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# Short and Sweet: HIIT Training in PE

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# Short and Sweet:



## HIIT Training in PE

By Tara B. Blackshear

**F**itness testing in physical education (PE) has pretty much remained unchanged since the 1950s and 1960s. The one-size-fits-all approach tends to include isolated endurance runs, independent muscular fitness activities, and flexibility tests (e.g., mile run, shuttle runs, push-ups, curl-ups, pull-ups, and the sit and reach) completed once or twice a year (Keating & Silverman, 2004; Silverman, Keating, & Phillips, 2008). Concerns arise with little evidence that these practices benefit students or promote physical literacy (Eastham, 2018; Keating & Silverman, 2004; Seefeldt & Vogel, 1989). Conversely, insurmountable evidence shows traditional fitness testing methods are problematic, including students' and teachers' negative associations with fitness testing, students who are improperly prepared, inconsistent implementation, and the rationale is unclear, non-existent or viewed as useless (Eastham, 2018; Keating & Silverman, 2004, 2009; Landi & Lynch, 2019; Miller et al., 2016; Seefeldt, & Vogel, 1989; Silverman et al., 2008). Additionally, humiliating experiences for low-performing, overweight and lesbian, gay,

bisexual, transgender and queer students is reported in the literature (Landi & Lynch, 2019; Sidwell & Walls, 2014; Silverman et al., 2008). Equally upsetting is old school fitness testing practices have little real-world application and keep students in the dark as to how to move and work their bodies, yet the mission of many PE programs is to ensure that students are physically competent—criteria under physical literacy.

The Centers for Disease Control and Prevention (2018), the Canadian Society for Exercise Physiology (2019), and the World Health Organization (2019) all agree that youth should engage in 60 minutes of moderate to vigorous activity and include 3 days of muscular fitness activities—a difficult feat in many PE programs. Considering the challenges of reduced PE courses and activity time, and the evolution of student behaviors that include sedentary living and portable technology (e.g., cell phones, tablets), alternative approaches that captivate an often-distracted audience must emerge.

**Table 1. Body Weight Exercises**

<b>Beginner</b>	<b>Intermediate</b>	<b>Advanced</b>	<b>Alternative Options</b>
Squats	Pop squats	Jump squats	Squat hold; wall sit; single leg wall sit
Squat + front jabs	1-leg squat R/L	Pulse squats	Plank squat thrusts; criss-cross squats
Alt lunges	Pulse lunges (R/L)	Alt power lunges	Curtsey lunge; front/rear lunge (R/L); alt power low lunge
Alt front kicks	Kick squats	Alt power kicks	Lateral leg lifts (R/L)
Alt rear kicks	Front/rear kicks (R/L)	Alt side kicks	Front + side kicks (R/L)
Single leg squats (R/L)	Repeated broad jumps	Broad jump + squats	Vertical jumps; vertical jump squats
Alt step high knees	1-2-3 knee	Alt power high knees	Repeater knee drives (R/L); front knee/side knee (R/L)
Front jabs	Overhead jabs	Front + overhead jabs	Upper cuts
Alt hooks	Front jab + hook (R/L)	Side elbow + front jab (R/L)	Cross jabs
Dips	Dips + alt leg raise	Crab + alt kicks	
Modified/knee push-ups	Push-ups	Push-up jacks	Push-ups w/rotating plank; push-ups, push backs; wall push-ups
2-leg glute bridge lift	Glute bridge + alt leg lift	Fire hydrants (R/L)	Quadruped (R/L); clams (R/L)
Elbow plank hold	High plank hold	Up/down planks	Side rotating plank (R); side rotating plank (L); plank + alt shoulder taps; plank + alt toe taps
High plank hold	Rotating plank	Plank jacks	Plank + alt hip dips; hi plank + alt side knee crunch; low side plank w/ knee crunch
X-arm curl-ups	Bicycles	Hi/lo boat	Boat holds; bear plank; plank tap combo (shoulders, quads, shin)
Superman	Supermans + lat pull	Supermans + lay down push-ups	Supermans + planks w/crunch; Shoulder press + lat pull; bent row or seated row
Step jacks	Jumping jacks	Power jacks	X-jacks; V-step; walk in place;
Inchworms	Burpees	Burpee or spin burpee + push-ups	Burpee w/push-up jacks; burpee w/ jumping jacks; burpee no jump
Alt step low Lunge	Mountain climbers	X-mountain climbers	Plank tucks + plank jacks; plank tucks; plank jacks
Forward and back quick feet	In in/out out	Alt shuffle + knee	1-2-3 knee (R/L); quick feet
Alt shuffle	Shuffle squat	Shuffle + squat jumps	Shuffle + jump
Step donkey kick	Donkey kicks	R/L donkey kicks	Single leg donkey kicks
5 m walking shuttle	5 m continuous shuttle	5 m shuttle + jump	Alt lateral leap + jump
Line jumps	Line hops (R/L)	Skaters R/L	Skiers R/L
Step touch	Grapevine + knee drive hop	Power step touch	Triple hops R/L; pendulum swing; grapevine
<b>Key</b>			
Step = Low Impact, no hopping or jumping; step in lieu of a jump or hop			
Alt = Alternate from right to left			
R/L = Right to left or R/L/R/L pattern per round (1 side then switch the next round)			
Repeater = 3 quick successions in a row			
X = Across the body in an X on diagonal pathway			

