



## USING LTAD TO PROGRAM FOR A MIDDLE SCHOOL ATHLETE AND A HIGH SCHOOL ATHLETE: PART 2 – CREATING A DEVELOPMENTALLY-APPROPRIATE STRENGTH AND CONDITIONING PROGRAM

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This article continues the discussion of long-term athletic development (LTAD) by providing a sample program design. Part 1 of this two-part article served to help sports coaches better understand and apply LTAD principles to the development of athletic profiles for their youth athletes based on multiple dimensions of physical maturity (at the youth level, the sports coach often is the strength and conditioning coach) (3). These athletic profiles were divided into two major groups based on peak height velocity (PHV); “the period of time in which an adolescent experiences their fastest upward growth in stature...” (3). As athletes that are pre-PHV (not yet adolescent) have different exercise and movement goals when compared with post-PHV (adolescent) athletes, practical application of LTAD can be complicated. This article provides practical application of the LTAD principles by examining two sample programs. The first program is for a middle school athlete who is pre-peak height velocity (pre-PHV). The second program is for a high school athlete who is post-peak height velocity (post-PHV). Recognizing that coaches are most often faced with an uncertain combination of pre-PHV and post-PHV, the practical application is not always so easy or straightforward for coaches working with young athletes.

### PRE-PHV AND POST-PHV DIFFERENCES IN YOUTH

Coaches should recognize that pre-PHV and post-PHV aspiring athletes will have overlapping, yet different program goals. Pre-PHV should focus on “mastery of fundamental motor skills, sport sampling, general physical preparation, development of muscle strength using a variety of implements, introductory sport skills, physical literacy, attention to volume of training/playing, rest, and nutrition,” (3). This includes locomotor skills, object control

skills, and body awareness. The development of fundamental motor skills is also demonstrated by the ability to establish proper athletic positioning via the universal athletic stance, body awareness when shifts in position occur, and development of movement abilities in all three cardinal planes of motion (4). On the other hand, post-PHV youth “may narrow focus to one or two sports but also may continue to sample/play multiple sports, continue focus on general physical preparation with enhanced sport skills, continue to develop muscle strength and power, correctly periodize the volume of training/playing, and pay attention to rest, and nutrition,” (3). The post-PHV athlete should apply strength and skill to the desired sports or activities. These categories lead to the testing that best matches level of maturity, with pre-pubertal youth continuing to focus on improving general athleticism while pubertal youth can apply that athleticism in a sport setting (3).

### EXAMPLE TEST RESULTS AND PROGRAM DESIGN FOR PRE-PHV YOUTH

#### TEST RESULTS FOR PRE-PHV YOUTH

In accordance with pillar 8 of the National Strength and Conditioning Association’s Position Statement on Long-term Athletic Development, testing is a snapshot of the athlete’s performance on that test or battery of tests on that day only (5). Test results are to be used to establish individual athlete’s strengths and weaknesses, not to predict athletic talent. The example test results for the pre-PHV youth (Table 1) focus on fundamental movements, exercise technique, and generic fitness tests. Note that not all tests have gender-specific data. Testing is designed to be completed in one session but larger numbers of athletes may require testing over two or three initial sessions.

Testing order follows the NSCA testing protocol, where available—motor skill mastery is not included in the NSCA protocol, for example. These tests are samples of tests conducted by the author (1).

