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CAP Soccer:
Improvements in Linear Power (Acceleration) and Multidirectional Power (Agility) during a 3 week Power Interval Phase

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Introduction

As we approach the beginning of the spring 07 soccer season, we are starting to prepare the athletes for the first peak of the season. We want them to be as fast as they have ever been, while still maintaining a high level of conditioning to repeat these bursts of speed and agility over the course of a game, tournament and season. We just came out of a linear speed development phase that was one or our best of all time! The results below show the improvements of 2 groups. First, those that trained strength and conditioning with CAP in the fall, and second, those that started to train with CAP in the winter.

The graphs below show that 20 yd dash speed improved steadily over the fall, and then continued to improve over the first 6 weeks of the winter off-season phase. We were curious how the next 3 week power / plyometric phase would affect 20 yd dash speed. Would it continue to improve acceleration? Or would it be hindered short term due to the load and demand of resisted sprinting, depth jumps and lateral to linear plyo emphasis.

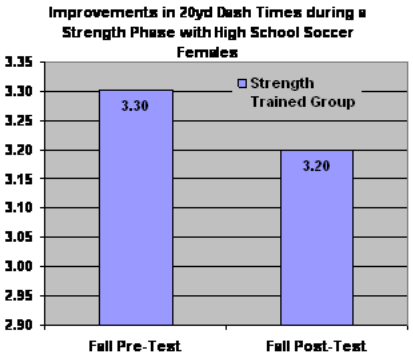

Figure 1: FALL 06 Soccer Group that went through a max strength protocol. The group had an improvement of .10 seconds off their 20yd dash during the Fall Season.

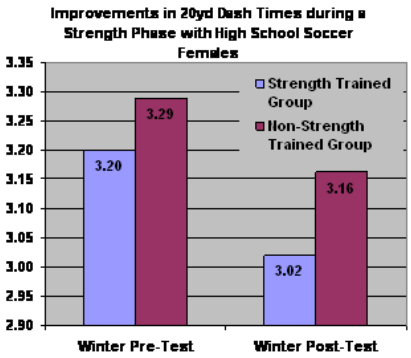

Figure 2: Winter 06 Soccer Group that went through a max strength protocol in the fall had significantly better speed improvements than those that did not.

Over this 3 week Power Interval Phase of the Offseason Training Program, the athletes that trained on the Woodway Force Treadmill with Polar Heart Rate Monitors continued to improve, while those that did not train on the Force, slowed down or leveled off. The key to this was the implementation of the Heart Rate Monitors to assure that each athlete was recovered enough to start the next sprint. We did not want this 10 minute block on the Force to be a "conditioning" block, but rather a power and speed block where you need to be almost fully recovered before running your next sprint.

Overall this phase was very successful and we expect to see even more improvements over the next few weeks as their legs recover from some of the plyometric work that was done.

Power Interval Training Protocol:

The training protocol for this phase was solely based around power production. The goal was to move as quick and powerfully through each movement, and to develop powerful bursts in all three planes (linear, lateral and rotational). We varied the loads week to week, but overall the loads were lighter than those used in the previous phases. Strength was not a focus, and in fact, we only used a barbell for 1 exercise – Band Squats with the Tendo Power Analyzer. Therefore, strength gains during this phase were minimal. We really put all the focus on improving explosive force production.

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We divided the 95 soccer athletes in our Long Term Soccer Program into two groups. **Group 1** used the Woodway Force Treadmill (we will refer to this group as the WF group for Woodway Force) to run resisted sprints. **Group 2** used a Lifefitness Treadmill (we will refer to this group as the LF group for Lifefitness) to do incline runs of 10 seconds or less at a 15 degree incline and a speed of 10 mph. The WF group ran a max speed sprint with a resistance (load) of 15% of their body weight, then let their heart rate (HR) recover to 150 beats per minute (bpm), then ran another max speed sprint. The goal was to run as many max speed sprints as possible, and run as fast as possible for the 10 minute time frame in which they were on the Force. The LF Group ran an incline run in a ratio of 10 seconds on and 50 seconds off. On week 3 the LF group super setted these runs with a sprint up the stairs (25 stairs) skipping 1 stair. This was the only difference in the 2 groups programs. Below is the exact protocol implemented for the 3 week Power Interval Phase.