**Table 2. Beginner Workout Example**

Name _____				Goal _____			
Date _____				Interval Ratio: work _____ seconds rest _____ seconds			
Exercises	#	Exercises	#	Exercises	#	Exercises	#
Step jacks		Step touch		Alternating front leg raise		March in place	
Front jabs		Knee push-ups		Lateral arm raises		Fire hydrants	
Step jacks		Step touch		Alternating front leg raise		March in place	
Front jabs		Knee push-ups		Lateral arm raises		Fire hydrants	
Step jacks		Step touch		Alternating front leg raise		March in place	
Front jabs		Knee push-ups		Lateral arm raises		Fire hydrants	
Step jacks		Step touch		Alternating front leg raise		March in place	
Front jabs		Knee push-ups		Lateral arm raises		Fire hydrants	
Reflection:							

**Table 3. Intermediate Workout Example**

Name _____				Goal _____			
Date _____				Interval Ratio: work _____ seconds rest _____ seconds			
Exercises	#	Exercises	#	Exercises	#	Exercises	#
High knees		Inchworm + jump		Pop squats		In, in, out, out	
Push-up jacks		Jumping jacks		Front jabs		X-mountain climbers	
High knees		Inchworm + jump		Pop squats		In, in, out, out	
Push-up jacks		Jumping jacks		Front jabs		X-mountain climbers	
High knees		Inchworm + jump		Pop squats		In, in, out, out	
Push-up jacks		Jumping jacks		Front jabs		X-mountain climbers	
High knees		Inchworm + jump		Pop squats		In, in, out, out	
Push-up jacks		Jumping jacks		Front jabs		X-mountain climbers	
Reflection:							

Prior to the 40-year physical activity decline among American youth (Committee on Physical Activity and Physical Education in the School Environment, Food and Nutrition Board, & Institute of Medicine, 2013) and the increased use of portable technologies, assessing youth fitness has and continues to challenge many PE programs (Mercier, Phillips, & Silverman, 2016). Further, traditional fitness assessment approaches have not shown to increase fitness, self-efficacy, physical literacy, or enjoyment of physical activity (Eastham, 2018; Silverman et al., 2008). Yesterday approaches also fail to address various student needs and stages of development. Alternatively, there are fitness assessment strategies that complement real-world physical activities that prepare secondary students for better understandings of health-related outcomes and increase student engagement (Bailey et al., 2018; Leahy et al., 2019).