### PROGRAM DESIGN FOR PRE-PHV YOUTH

Following NSCA principles, trainees with no prior lifting experience are considered training age 0 (1). The pre-PHV athlete in this example is training age 0, so, according to NSCA guidelines this aspiring athlete should begin with resistance training 1 – 2 times per week (1). According to his test results (Table 1), the focus of LTAD training should not only be on all 10 fitness attributes (pillar 2, 3, 6, and 7) but also focusing on improving the fitness attributes with scores below the norm (5). The exercises selected are usually available to coaches and address fundamental movement patterns such as hinging, lunging, and squatting; strength; and overall athleticism. A sample 2 times per week program might look like the following:

#### Day 1

Motor Warm-up:

Walk-March-Skip progressions (30 s x 2)  
Alternate coach pick/athlete pick (the coach and athlete take turns selecting the next exercise, which helps the athlete learn and take responsibility for the exercises and helps the coach by finding which exercises the athlete chooses vs. the exercises the athlete needs in his program)

Sample Alternating Coach/Athlete Exercise Selection:

Coach Pick: 15 lunges (bodyweight)  
Athlete Pick: Assault Bike 2 min  
Coach Pick: Hip Hinge with Kettlebell (4 kg)  
Athlete Pick: Leg Press 0.5 x bodyweight  
Coach Pick: Cable Push/Pull unilateral 15 lb/20 lb  
Athlete Pick: Game: Gaga

#### Day 2

Motor Warm-Up:

Obstacle Course: Hopscotch Poly-Spots, Hula Hoop, Cone Zig-Zag, Balance Beam Step and Stop, Jump Rope (20 s each, 40 s rest)

Circuit Training:

Hip Bridge, Can Openers, Suspension Training Squats, Medicine Ball Lateral Rotations, Mountain Climbers, Barre Romanian Deadlifts (1 circuit to start)

## EXAMPLE TEST RESULTS AND PROGRAM DESIGN FOR POST-PHV YOUTH (MALE)

### TEST RESULTS FOR POST-PHV YOUTH

For post-PHV youth, test results can be used not only to establish individual athlete's strengths and weaknesses but also to predict athletic talent. The example test results for the post-PHV youth (Table 2) focus on fundamental movements, exercise technique, and generic fitness tests, similar to pre-PHV youth, and also reveal that this athlete still has not mastered critical fundamental movements and has below standard test results for power, speed,

and relative strength. These tests are examples of tests conducted by the author for comparison to testing of PHV youth. Since this athlete needs general fitness and movement remediation, sports-relevant testing is not conducted as part of this profile.

### PROGRAM DESIGN FOR POST-PHV YOUTH

The post-PHV athlete in this example is training age 2 which means he has experience with resistance training exercise technique, although it is noted his power development is below standard, so his power exercise progressions need to be regressed. According to NSCA guidelines, this developing athlete should engage in resistance training according to seasonal requirements, i.e., based on whether he is off-season, pre-season, in-season, or post-season (1). However, multisport participation is factored as the focus of LTAD and he has not yet declared a sport in which he chooses to specialize, so training should continue to be on all 10 fitness attributes (pillar 2, 3, 6, and 7) (5). In order to improve his test results in exercises and motor abilities in which he is below the norm (see Table 2), a sample 3 times per week program might look like the following:

#### Day 1 (Monday)

Power:

Triple Extension 5 x 3

Core:

Front Squat 5 x 5  
Romanian Deadlift 3 x 5  
Push Press 3 x 5

Accessory:

Glute/Ham Raise 3 x 8  
Shoulder IYTLs 2 x 8  
Push-Ups As Many Repetitions As Possible (AMRAP)

#### Day 2 (Wednesday)

Power:

High Shrug Pulls 3 x 3  
Standing Broad Jumps 3 x 3

Core:

Step-Ups 5 x 5  
Incline Press 5 x 5  
Trap Bar Deadlift 5 x 5

Accessory:

Pull-Ups AMRAP  
Lateral Band Walks Light Tubing x 30 s each way

#### Day 3 (Friday)

Power:

Jump Shrugs 3 x 3  
Vertical Jumps 3 x 5  
One-Leg Hops x 10

Core:

Back Squats 5 x 3  
Landmine One-Arm Press 3 x 5  
One-Leg RDL 3x 10

Accessory:

Pallof Press 2 x 12  
Medicine Ball Against the Wall 3 x 5  
Mountain Climbers 30 s x 3