PHASE 4					
WK 10		WK 11		WK 12	
15-Jan-07		22-Jan-07		29-Jan-07	
SPD-STR / Agility		SPD-STR / Agility		SPD-STR / Agility	
Quick Stretch	5min	Quick Stretch	5min	Quick Stretch	5min
Sup. Legs	1set	Sup. Legs	1set	Sup. Legs	1set
MB Rot Pwr	4x6	MB Rot Pwr	4x6	MB Rot Pwr	4x6
Box Jump Ups	4x6	Box Jump Ups	4x6	Box Jump Ups	4x6
Stair Sprints	4x25	Stair Sprints	4x25	Stair Sprints	4x25
WW PWR runs		WW PWR runs		WW PWR runs	
Reactive str/Plyo		Reactive str/Plyo		Reactive str/Plyo	
Lateral Plyos		Lateral Plyos		Lateral Plyos	
D jump & J clean	5x5	D jump & J clean	5x4	D jump & J clean	5x3
Jump sqt to press	5x5	Jump sqt to press	5x4	Jump sqt to press	5x3
Sqt raise	5x5	Sqt raise	5x4	Sqt raise	5x3
Box step up	5x5	Box step up	5x4	Box step up	5x3
Plyo push ups	5x5	Plyo push ups	5x4	Plyo push ups	5x3
Tendo Band sqt	10x3	Tendo Band sqt	10x3	Tendo Band sqt	10x3
Track Cond		Track Cond		Track Cond	

Here is a breakdown of some of the training components:

MB Power Circuit:
Alternating between heavy and light med balls athletes performed 6 reps on each side of rotational shot tosses or rotational scoop tosses, then super-setted the med ball work with 6 box jump ups (each leg) on a 18" box, alternating legs with each jump. The focus was on generating as much power and speed as possible with each jump or throw.

WF Power Runs:
On a Woodway Force © Treadmill the athlete would enter in a load of 15% of their body weight, and after a few warm up sprints at that load, they would perform a full speed sprint, attempting to get to top speed as fast as possible. They would then stop, rest and let their heart rate recover to 150 bpm using a Polar FS1 HRM. As soon as their heart rate (HR) recovered to 150 bpm they would perform another sprint. They repeated this process for 10 minutes trying to get as many sprints in as possible in the 10 minute time frame. Our athletes were getting between 10 and 17 sprints.

The focus of this portion of the workout was two-fold.

1) Develop more power in their initial acceleration from a standing start
2) Improve efficiency in max power output allowing their HR to recover more rapidly thus allowing them to get more out of each workout

MORE SPRINTS + FASTER SPEEDS = POWER EFFICIENCY

Lateral Plyos:
Emphasis on decreased GCT and increased RFP in the form of height and distance while maintaining fwd body lean for smooth transition into a sprint.

- Lateral Plyo Split squats x4 sets of 5 yds
- Lateral bound to sprint (5 bounds to 5 yd sprint) x2
- Single leg lateral bounds (5 bounds to 5 yd sprint) x 1 each leg
- Lateral Tuck jumps to sprint (5 tuck jumps to 5 yd sprint) x2
- 10yd shuttle to 10 yd sprint x2

Tendo Band Squat:
When performing barbell back squats with black Jumpstretch © bands attached to the bar (which was also hooked up to a Tendo © Force Analyzer) the athletes performed a single rep with just the bar and bands to establish maximal Tendo © speed. Once optimal speed was established, the athletes added weight each set while maintaining 90% of optimal speed for 10 sets.

The bands allow for an unloading at the bottom of the movement while allowing the athletes to accelerate aggressively to the top of the motion as resistance increases, thus forcing them to be as powerful as possible. The addition of the Tendo © Force Analyzer allows us to monitor the speed of each rep. This also pushes the athletes to go faster and faster with excellent form so as to keep the speed at the optimal range.

Agility Circuit:
The Agility Circuit was performed on a track surface 4yds wide and 40yds long. The athletes started with a cutting drill, cutting between 2 cones 3yds apart, and then cutting between 2 cones 5yds apart. Then they would jog 10yds to the end of the track. At that point they would turn and sprint maximally for 10yds, decelerate over the next 10yds to a walk, then walk for 30yds, jog for 30yds, and then begin again. The drill was as follows:

- 3yd cone cut drill,
- 5yd cone cut drill,
- 20yd sprint,
- 30yd walk,
- 30yd jog
- *** repeat for 10 minutes ***
-

This type of conditioning allowed us to practice several things:

1) cutting efficiency
2) powerful acceleration
3) repeatable performance without a loss of efficiency or speed

Testing and Results:

We pre-tested all soccer players in the 20yd dash and 20yd Shuttle, and then as we went through this 3 week phase, we monitored the workouts by recording the speed and recovery time of each sprint for the WF Group that ran the power intervals on the Woodway Force Treadmill.