Bailey et al. (2018) found adolescents improved fitness and enjoyed participation in concurrent or high-intensity interval training (HIIT), which allows students to work simultaneously on aerobic and anaerobic activities in short time spans with similar or greater health outcomes than endurance or aerobic training alone (American College of Sports Medicine, 2014; Gibala et al., 2006; Wilson et al., 2012). Leahy et al. (2019) had similar results in a HIIT intervention targeting high school youth. Not only did students' fitness increase, they enjoyed HIIT sessions, and retention was high. Positive responses among PE teachers who incorporate HIIT in PE are also evident (Costigan, Eather, Plotnikoff, Hillman, & Lubans, 2016), and adults who participate in HIIT benefit physiologically and psychologically (Oliveira, Santos, Kilpatrick, Pires, & Deslandes, 2018). This article provides teachers with HIIT assessment and testing



**Table 4. Advanced Workout Example**

Name _____				Goal _____			
Date _____				Interval Ratio: work _____ seconds rest _____ seconds			
Exercises	#	Exercises	#	Exercises	#	Exercises	#
Burpees		Mountain climbers		Alternating power lunges		Dips	
Jump squats		Jumping jacks		Push-up jacks		Power kicks	
Burpees		Mountain climbers		Alternating power lunges		Dips	
Jump squats		Jumping jacks		Push-up jacks		Power kicks	
Burpees		Mountain climbers		Alternating power lunges		Dips	
Jump squats		Jumping jacks		Push-up jacks		Power kicks	
Burpees		Mountain climbers		Alternating power lunges		Dips	
Jump squats		Jumping jacks		Push-up jacks		Power kicks	
Reflection:							



This article provides teachers with HIIT assessment and testing options that support PE objectives and increase student fitness and enjoyment of physical activity, which empowers students to take responsibility in physical activity participation over the lifespan.

options that support PE objectives and increase student fitness and enjoyment of physical activity, which empowers students to take responsibility in physical activity participation over the lifespan.

**HIIT Physical Activity Fitness Menus—aka Fitness Blast**

HIIT Physical Activity Menus are teacher-created fitness cards using 32 rounds of exercises from an inventory of various bodyweight exercises (Table 1) in three categories: beginner, intermediate and advanced (Tables 2, 3, and 4, respectively). Beginner exercises are low-impact and provide students opportunities to work on form and technique; intermediate exercises include high- and low-impact exercises and expands students’ knowledge and inventory of body weight exercises and intensities; and the advanced options include high-impact movements that provide additional challenge, including power and multifaceted movements. The teacher can elect to name each card (e.g., B-1, B-2, I-5, A-10) or color code each level (e.g., **Blue** for beginner, **Yellow** for Intermediate, and **Red** for Advanced) for *better tracking* of exercises and progress. Teachers can also elect to keep all categories on one card (Table 5), which allows students to select from various activities across all intensity levels, which illustrates students’ areas of strength and areas of growth. This option also allows students not to “stand out” when they choose a Beginner card; however, most students are focused on their own card and fitness goals, and given the nature if HIIT, they have no time to worry about what others are doing—a benefit of this approach.



**Table 6. Student Choice with Teacher Assistance with Rep Count, Heart Rate, and Time Options**

Name _____		Goal _____					
Date _____		Interval Ratio: work ____ seconds rest ____ seconds; HR ____; Time ____					
	#/HR/Time		#/HR/Time		#/HR/Time		#/HR/Time
Exercises		Exercises		Exercises		Exercises	
High knees		Choice		Pop squats		Choice	
Choice		Jumping jacks		Choice		X-mountain climbers	
High knees		Choice		Pop squats		Choice	
Choice		Jumping jacks		Choice		X-mountain climbers	
High knees		Choice		Pop squats		Choice	
Choice		Jumping jacks		Choice		X-mountain climbers	
High knees		Choice		Pop squats		Choice	
Choice		Jumping jacks		Choice		X-mountain climbers	
High knees		Choice		Pop squats		Choice	
Choice		Jumping jacks		Choice		X-mountain climbers	
Reflection:							

**Table 7. Student Choice without Teacher Assistance Rep Count, Heart Rate, and Time Options**

Name _____		Goal _____					
Date _____		Interval Ratio: work ____ seconds rest ____ seconds; HR ____; Time ____					
	#/HR/Time		#/HR/Time		#/HR/Time		#/HR/Time
Exercises		Exercises		Exercises		Exercises	
Reflection:							

