% of Bench Max.	
Internal/External Rotation	(2 x 10ea. surgical tubing)	
Upright Rows	(2 x 8)	SHOULDERS
Bent-over Fly's	(2 x 8)	
Triceps Ext./Lying on bench	(3 x 8) elev. in wt	TRICEPS
1-Arm Cable Ext.	Superset (2 x 8ea.)	
Concentric/Isometric Contraction		
Abdominals	Phase V (see chart)	
TUESDAY		
Hang Cleans	(2 x 6) 55-60%	OVERALL
Squats	(1 x 10) 60% (1 x 5) 65% (1 x 3) 80% (3 x 3) 90-92%	LEGS
Front Squats	(2 x 6) 55-60% of Squat Max.	
Leg Curls	(8-8-8; superset for 2 sets)	
Calf Raises	(3 x 15; In's and Out's)	
Bent-over Rows	(2 x 8)	BACK/LATS
Pullovers/rev. grip	(2 x 8)	
E-Z bar Curls	(2 x 8)	BICEPS
Preacher Curls	(2 x 8)	
Abdominals	Phase V (see chart)	

WEDNESDAY = OFF!

THURSDAY

Incline Press	(1 x 10) 50% (1 x 7) 65% (2 x 4) 80-82% dead pause!	CHEST
Incline or Decline Dumbbells Pec Deck/Negatives	Superset; (2 x 8ea.)	
(NO SHOULDERS TODAY)		
Triceps Ext./regular	(3 x 8)	
Triceps Ext./lying on bench	(2 x 8)	TRICEPS
BAD-RAD	(2 x 8)	
Abdominals	Phase V (see chart)	

FRIDAY

Squats	(1 x 10) 50% (1 x 5) 60% (1 x 5) 70% (1 x 5) 75%	LEGS
Step-ups	(1 x 8ea.) 50% of Body Wt. (2 x 5ea.) 60% of Body Wt.	
Calf Raises	(3 x 15; In's and Out's)	
Hyper-extensions	(3 x 15) 10-20lb plate	BACK
Hammer DB Curls	(2 x 8 ea.)	
Preacher Curls	(2 x 8)	BICEPS
1-Arm Cable Ext.	(2 x 6 ea.)	
Abdominals	Phase V (see chart)	

Week #12 (April 25, 1994)
MONDAY

Bench Press	(1 x 10) 50% (1 x 8) 65% (1 x 6) 82% (1 x 3) 92% (1 x 1) 100%	CHEST
Decline Dumbbells	(2 x 6) 25% of Bench Max.	
Seated DB Press	(2 x 8 ea.)	SHOULDERS
Upright Rows	(2 x 8)	
Close-grip Bench	(8-6-4-4) elev. in wt.	
French curls	(2 x 6) heavy!	TRICEPS
Abdominals	Phase V (see chart)	

TUESDAY

Squats	(1 x 10) 50% (1 x 5) 65% (1 x 4) 80% (1 x 3) 87-88% (2 x 2) 95-97%	LEGS
Front Squats	(2 x 10) 50% of Squat max.	
Leg Curls	(2-3 x 15)	
Seated Rows	(2 x 8)	BACK/LATS
Lat. Pulls/Front	(2-3 x 8)	
Biceps/Choice	(3 x 10)	BICEPS
Abdominals	Phase VI (see chart)	

WEDNESDAY = OFF!

THURSDAY

Incline Press	(1 x 10) 50-55% (3 x 3) 70,75,80%	CHEST
Pec Deck	(2 x 10)	
B-N Press Military Press	(2 x 10) (2 x 10)	SHOULDERS
Triceps/Choice		TRICEPS
Abdominals	Phase IV (see chart)	

FRIDAY

		LEGS
Step-ups	(1 x 8 ea.) 50% of Body wt. (1 x 6 ea.) 55%	
Leg Curls/1-legged	(2 x 10)	
Lat. Pulls/rev. grip	(3-4 x 8)	LATS
Str. Bar Curls E-Z Curls Hammer Curls	(2 x 6-8) (2 x 6-8) (2 x 6-8)	BICEPS
Abdominals	Phase VI (see chart)	

APPENDIX G

SLIDE BOARD PROTOCOL

SLIDEBOARD WORKOUTS / "Football Team"

"General Periodization Model"

Jan. 24-28= Meetings/Get maximums (squat & bench)/ Pre-test on agility areas.