The results were impressive. We noticed great improvements in both average speed as well as max speed with a 15% load in the runs on the Woodway Force (as seen in Figure 3). The cues given during each sprint were based around getting the athlete to try and get to top speed faster. We counted steps and asked them to try and get to top speed in 7 steps or less. Most of the athletes were hitting their top speed in around 9-11 steps, with some not hitting top speed until 15 steps into the run. The goal of this is to get them to be more explosive in their start. Hopefully this will translate to better closing speed and separation speed on the field.

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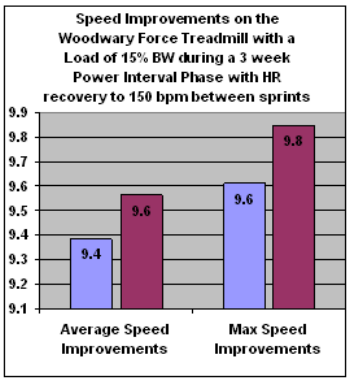

Figure 3: WINTER 06 Soccer Group that used the Woodway Force Treadmill to perform max power sprints showed significant increases in speed in both average speed and max speed during the 10 minute workout

The next goal was to improve the recovery time between these sprints. This was achieved in impressive fashion most likely due to the fact that the athletes were getting to top speed quicker and not wasting time and energy on building up to speed (slow accelerations). The results are seen below in Figures 4 and 5.

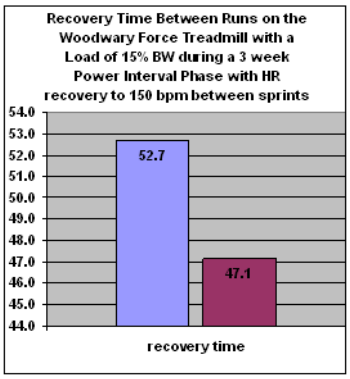

Figure 4: WINTER 06 Soccer Group that used the Woodway Force Treadmill to perform max power sprints decreased their Heart Rate Recovery time between sprints over the 3 week Power Interval Phase.

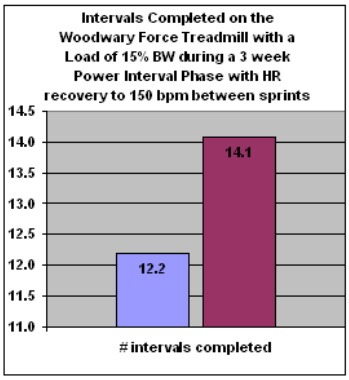

Figure 5: WINTER 06 Soccer Group that used the Woodway Force Treadmill to perform max power sprints increased the number of intervals that they could complete and still allow their Heart Rate to recover to 150 bpm between sprints.

All of these improvements don't really mean anything unless it can be applied to something that impacts what they do on the field. We used the 20yd dash and 20yd shuttle to answer these questions. To run a fast 20yd dash, you must accelerate very quickly and be at top speed as soon as possible (more like an actual sprint in a game than a 40 or 100yd dash). To run a fast shuttle you need to be able to change direction well and be explosive out of each cut. In Figure 6 you can see that both groups started out about the same speed, but the group that used the Woodway Force (WF Group) had much better results than that of the group that ran the incline sprints on the treadmill. Even our fastest athlete in the WF Group improved from a 2.91 to a 2.83 in the 20yd dash. The fastest athlete in the LF Group went from a 2.82 to a 2.83 in the 20yd dash.

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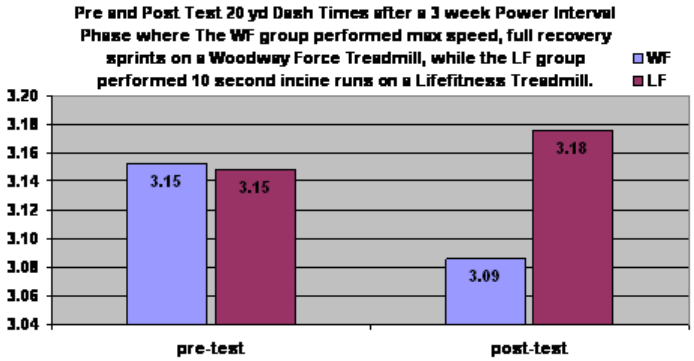

Figure 6: WINTER 06 Soccer comparison of group that use the Polar Heart Rate Monitors to identify full recovery between max speed sprints at 15% of body weight used as a load on the Woodway Force Treadmill. The WF (Woodway Force group) had improved performance in 20 yd dash speed, while the group that ran incline sprints at 15 incline and 10 speed on a Lifefitness treadmill actually got slower.