Interval work ratios, initially set by the teacher and later by students, allow students to work efficiently in a short amount of time. The recommended work/rest ratios are 20/10 seconds (10:67/16:00 minutes), 30/15 seconds (16:00/24:00 minutes), and 45/15 seconds (24:00/32:00 minutes). Students create Specific, Measurable, Attainable and Realistic in a Timely

manner (SMART) fitness goals at the beginning of each semester, but all fitness cards have a daily goal(s) that students focus on during the Fitness Blast, which they reflect on immediately at the end of each session. Students might choose to increase their number, complete a full column/row or card without stopping, and/or keep moving during every exercise.

The number of reps and completions provide instant and comparative feedback to both student and teacher.

Students choose their fitness level and the direction of exercises—vertical or horizontal. Students are encouraged to complete as many reps as possible in good form, count the number of completed exercises per round, and record the number during the rest segments. Ideally, Fitness Blast should be intense and occur at the beginning of every class. A class or individual warm-up should occur prior (cool down after) to the Fitness Blast, or warm-up exercises can be included in the workout cards. Laminated workout cards allow for frequent use as students can use dry erase markers and then transfer results to a fitness log/journal or online tracking system on the school’s instructional platform (e.g., Moodle, Blackboard, Canvas).

### **Fitness Assessment, Tracking and Grading**

In addition to ongoing formative fitness assessment and tracking by use of the Fitness Menus, after 8 to 10 card completions, students participate in a 10-minute summative fitness assessment that includes five exercises at 2 minutes (1-minute rest) each that include a combination of health- and skill-related exercises that support student and class goals (Table 5). Teachers can choose to track student data over time and establish target health zones/goals/numbers for each exercise based on the student population. For example, the maximum number of burpees attainable in 20 seconds among students may be 8 to 10, which would set the Advanced range. Seventy to eighty percent of the Advanced scores would set the Intermediate range (6 to 7), and 50% of the Advanced Scores would set the Beginner range (4 to 5). Other options for summative fitness assessments include a timed cross-training segment that includes a 500-meter run, 40 squat jumps, 30 curl-ups, and 20 push-ups; the 7-minute workout shown to improve fitness and metabolic outcomes (Klika & Jordan, 2013; Reynolds, 2013); Shaun T’s *Insanity Fit Test* (2020); or one of hundreds of Darbee printable workouts (Darbee.com, n.d.), which gives students variety, choice, access and physical activity options they will likely encounter as adults (Oliveira et al., 2018).

In addition to fitness assessment and tracking, high schools often require letter grades (e.g., A, B, C, D, F). As a result, many PE teachers are challenged with employing appropriate grading practices (Carroll, 1994). This is especially difficult as attaching grades to fitness scores is not aligned with SHAPE America – Society of Health and Physical Educators (2017), the leading United States governing body of PE, and The Cooper Institute, creators of FitnessGram® and the primary research agency for fitness testing in American schools (Presidential Youth Fitness Program, n.d.). To address this issue, four suggestions are given. The first is to award a grade based on student tracking and the quality of student responses to reflection questions. For teachers, schools and/or districts committed to assigning grades to fitness scores, completing 80 to 90% of the Intermediate cards within a range determined by student scores during



Students create Specific, Measurable, Attainable and Realistic in a Timely manner (SMART) fitness goals at the beginning of each semester, but all fitness cards have a daily goal(s) that students focus on during the Fitness Blast, which they reflect on immediately at the end of each session.

the semester could be the A–B criteria. A grade of C would be awarded for completing Beginner cards only throughout the semester; however, improvement or challenge points can be built-in based on a percentage of improvement determined by the teacher, or the percentage of Intermediate or Advanced workouts attempted or completed. A third option is to use cutoff criteria for the summative fitness assessments, again by using individual student data over the course of the semester. A final, more equitable, and perhaps *less contentious approach*, however, is to adopt a democratic method where students and the teacher establish the fitness grading scale, which could be collective (the entire class) or on an individual basis. Democratic approaches used in PE have shown to increase student buy-in because students are involved in decision making that impacts their lives (Butler, 2016; Lynch, 2019). As fitness is a personal endeavor, this approach may strengthen participation and physical literacy.