Jan. 31-Feb.4= Introduction of basic skills on "slideboard"

Feb. 6-10=

"Beginning Phase"

Feb. 13-17=

Feb. 20-24=

Feb. 27-Mar. 3=

"Intermediate Phase"

Mar. 6-10=

Mar. 20-24=

Mar. 27-31=

April 3-7=

"Advanced Phase"

April 10-14=

April 17-21=

April 24-28= Posttest all players (squat & bench max; agility tests.

WORKOUT BREAKDOWN (Slide board Study):

Week #1 (Jan. 31-Feb. 4)

Monday:

I. Warm-up series
II. Introduction to basic skills:
    A. Anaerobic:
        * Basic slide (with & without arms)
    B. Aerobic:
        1. Basic slide (with & without arms)
        2. Fencing slide
    C. Positioning (body alignment, depth, etc.)
III. Prescribed workout = general

Wednesday:

I. Warm-up series
II. Review introductory skills
III. Prescribed workout:
    A. Basic slide-w/o arms (2 x 45-sec. exertions)
    B. Fencing Slide-w/o arms (2 x 45-sec. exertions)

Friday:

I. Warm-up series
II. Prescribed workout:
    A. Basic slide-w/o arms (1 x 45-sec. exertions)
    B. Basic slide-with arms (1 x 45-sec. exertions)
    C. Fencing slide-w/o arms (2 x 45-sec. exertions)

Week #2 (Feb. 6-10)

Monday:

I. Warm-up series
II. Prescribed workout (anaerobic):
    A. Basic slide-w/o arms (2 x 45-sec. exertions)
    B. Basic slide-with arms (2 x 45-sec. exertions)
    C. Note: rest periods 1 min.

Wednesday:

I. Warm-up series
II. Prescribed workout (aerobic):
    A. Basic slide-w/o arms (2 x 2-min. exertions)
    B. Basic slide-with arms (2 x 2-min. exertions)
    C. Note: rest period 1 min.

Friday:

I. Warm-up series
II. Prescribed workout (open; time trials):
    A. Time trials (most possible in 1 min.; 2 total)
    B. Leisure sliding (review of each method)

Week #3 (Feb. 13-17)

Monday:

I. Warm-up series
II. Prescribed workout (anaerobic):
    A. Basic slide-w/o arms (2 x 50 sec.)
    B. Basic slide-with arms (2 x 50 sec.)
    C. Fencing slide-w/o arms (2 x 50 sec.)
    D. Note: rest periods 1 min.

Wednesday:

I. Warm-up series
II. Prescribed workout (aerobic):
    A. Basic slide-w/o arms (2 x 3 min.)
    B. Basic slide-with arms (2 x 3 min.)
    C. Fencing slide-w/o arms (1 x 3 min.)
    D. Note: rest periods 1 min.

Friday:

I. Warm-up series
II. Prescribed workouts (open; time trials):
    A. Time trials (most possible in 1 min.; 2 total; compare to last week's efforts)
    B. Leisure sliding

Week #4 (Feb. 20-24)

Monday:

I. Warm-up series
II. Prescribed workout (anaerobic):
    A. Basic slide-w/o arms (2 x 55 sec.)
    B. Basic slide-with arms (2 x 55 sec.)
    C. Fencing slide-w/o arms (1 x 55 sec.)
    D. Fencing slide-with arms (1 x 55 sec.)
    D. Note: rest periods= 2 min.

Wednesday:

I. Warm-up series
II. Prescribed workout (aerobic):
    A. Basic slide-w/o arms (1 x 3 min.)
    B. Basic slide-with arms (1 x 4 min.)
    C. Fencing slide-w/o arms (1 x 4 min.)
    D. Note: rest periods= 1 min.