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**TABLE 1. SAMPLE ATHLETIC PROFILE TEST RESULTS FOR PRE-PHV YOUTH (MALE)**

| <b>FITNESS ATTRIBUTE</b>               | <b>EXERCISE/MOVEMENT</b>  | <b>ATHLETE SCORE</b>   | <b>PRE-PHV NORMS (2)</b>                       | <b>ABOVE NORM, BELOW NORM, OR MEETS STANDARD</b>                        |
|--|---|--|--|---|
| <b>Fundamental Motor Skill Mastery</b> | Fundamental Motor Skill Mastery Checklist (8)                                       | Knee valgus on skipping and landing                                  | Does not meet standard                         | Below for Skipping and Landing  |
| <b>Proper Athletic Stance</b>          |   | Met standard when coached properly                                   | Meets standard                                 | Meets standard  |
| <b>Body Awareness</b>                  |   | Was aware of balance, center of gravity, and base of support changes | Meets standard                                 | Meets standard  |
| <b>Cardinal Planes of Motion</b>       |   | Does not move well laterally   | Does not meet standard                         | Below for frontal plane movements                                       |
| <b>Exercise Technique (1)</b>          | Basic Exercise Technique for Foundational Movements such as Squat, Lunge, and Hinge | Needs further coaching and cuing for foundational movements          | Meets standard                                 | Needs further coaching and cuing for foundational movements             |
| <b>Balance (static)</b>                | Stork Stand   | 24 s (boys)  | 30 s (boys);<br>20 s (girls)                   | Below norm  |
| <b>Agility</b>                         | Pro-Agility   | 7.15 s   | Not found                                      | Below, especially for movements such as deceleration and reacceleration |
| <b>Power (horizontal)</b>              | Standing Broad Jump   | 52 in. (boys)  | 59 in. (boys);<br>56 in. (girls)               | Below norm  |
| <b>Power (vertical)</b>                | Vertical Jump   | 12 in.   | 10.5 in. (not gender differentiated)           | Slightly above norm   |
| <b>Strength (absolute)</b>             | Handgrip Dynamometer  | 25.5 kg  | 29.7 kg (11-12 y/o)                            | Below norm  |
| <b>Strength (relative)</b>             | Pull-Ups/Push-Ups   | Pull-Ups: 0<br>Push-Ups: 8   | 34 (boys); 21 (girls) /<br>8 (boys); 3 (girls) | Below norm for push-ups and pull-ups                                    |
| <b>Speed</b>                           | 40-Yard Dash  | 6.21 s   | 5.97 s (boys)                                  | Below norm  |
| <b>Cardiovascular Endurance</b>        | One-Mile Run  | Could not complete   | 6:57 min (boys);<br>8:00 min (girls)           | Below norm  |

