

## Resúmenes

### **Validity of a self-perceived physical fitness questionnaire in young population. The HELENA study**

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**Background:** Self-perceived fitness is sometimes included in physical fitness test batteries. However, whether it is correctly estimated in young people has not been clarified yet. The aim of this study was to assess in European adolescents the validity of a self-perceived fitness questionnaire by comparing with the concordance degree to the actual measured physical fitness level.

**Methods:** A total of 178 adolescents (96 boys and 82 girls) aged 13.6 (0.8) years from 10 European cities participated in the study. Self-perceived physical fitness was assessed by asking five questions to the adolescents regarding general fitness level and 4 physical fitness qualities. These physical qualities were also directly measured: cardiorespiratory fitness (20m shuttle run test), muscular strength (hand-grip, standing broad jump and bent arm hang tests), speed / agility (4x10m shuttle run test) and flexibility (back-saver sit and reach).

**Results:** Chronbach's  $\alpha$  coefficient (internal consistency) of the physical fitness questionnaire was 0.79. There was no difference between genders in the distribution of the answers among the classes (Very poor, Poor, Fair, Good, Very good). Percentage of adolescents whose estimation differ no more than one class from measured performance (distributed in quintiles) was 68.5, 63, 46.3 and 71 % for cardiorespiratory fitness, muscular strength, speed / agility and flexibility, respectively. In all fitness qualities, those adolescents who actually had a mid to high fitness levels (i.e., quintile 3, 4 and 5) provided a better self estimation of

their actual physical fitness level, than those who had a low fitness level, who tended to over-estimate it.

**Conclusion:** The results suggest that in adolescents, the proposed self-perceived questionnaire of fitness status provides an acceptable estimation of the actual fitness level, at least in the middle and high fitness groups. Questions concerning self-perceived physical fitness could be useful for clinicians and researchers in developing group-based fitness programs or populations studies.

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### **Active commuting to school, physical activity and cardiovascular fitness in adolescents; The AVENA Study-**

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**Background:** Active commuting to school provides an opportunity for having/increasing the daily physical activity in young people. Previous studies have shown associations between the way of travelling to school, physical activity and fitness levels. The purpose of this study was to study these relationships in the Spanish adolescent population.

**Methods:** The data were gathered as part of the AVENA Study. A total of 2194 adolescents (1048 ma-

les and 1146 females) aged 13-18.5 years participated in this study. Both way and time of transportation to school were assessed by questionnaire. According to the answers, the adolescents were classified as follows: walking or bicycling commuting at least during 15 minutes (ACS), and passive commuting or active commuting less than 15 minutes (non-ACS). Leisure-time physical activity was recorded from the same questionnaire. Cardiovascular fitness was measured by 20-m shuttle-run test. Chi-square and ANCOVA tests were used to analyze the relationship between ACS with other variables.

**Results:** Less than 15% of adolescents were ACS, the number of active girls being higher when compared to boys. In males aged 16 years, leisure-time physical activity was associated with ACS ( $P=0.036$ ). Cardiovascular fitness was higher in ACS than in non-ACS in both males and females, however, this difference was only statistically significant in males aged 14 years ( $P = 0.024$ ).

**Conclusion:** A relatively low number of Spanish adolescents show a daily ACS. Cardiovascular fitness seems to be higher in ACS than in non-ACS, especially in 14-year old males.

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### Hand grip strength is influenced by sex, hand size and grip span in adolescents\*

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**Background:** Handgrip strength is a widely used test in experimental and epidemiological studies. Sex, hand size and grip span seems to influence handgrip strength in adults, but how these variables influence handgrip strength in younger individuals is not known. The purpose of this study was to examine if there is an optimal grip span for determining the maximum handgrip strength in adolescent boys and girls, and if the optimal grip span was related to hand size.

**Methods:** A total of 206 adolescents (100 boys and

106 girls) aged 13 to 18 years, free of any lesion or impairments in the upper limbs participated in the study. The hand size was measured from the tip of the thumb to the tip of the little finger with the hand open widely. Each participant performed the test with the right and left hand on 10 occasions, using 5 different grip spans, and allowing a 1-minute rest between attempts.