Friday:

I. Warm-up series
II. Prescribed workout (open; time trials):
    A. Time trials (most possible in 1 min.; 3 total)
    B. Leisure sliding

Week #5 (Feb. 27-March 3)

Monday:

I. Warm-up series
II. Prescribed workout (anaerobic):
    A. Basic slide-w/o arms (2 x 1 min.)
    B. Basic slide-with arms (2 x 1 min.)
    C. Fencing slide-w/o arms (1 x 1 min.)
    D. Fencing slide-with arms (1 x 1 min.)
    D. Note: rest periods 2 min.

Wednesday:

I. Warm-up series
II. Prescribed workout (aerobic):
    A. Basic slide-w/o arms (1 x 4 min.)
    B. Basic slide-with arms (1 x 4 min.)
    C. Fencing slide-w/o arms (1 x 4 min.)
    D. Note: rest period's 1 min.

Friday:

I. Warm-up series
II. Prescribed workout (open; time trials):
    A. Time trials (most possible in 1 min.; 3 total)
    B. Leisure sliding

Week #6 (March 6-10)

Monday:

I. Warm-up series
II. Prescribed workout (anaerobic):
    A. Basic slide-w/o arms (2 x 65 sec.)
    B. Basic slide-with arms (2 x 65 sec.)
    C. Fencing slide-w/o arms (1 x 65 sec.)
    D. Fencing slide-with arms (1 x 65 sec.)
    E. Note: rest period's 2 min.

Wednesday:

I. Warm-up series
II. Prescribed workout (aerobic):
    A. Basic slide-w/o arms (1 x 4 min.)
    B. Basic slide-with arms (1 x 4 min.)
    C. Fencing slide-w/o arms (1 x 5 min.)
    D. Note: rest period's 1 min.

Friday:

I. Warm-up series
II. Prescribed workout (open; time trials):
    A. Time trials (most possible in 1 min.; 3 total)
    B. Leisure sliding

Week #7 (March 20-24)

Monday:

I. Warm-up series
II. Prescribed workout (anaerobic):
    A. Basic slide-with arms (4 x 70 sec.)
    B. Fencing slide-w/o arms (2 x 70 sec.)
    C. Note: rest period's 2 min.

Wednesday:

I. Warm-up series
II. Prescribed workout (aerobic):
    A. Basic slide-with arms (1 x 4 min.)
    B. Fencing slide-w/o arms (1 x 4 min.)
    C. Fencing slide-with arms (1 x 5 min.)
    D. Note: rest period's 1 min.

Friday:

I. Warm-up series
II. Prescribed workout (open; time trials):
    A. Time trials (most possible in 1 min.; 3 total)
    B. Leisure sliding

Week #8 (March 27-31)

Monday:

I. Warm-up series
II. Prescribed workout (anaerobic):
    A. Basic slide-with arms (4 x 75 sec.)
    B. Fencing slide-with arms (1 x 75 sec.)
    C. Fencing slide-w/o arms (1 x 75 sec.)
    D. Note: rest period's 1.5 min.

Wednesday:

I. Warm-up series
II. Prescribed workout (aerobic):
    A. Basic slide-with arms (1 x 4 min.)
    B. Fencing slide-w/o arms (1 x 5 min.)
    C. Fencing slide-with arms (1 x 5 min.)
    D. Note: rest period's 2 min.

Friday:

I. Warm-up series
II. Prescribed workout (open; time trials):
    A. Time trials (most possible in 1 min.; 3 total)
    B. Leisure sliding

Week #9 (April 3-7)

Monday:

I. Warm-up series
II. Prescribed workout (anaerobic):
    A. Basic slide-with arms (4 x 80 sec.)
    B. Fencing slide-with arms (1 x 80 sec.)
    C. Fencing slide-w/o arms (1 x 80 sec.)
    D. Note: rest period's 1.5 min.

Wednesday:

I. Warm-up series
II. Prescribed workout (aerobic):
    A. Basic slide-with arms (1 x 4 min.)
    B. Fencing slide-w/o arms (1 x 5 min.)
    C. Fencing slide-with arms (1 x 6 min.)
    D. Note: rest period's 2 min.