TABLE 2. SAMPLE ATHLETIC PROFILE TEST RESULTS FOR POST-PHV YOUTH

| FITNESS ATTRIBUTE                      | EXERCISE/MOVEMENT   | ATHLETE SCORE   | POST-PHV NORMS (2)                                | ABOVE NORM, BELOW NORM, OR MEETS STANDARD   |
|--|---|---|---|---|
| <b>Fundamental Motor Skill Mastery</b> | Fundamental Motor Skill Mastery Checklist (8)                                     | Motor Skill Mastery except for static and dynamic balance   | Meets standard (in combinations for sport skills) | Below norm for static and dynamic balance   |
| <b>Proper Athletic Stance</b>          |   | Meets standard  | Meets standard                                    | Meets standard  |
| <b>Body Awareness</b>                  |   | Meets standard  | Meets standard                                    | Meets standard  |
| <b>Cardinal Planes of Motion</b>       |   | Meets standard  | Meets standard                                    | Meets standard  |
| <b>Exercise Technique (1)</b>          | Exercise Technique for Foundational Exercises as well as sport-relevant exercises | Exercise technique on power exercise (Clean) is very poor. Core exercise performance is very good (training age = 2). Accessory exercise performance also matches training age 2. | Meets standard                                    | Programming needs to be regressed for power exercises. All other exercises programmed at training age 2 |
| <b>Balance (static)</b>                | Stork Stand   | 43 s (boys)   | 31-40 in. (boys)<br>16-32 in. (girls)             | Meets standard  |
| <b>Agility</b>                         | Pro-Agility   | 5.19 s  | 5.02 s +/- 0.24 s                                 | Meets standard  |
| <b>Power (horizontal)</b>              | Standing Broad Jump   | 70 in. (boys)   | 79 in. (boys);<br>65 in. (girls)                  | Below norm  |
| <b>Power (vertical)</b>                | Vertical Jump   | 17.5 in. (boys)   | 20.5 in. (boys);<br>15.5 in. (girls)              | Below norm  |
| <b>Strength (absolute)</b>             | Handgrip Dynamometer  | 45 kg   | 43.4 kg +/-<br>7.3 kg (17 y/o)                    | Above norm  |
| <b>Strength (relative)</b>             | Pull-Ups/Push-Ups   | Pull-Ups: 5 (boys)/<br>Push-Ups: 27 (boys)  | 15 (boys); 2 (girls)/<br>56 (boys); 28 (girls)    | Below norm  |
| <b>Speed</b>                           | 40-Yard Dash  | 5.00 s (boys)   | 4.76 s (boys)                                     | Below norm  |
| <b>Cardiovascular Endurance</b>        | One-Mile Run  | 6:10 (boys)   | 5:57 (boys); 7:58 (girls)                         | Below norm  |

## COMMONALITIES AND DIFFERENCES IN PROGRAM DESIGN

Program design for pre- and post-PHV has the following similarities:

- Programming is based on the needs analysis and test results
- Fundamental movement skills need to always be taught and reinforced
- Exercise technique should always be reviewed and corrected when necessary (during the growth spurt, for example)
- Training age is always based on the experience of the athlete with each movement—chronological age is not the primary determinant of program design
- Training needs to occur in all three planes of movement
- While it seems that there are significant training differences, foundational strength and conditioning is often the correct approach for athletes of all ages and abilities. Sports practice differentiates sport-relevant and sport-centric movements, patterns, and strategies.

Program design for pre- and post-PHV has the following differences:

- A group of aspiring athletes may vary in training age, level of maturity, and interest in the program. Movements need to be modified, progressed, and regressed as applicable.
- Pre-PHV athletes still need to focus on development of movement, strength, and technique; post-PHV athletes need to also consider building on their strength capabilities as power.
- As training age advances, program design also advances. Coaches need to be prepared with exercise progressions and regressions to adjust for athletes of different ages and abilities in the same group.

## CONCLUSION

Strength and conditioning coaches can apply LTAD to help create a developmentally-appropriate strength and conditioning program for youth of varying ages, abilities, and interests. Regardless of training age, chronological age, or developmental age, all fitness attributes need to be continuously developed throughout childhood and adolescence (pillar 3, 6, and 9), while programming for specific deficits, as identified in the needs analysis and test results. Part 2 of this article is but one example of how LTAD can be utilized to develop a strength and conditioning program for pre-PHV and post-PHV youth. Factors including movement proficiency, fitness attribute test results, sports-relevant skill/attribute test results, goals, and periodization phase need to be considered when designing training programs.

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## ABOUT THE AUTHOR

*Rick Howard helped start the National Strength and Conditioning Association (NSCA) Youth Special Interest Group (SIG) and served this year as Immediate Past Chair. In addition, Howard serves on the NSCA Membership Committee and is the NSCA State/Provincial Program Regional Coordinator for the Mid-Atlantic Region. Howard is involved in many pursuits that advance knowledge, skills, and coaching education to help all children enjoy lifelong physical activity and sports participation.*

## CONFLICT OF INTEREST STATEMENT

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