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Hispanic Community Children's Health/ Study of Latino Youth (SOL Youth)

Physical Activity and Fitness Data Overview and Methods Version 2.0 February 2016 INV2

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Updates to SOL Youth Physical Activity Data Release or Documentation

Version	Date	Description	Datasets	Overview Document
1	10/06/2014	1 st data release: PAE and FST (raw data)	_INV1	v1 (Oct 2014)
2	2/06/2015	Analytic dataset (ACTICAL and self-report) release to SD for preliminary analyses for SOL Youth V2 grant application	_INV1	v1.1 (Feb 2015)
3	5/12/2015	Derived variables from self-report PA added to the SYOUTH_CHILD_PART_DERV	_INV1	None
4	8/6/2015	ACTICAL datasets released: CHILD_PA_EPOCH, CHILD_PA_DAYS and CHILD_PA_DERV	_INV1	v1.2 (Aug 2015)
5	2/5/2016	-Data sets updated for INV2 designation. No changes in the values of the Actical datasets (CHILD_PA_EPOCH, CHILD_PA_DAYS and CHILD_PA_DERV) -Variable VO2_MAX (calculated from step test) is now included in SYOUTH_CHILD_PART_DERV	_INV2	V2.0 (Feb 2016)

1. Physical Activity and Fitness Assessment in SOL Youth

Physical activity (PA) was measured using two different instruments:

- **Objective assessment** of physical activity obtained by the child wearing an accelerometer (Actical).
Self-reported child assessment of their physical activity levels.

A cardiorespiratory fitness test was also conducted, abbreviated from here forward as the “fitness test”.

1.1 Objective assessment (accelerometer)

The protocol for the **accelerometer component** is described in section 13 of Manual of SOL Youth Manual of Operations 1 (Field Center Procedures v3.1 Feb 2013). Briefly, children were asked to wear an accelerometer (Actical) for 7 days to assess the frequency, duration, and intensity of their physical activity during that time period. Epoch length was set to 15 seconds and the step function was enabled.

A challenge with the Actical accelerometer is that it can be difficult to distinguish non-wear from sedentary behavior, since theoretically both measures can register 0 counts per epoch length. No standard currently exists that specifies the optimal approach to define non-wear, although generally investigators define it with a certain number of consecutive zero counts. Thus, we reviewed the literature and offer best recommendation at this time. Based on this literature review, at present the best way to define non wear time would be to follow the recommended algorithm by Choi et al, 2011.

Key decisions made include:

- **Choi's algorithm to define the non-wear time.** Non-wear time was defined as consecutive zero counts for at least 90 minutes (window 1), allowing for short time intervals with nonzero counts lasting up to 2 minutes if no counts were detected during both the 30 minutes (window 2) upstream and downstream from that interval; any nonzero counts except the allowed short intervals were considered as wear time. All the non-wear time are coded as missing values.
- While there are several calibration studies of the Actical among youth, we chose **cutpoints from the Romanzini (*Eur J Sport Sci, 2014*) study** because their participants were of similar age to SOL Youth and had a large sample size. **The intensity levels:**
 - sedentary <18 counts/15-seconds
 - light 18-440 counts/15-seconds
 - moderate 441-872 counts/15-seconds
 - vigorous >=873 counts/15-seconds
- **Adherent day.** At least 8hrs of wear time;
- **Minimum number of adherent days** to summarize data: 3
- Having at last a **weekend day** was not required to summarize the data, but there is a flag (WKENDDAY_INCLUDED) that identifies those that do.

1.2 Self-report questionnaire (PAE)

The SOL Youth self-report physical activity form (PAE) includes a 68-item questionnaire that uses activity-based and time-based approaches for obtaining self-reported moderate-to-vigorous physical activity from adolescents and children. These were converted to create a number of times/month by mode and intensity. In addition asked 4 questions on how much time per day (in hours and minutes) children spent in certain sedentary behaviors. See SOL Youth Child Derived Variable Dictionary for more detailed descriptions.

1.2.1 Physical activity (times/month) BY MODE: transport, school, leisure non-sport, sports/exercise, and household

The SOL Youth physical activity questionnaire (PAE) asked children to estimate how often they participated in each of 68 activities in the past month. The response options included never, 1-2 times/month, 1-2 times/week, 3-4 times/week, 5-6 times/week, and daily. These were converted to create a number of times/month; for additional details see the Derived Variable Dictionary. The 68 activities were grouped by **mode** based on the compendium of physical activities (Ridley K, Int J Behav Nutr Phys Act. 2008) into 5 categories: transport, school, leisure non-sport, sports / exercise, and household. Items assigned to each mode of activity were summed to derive number of times/month spent in each mode. In summary, there are 5 variables with times/month spent in each mode.