Friday:

I. Warm-up series
II. Prescribed workout (open; time trials):
    A. Time trials (most possible in 1 min.; 3 total)
    B. Leisure sliding

Week #10 (April 10-14)

Monday:

I. Warm-up series
II. Prescribed workout (anaerobic):
    A. Basic slide-with arms (4 x 80 sec.)
    B. Fencing slide-with arms (1 x 80 sec.)
    C. Fencing slide-w/o arms (1 x 80 sec.)
    D. Note: rest period's 2 min.

Wednesday:

I. Warm-up series
II. Prescribed workout (aerobic):
    A. Basic slide-with arms (1 x 5 min.)
    B. Fencing slide-with arms (1 x 6 min.)
    C. Note: rest period's 2 min.

Friday:

I. Warm-up series
II. Prescribed workout (open; time trials):
    A. Time trials (most possible in 1 min.; 3 total)
    B. Leisure sliding

Week #11 (April 17-21)

Monday:

I. Warm-up series
II. Prescribed workout (anaerobic):
    A. Basic slide-with arms (3 x 85 sec.)
    B. Fencing slide-with arms (3 x 85 sec.)
    C. Note: rest period's 2 min.

Wednesday:

I. Warm-up series
II. Prescribed workout (aerobic):
    A. Basic slide-with arms (1 x 6 min.)
    B. Fencing slide-with arms (1 x 6 min.)
    C. Note: rest period's 2 min.

Friday:

I. Warm-up series
II. Prescribed workout (open; time trials):
    A. Time trials (most possible in 1 min.; 4 total)
    B. Leisure sliding

Week #12 (April 24-28)

Monday:

I. Warm-up series
II. Prescribed workout (anaerobic):
    A. Basic slide-with arms (3 x 90 sec.)
    B. Fencing slide-with arms (3 x 90 sec.)
    C. Note: rest period's 2 min.

Wednesday:

I. Warm-up series
II. Prescribed workout (aerobic):
    A. Basic slide-with arms (1 x 7 min.)
    B. Fencing slide-with arms (1 x 6 min.)
    C. Note: rest period's 2 min.

Friday:

I. Warm-up series
II. Prescribed workout (open; time trials):
    A. Time trials (most possible in 1 min.; 4 total)
    B. Leisure sliding

Week #13 (May 1-5)

*Posttest all players (squat & bench max; agility tests)

APPENDIX H

ATTENDANCE CARD FORMS

LEG WORKOUT – WT Group

Name: _____ Date Started: _____ Max (1 RM Squat):_____

Week 1 _____ _____ Week 2 _____ _____

Week 3 _____ _____ Week 4 _____ _____

Week 5 _____ _____ Week 6 _____ _____

Week 7 _____ _____ Week 8 _____ _____

Week 9 _____ _____ Week 10 _____ _____

LEG WORKOUT – WTSB Group

Name: _____ Date Started: _____ Max (1 RM Squat): _____

Week 1 _____ _____ Week 2 _____ _____

Week 3 _____ _____ Week 4 _____ _____

Week 5 _____ _____ Week 6 _____ _____

Week 7 _____ _____ Week 8 _____ _____

Week 9 _____ _____ Week 10 _____ _____

SLIDE BOARD WORKOUT CARD

Name: _____ Date Started: _____ Group 1: _____ 2: _____

Week 1 _____ _____ Week 2 _____ _____

Week 3 _____ _____ Week 4 _____ _____

Week 5 _____ _____ Week 6 _____ _____

Week 7 _____ _____ Week 8 _____ _____

Week 9 _____ _____ Week 10 _____ _____

SLIDE BOARD WORKOUT CARD

Name: _____ Date Started: _____ Group 1: _____ 2: _____

Week 1 _____ _____ Week 2 _____ _____

Week 3 _____ _____ Week 4 _____ _____

Week 5 _____ _____ Week 6 _____ _____

Week 7 _____ _____ Week 8 _____ _____

Week 9 _____ _____ Week 10 _____ _____

APPENDIX I

REVIEW OF LITERATURE

REVIEW OF LITERATURE

Introduction

This literature review establishes the idea of strength training and lateral movement in football players. Strength training, off-season training in football, rehabilitation, lateral movement studies, and drills used for testing lateral movement and agility are presented in this review.