This reinforces our belief in using resisted sprinting on the Woodway Force as a way to peak speed during a Power Interval Phase. We have done this test before and never had as good of results as we did this winter. We feel that we owe it to the use of Heart Rate Monitors to make sure that each athlete is fully recovered before starting the next sprint. In years past, we set the rest interval at 30, 45 or 60 seconds between sprints. That seemed to be too short a rest period for some and too long a rest for others. By using the Heart Rate Monitors we could let each athlete get the most out of their training.

The groups continued improvement in 20yd Shuttle impressed us even more (seen in Figure 7). We expected to see both groups improve about the same based on the plyo type activity and the emphasis on multi directional cutting in the conditioning part of the workouts. We didn't expect the Woodway Force Treadmills to have such an effect on agility.

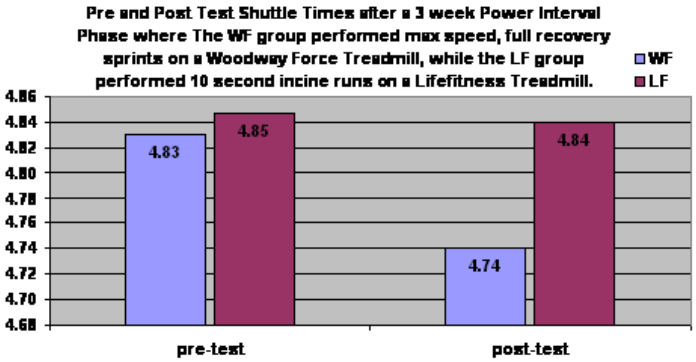

Figure 7: WINTER 06 Soccer comparison of group that use the Polar Heart Rate Monitors to identify full recovery between max speed sprints at 15% of body weight used as a load on the Woodway Force Treadmill. The WF (Woodway Force group) not only had improvements in 20 yd dash speed, but also out performed the LF (Lifefitness group) in the 20 yd Shuttle (agility). The LF group performed 1, 10 second run at 10 speed and 15 incline on a treadmill for 10 minutes.

Practical Applications and Thoughts for the Future:

To look at this phase in isolation, apart from the other phases of the CAP year round soccer program would not do it justice. This is just one phase, looking for one response. These results were achieved through the athlete's dedication and consistency over the last 9 months to setting a solid foundation, and then slowly building on that foundation, adding new stimuli each phase to continue to boost performance.

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If you take a handful of the soccer players that have trained here for the last 9 months consistently (20 or so Female players and a half dozen males), and you look at separate them from the rest, the numbers are staggering. They showed consistent improvement in the weight room, then they improved the way they moved (rhythmically, stably, confidently), then they added a degree of speed and power to the movement. This is a template for success. Not trying to get improvements all at once, but trying to build upon a solid foundation. Not always focusing on speed! The end result is **CONSISTANCY**!

Do we use the Force Treadmill all year? Yes. But we run various protocols on this treadmill to peak certain aspects of athleticism and conditioning. I know now that this protocol works, but it will only work as long as you strategically place it into the workout. The day we sell out to using this protocol to try and peak speed all year long, is the day we start to lose the one thing that makes us great. **Variety**!

Note to all our athletes: **Don't get comfortable doing the things you like, or the things that you know work for you. You are young and you need variety! You need to have new stimuli coming in from all directions, forcing you to adapt, learn and develop. The day your program becomes stagnate is the day your performance will become stagnate. As we go into the spring season, it is important that you continue to stimulate your athleticism or it will decline. Congrats on a great winter and good luck on a successful spring!**

Research:

EXPLOSIVE-RESISTANCE TRAINING IMPROVES EXPLOSIVE ACTIVITIES IN SOCCER

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SPORT SPECIFIC APLICATIONS FOR STRENGTH TRAINING, PERIODIZATION

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