1.2.2 Physical activity (times/month) BY INTENSITY: sedentary, light, moderate, or vigorous.

Each activity reported was assigned a metabolic equivalent (MET) value from the MET table used in a prior study (McMurray et al, Med Sci Sports Exerc. 2004) and from the compendium of physical activities (Ridley K, Int J Behav Nutr Phys Act. 2008). Activities listed as “Other” by a participant were reviewed to determine activity type and intensity. Activities can be grouped into 4 broad categories:

- 1.0-1.5 METS sedentary
- 1.6-2.9 METS light
- 3.0-5.9 METS moderate
- >=6.0 METS vigorous

1.2.3 Sedentary behavior (min/day)

The PAE questionnaire also asked how much time per day (in hours and minutes) children spent in the following 4 sedentary behaviors: television or video watching, computer or internet, video/computer games (non-active), and talking on the phone or text messaging. These activities were summed to create total time (in hours and minutes) spent in 4 sedentary behaviors: television or video watching, computer or internet, video/computer games (non-active), and talking on the phone or text messaging.

1.3 Cardiorespiratory fitness test (FST)

The fitness test was based on procedures by Francis et al (Francis, South Med J. 1991). This paper estimates step height based on femur length. According to Dr. McMurray’s recollection, the SOL youth sites did not want to measure femur length, so the group instead used a choice of 8 different step heights based on the child’s height. As a result, the scoring methods from the paper cannot be used and our group needs to come up with recommendations.

Scoring

A good first step is just to examine the heart rate response (FST5) by age/gender and step height.

Calculate estimated VO₂ max (aerobic fitness) as follows:

Use the 15 second recovery heart rate (FST5) and put it in the regression equation from Figure 2: $VO_2\text{max in ml/kg/min} = 105.3959 - 1.643756 \times \text{FST5}$

This equation is correct as Sol Youth protocol specified to set the metronome at 22 ascents/minute (section 14.3 SOL Youth MOP 1). Note that this equation was based on step heights determined on the height of the foot when the hip is flexed at a given angle.

Interpreting the Result

According to Bob, “the resulting numbers should be >20 and <80, unless the child is obese (then the number could be lower) or very very tiny (then >80 but never over 100)”.

Criteria found in the literature:

- Provides age, gender, and race specific percentiles from NHANES 1999-2002 ages 12-18 years using a treadmill test (Eisenmann et al, Am J Prev Med. 2011). Another related article analyzed the data using ROC curves (Welk et al, Am J Prev Med. 2011).
- In 2012, the NHANES National Youth Fitness Survey collected data on physical activity and fitness among US youth age 3-15 years. This data can provide normative values to compare our results against. A total of 1640 children were interviewed and 1576 were examined.
- Two studies of adolescents indicate that girls with aerobic power <37 mL/kg/min and boys <42 mL/kg/min were at highest risk for metabolic syndrome (McMurray RG et al, Dyn Med. 2008 and Ruiz JR, Ortega FB et al, Pediatr Res. 2007).

2. Physical Activity Datasets

Table 2.1 SOL Youth Datasets for Physical Activity

SOL Youth SAS Dataset	Key fields	Dataset description
ACTICAL DATA		
SYOUTH_CHILD_PA_EPOCH	ID + EPOCH	Multiple records per participant; one record per 15sec epoch. For Day 1, all counts were set to special missing (.L) from midnight to 5 am. For Days 2 to 7, all counts were set to special missing (.S) from midnight to 5 am. There are 70,206,764 records (child-day-epoch).
SYOUTH_CHILD_PA_DAYS	ID + DAY	Multiple records per participant; one record per day. Day 1 is the next day after the clinic visit day. There are 8,693 records (child-days).
SYOUTH_CHILD_PA_DERV	ID	Actical data (average min/day) at the participant level (N=1,238). Dataset includes those with less than 3 adherent days (N=134), but all summary variables are missing. ADHERENTYN is an indicator variable that identifies participants with at least 3 adherent days. WKENDDAY_INCLUDED is an indicator variable that identifies those for which a weekend day was included (N=1,038). ADHERENT DAY was defined as >8hrs/day (section 3).
Self-Report Physical Activity, Sedentary Behavior, and Cardiorespiratory Fitness Test		
PAE	ID	A 68-item questionnaire that uses activity-based and time-based approaches for obtaining self-reported moderate-to-vigorous physical activity (MVPA) from adolescents and children.
FST	ID	Fitness Step Test
SYOUTH_CHILD_PART_DERV	ID	<ul style="list-style-type: none"> - Derived variables from PAE by mode (transport, school, leisure non-sport, sports/exercise, and household) or by intensity (sedentary, light, moderate, and vigorous). - VO2_MAX (estimated maximum VO2) from FST.

PA refers to Physical Activity, and DERV to derived.

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