Background of the Slide Board

In our society if one should ask what a slide board is, their answer may be a training or rehabilitative device. The slide board, also referred to by a variety of brand names, is better known in the exercise science world as a lateral movement trainer (LMT). The LMT captured the attention of scientists for the same reasons it has caught the attention of exercisers across the nation – it is cheap, portable, burns calories (6), trains the cardiovascular system (12), is non-impact, and is safe.

Bergfield and Anderson first described the lateral movement trainer in clinical research as an ideal exercise modality for "achieving mobility, strength and functions of the injured knee" (1, 4, 10). Originally developed to rehabilitate torn anterior cruciate ligaments of the knee in 1984, the LMT simulates ice-skating and has gained popularity not only as a rehabilitative device, but also as a conditioning exercise.

As training practices have evolved, functional activities have become a significant part of all conditioning programs. Functional training usually involves activities that are directly associated with the skill used in competition. It is also important to realize that a functional activity may be directly associated with one sport and indirectly associated

with another. The LMT is a functional training device that with recent design advancements is becoming a popular addition to conditioning and rehabilitative programs (13, 14). Such popularity has brought it into the club scene where aerobic classes have implemented slide boards into, for example, a step aerobic class or even a class specifically for slide board training.

A LMT is a durable slide surface made from high-density polymers, Formica, Plexiglas, or other such materials (2, 4, 16). It measures approximately 2 feet wide by 5 to 12 feet long, with a padded block at each end. The better models are rigid and have adjustable bumpers to provide clientele with varying degrees of cardiovascular fitness with longer sliding distances. Becoming somewhat more popular are the vinyl slides that can be rolled like a sleeping bag to save space. Nylon booties are usually worn on top of the athletic shoes in order to slide (2, 4, 11, 14, and 16).

So which muscles do LMT's exercise? As a skate simulator, the hip and the knee extensors and flexors do most of the work; however, the LMT easily works the entire body. The LMT uses body weight and the inertia it generates as resistance. While it requires concentric (muscle shortens) extension of the hip and knee for the push-off phase, it also uses the posture muscles in a static (isometric) contraction during the sliding phase. In order to overcome inertia, it uses the hamstrings in an eccentric (muscle lengthens) contraction throughout the slide. As in skating, the push-off motion requires use of the entire hip extensor muscle group (gluteals), the whole knee extensor muscle group (quadriceps), and also working the calf. Ankle extensors (plantar flexors) such as the gastrocnemius and soleus contract during the push-off phase (4). Finally, because of

the bent forward position required to maintain balance, postural muscles also get a workout; mainly these are the back extensors, a series of muscles that keep the spine upright. Other postural muscles utilized are the abdominals, rectus abdominis, and the internal and external obliques, which wrap around the side and keep the body from swaying sideways when hitting the stop block.

Although the LMT requires the use of the entire body for balance, the device is mainly a lower-body workout in terms of muscle strengthening and development. It also can provide an intense aerobic and anaerobic workout of the cardiovascular system depending on the protocol used (4, 14).

The LMT is purported to train an integral part of almost every sport: lateral agility and power (14). The application of a slide board workout to a variety of sports is limited only by the coach's imagination. Although originally designed for skaters and hockey players, athletes in basketball, football, volleyball, tennis, and other sports can potentially benefit from using the LMT's. In addition to strengthening the muscles involved, the LMT also teaches athletes to maintain control of their bodies throughout the exercise. This development of "kinesthetic awareness" is essential to functional training. After the skill of the LMT is learned, an athlete can train awareness at various stages of fatigue (14).

Rehabilitation and the LMT

The LMT can also be an integral part of a rehabilitative program. The premise of any rehabilitation program is to return an individual to normal or to return an athlete to functional levels at or above pre-injury status (17). Generally, the most rapid decrements

occur in cardiovascular endurance, flexibility, and strength (3). As with certain upper-extremity injuries, the LMT is another method of maintaining aerobic conditioning while the individual is unable to compete (14).