### **Integration of Movement Concepts to Promote Physical Literacy**

Teaching movement concepts and training principles alongside the Fitness Menus is encouraged and should in-





clude safety; technique; form; the Frequency, Intensity, Time and Type and Specific Adaptation to Imposed Demands Principles; muscle identification; muscular contractions and joint movement; energy systems; physiological response; and other movement concepts that promote further understanding of how to move and work the body, thus increasing physical literacy.

## Student Accountability and Choice

Although time and heart rate can be used in lieu of counting the number of reps, using a simple number system keeps assessments simple, helps students easily create goals, track progress, and simply graph results over time to illustrate improvement and areas of concern. Students build portfolios with evidence of completed workouts and progress along with teacher-created reflection questions (see Appendix), or questions related to movement concepts or training principles. Students may celebrate achievement by moving from the beginner cards to the intermediate, incorporate *more challenging exercises*, or simply complete cards they were unable to complete weeks or months prior. Students can also track their own anthropometric measures (e.g., body weight, Body Mass Index, waist circumference, and other body measurements), or physiological adaptations (e.g., blood pressure, heart rate) depending on their fitness goals. Further, teachers can post fitness menus online for absent students or students to use on non-PE days, which can also serve as an intervention for students who need more practice. Once students have an understanding and proficiency of performance/movements, they can design their own fitness menus—with (Table 6) or without (Table 7) teacher assistance, and choose assessments to support goals, which empowers students to make realistic, lifetime physical activity choices.

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## Appendix. Sample Reflection Questions

### Reflection Questions #1

1. Were you happy with your OVERALL results? Were there tests with which you were not happy? Why? Were there tests with which you were pleased? Why?
2. For each of the fitness tests, in which Fitness Zone does it place you? Beginner, Intermediate, Advanced? or Level A, B, C?
3. Comment about how you were feeling while you were completing the fitness tests—both physically and mentally. (What were your thoughts while completing the fitness tests?)
4. What contributed to your scores, either positively or negatively?
5. What do you think may help you to achieve a better score on subsequent fitness tests?

### Reflection Questions #2

1. Are you making as much progress as you anticipated? If you answered yes, what are you doing that helped you improve and achieve your SMART goals? If you answered no, what do you have to do to achieve your goals?
2. For EACH of the fitness tests, please answer these questions:
3. How do your second results compare to your first score? Please comment on why you think they were better or worse than before.
4. What factors motivate you and influence your fitness results?
5. Which of the exercises or health/skill-related fitness areas do you find the hardest to improve? Which exercises or health/skill-related fitness areas have been easier? Why do you think that is the case?

6. What are your SMART goals (list a number specifically for EACH test) for the final round of testing? Remember, goals must be SMART (Specific, Measurable, Attainable, Results Oriented, Time Frame).
7. Besides activities done in PE, what will you do to work to achieve your goals?

### Reflection Questions #3

1. What were your final results on the following tests (tests may vary according to student's goals):SQUAT JUMPS:

PUSH-UP JACKS:

IN IN OUT OUTS:

X-MOUNTAIN CLIMBERS:

SKATERS:

- For each test, comment on whether you did better or worse than previous attempts, and outline the reasons why.
2. For each fitness test, where does it place you according to the PE fitness zones? (i.e., Are you in the beginner, intermediate, or advanced Fitness Zone?)
  3. Upon analyzing your results and your improvements, which test result(s) are you most proud of and why?
  4. Look back at your SMART goals from the beginning of the semester. Were you able to achieve your goals; why or why not?
  5. Analyze your performance in each fitness test. Provide specific reasons that will help to explain either why you improved, or why you did not improve. Be as thorough and as specific as possible.
  6. Outline your HEALTH & FITNESS action plan for winter/spring/summer break, so that you do not lose all of the fitness gains you achieved this semester. Be SMART. (Be specific in terms of what you will do, set measurable goals that are attainable & realistic, and outline a time frame.)  
Modified from the International School Bangkok PE reflection questions.