"Closed chain exercises are more effective in the healing process than open chain exercises," says Gary Gray, PT and originator of the Chain Reaction Seminar Series. The three reasons for advocating closed chain exercises are, first, if there are shearing and compressive forces across the joints they would be dissipated over the entire kinematic chain and not focused across one joint. Second, the exercises are functional and sport specific, and can be performed at functional speeds. Third, closed chain exercises aid in restoration of proprioception and can be progressed along a continuum of difficulty with an increase in speed of movement as rehabilitation progresses and healing restraints allow (10).

Closed chain exercise also provides a natural way of exercising that involves functional movements, which is important, because directly and indirectly it requires your body (joints, muscles, neurological system) to "conduct" itself as it does normally. In functional movement, joints incur different natural stresses, depending on the plane of movement, the velocity of the movement, and the type of loading to which they are exposed. Of equal importance, functional movement facilitates normal proprioceptive feedback. The neurological system interacts with the musculoskeletal system in a coordinated fashion that produces safe and natural movement patterns (4, 8, and 10).

One of the intrinsically important rules of rehabilitation is to create an environment for optimal healing. Closed chain exercise provides the means for

individuals to safely engage in constructive rehabilitation activities within a healing environment, focusing on the way bodies actually work. "The body adapts to specific stresses; a functional stress will more likely produce a functional response" (8).

Biomechanists use the three basic cardinal planes of the body - frontal, sagittal and transverse - as reference points. Unlike open chain exercise, which isolates a part of the body during exercises to a single plane, closed chain exercises (LMT) take advantage of the fact the human body is constantly in a triplane mode. At any given moment, forces (stresses) are being imposed on the body while it is in all three planes. Any effort to rehabilitate the body, which is not based on this reality, can be counterproductive to the healing process.

The focus of rehabilitation today is to return athletes to functional levels achieved before the injury. Many devices have been developed to accommodate this need. LMT's are simple, portable, affordable, and effective. They can be used to maintain aerobic conditioning, develop sport-related skills, or redevelop neurological components of physical activities. The variety of athletic skills to which it relates, and the simplicity of the motor skills needed to perform this exercise, make it a useful part of any conditioning and rehabilitation program. In other words, the LMT may help in the restoration of muscle strength, power, and endurance, joint proprioception, and allows for the athlete to exercise in functional planes at functional speeds (8, 10, 14).

Strength Training and Lateral Movement

However, more recently Maclean (13) responded to the idea of functional strength training, or the development of sport-specific strength. Lateral stability has been the

primary reason for the sport-specific activities whose movement is in the frontal plane. Maclean (13) also revealed that movement in the frontal plane makes up 60-90% of most sport-specific movement. Some activities whose primary movement is in the frontal plane are tennis (serve reception), baseball (infielder's starting position), basketball (defensive positions), downhill skiing (moving laterally), and football (three-point stance - linemen and defensive backs) (13). In our study, the subjects were football players and since 60-90% of their movement is lateral, hopefully slide board training would enhance their agility.

Lateral Movement Studies--Benefits

The use of LMTs is a new trend in the fitness industry. Many studies have examined the beneficial effects of the LMT. Research has shown that the slide board activity is an outstanding cardiovascular workout, without the high impact forces characteristic of running (2, 4, 5, 6, 9, and 15). Also, the LMT strengthens upper and lower body muscles, joints, ligaments, and tendons, which are not strengthened by straight-ahead motions typical of running (2, 5, 8, 10, and 14).

Impressed by the low-impact and strengthening aspects of slide boarding, physical therapists are increasingly prescribing slide board activity for athletes recovering from injury (2, 4, 5, 8, 10, and 14). There's also evidence that slide board exercise can improve or develop the athletes' overall coordination, endurance, power, balance, agility (9), and sport-specific strength (2, 5, 7, 13). The main focus of this literature review and research is to emphasize agility and lateral movement which are most obvious in sports such as football, where players cut in and away from their opponents, and tennis, where

players run from side to side chasing a ball. Harmer and Nethery (9), performed a study using six college age students that engaged in a 2x/week slide board training program for six weeks and results indicated that it had a significant improvement in both agility and cardiovascular efficiency following this training program. However, they had a limited number of subjects ($\underline{N} = 6$) and did not have a control group.

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