**Results:** The results showed that an optimal grip span to determine the maximum handgrip strength was identified for both boys and girls, and the optimal grip span and hand size correlated in both genders.

**Conclusions:** The results suggest that there is an optimal grip span to which the dynamometer should be adjusted when measuring handgrip strength in adolescents. The optimal grip span was influenced by hand size in both genders. For adolescent boys the optimal grip span can be derived from the equation  $y = x/7.2 + 3.1$  cm, and for girls from the equation  $y = x/4 + 1.1$  cm. where  $y$  is the optimal grip span and  $x$  is the hand size. These equations may improve the reliability and accuracy of the results and may guide clinicians and researchers in selecting the optimal grip span on the hand dynamometer when measuring handgrip strength in adolescents.

### References

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### Analysis and interpretation of accelerometer data for monitoring levels of physical activity in large population based sample sizes; the ALPHA Project

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**Background:** Sustained moderate to high levels of physical activity are known to have positive effects on the health of the population and combat obesity in all

age groups. To develop an effective health policy, it is essential to understand actual population activity levels and their key factors. The pan-European project "ALPHA" (Instruments for Assessing Levels of Physical Activity and related Health Determinants) aims at developing a comprehensive set of assessment methodology for physical activity levels as well as barriers and promoters of physical activity, including the further development of accelerometry for use in large, population based sample sizes.

**Methods:** Accelerometers can be used as an objective measurement for the population wide monitoring of levels of physical activity. Accelerometers, comparable to the widespread pedometers, are little devices measuring the vertical acceleration during a one week's timeframe and thus allow conclusions about the activity patterns of the individuals wearing it. According to the literature, a lack of common data reduction and standardized reporting procedures dramatically limit the potential of accelerometry for use in population based surveys at the moment.

**Results and Conclusion:** The project ALPHA aims, in one designated work package, to develop a standardised operating procedure for the use of accelerometers in population based surveys in European member states. A pilot analysis software is presented as well as data on how its results compared to results derived from existing software that focuses on analysis of accelerometer data for single individuals. Summary variables on continuous activity blocks as well as physical activity bouts (blocks of activity above a certain threshold) are being added to the existing analysis possibilities. After further testing, this software can enable the analysis and interpretation of accelerometer data from large study groups, which increases the role of accelerometry as instrument in epidemiological studies.

The project ALPHA is in negotiation for being co-financed by the European Commission, Directorate General Health and Consumer Protection, under the Public Health Programme 2003-2008. FBO and JRR were supported by grants from the *Consejo Superior de Deportes* (109/UPB31/03, 13/UPB20/04) and the *Ministerio de Educación y Ciencia de España* (AP2003-2128, AP2004-2745).

### **Physical activity and physical fitness according to the socio-economic status in adolescents. The AVENA study\***

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**Background:** Both physical activity and physical fitness levels have been reported to be related to several health outcomes. To study the potential influence of socioeconomic status (SES) on these variables is of interest. The aim of this study was to examine whether the socioeconomic status (SES) influences physical activity and physical fitness levels, and to study the relationship between physical fitness and physical activity in this context.

**Methods:** Cardiovascular fitness (20m shuttle run), lower-extremities explosive strength (standing broad jump) and speed/agility (4x10m shuttle run) were assessed in 2428 Spanish adolescents aged 13 -18.5 y in the framework of the AVENA Study. Self-reported leisure-time physical activity and SES were recorded by questionnaire. SES was defined by the educational level and occupation of the father following the recommendation of the Spanish Society for Epidemiology. Accordingly, the adolescents were classified into five categories: low, medium-low, medium, medium-high and high SES.

**Results:** Adolescents who had a high SES were more active than those who had a low SES, in both males and females ( $P \leq 0.01$ ). Female adolescents who had a high SES showed significantly higher scores in the physical fitness tests assessed: 20m shuttle run, standing broad jump and 4x10 shuttle-run test; compared to those adolescents who had a low SES ( $P \leq 0.05$  in all the analyses). All physical fitness tests were positively correlated with physical activity in both sexes ( $P \leq 0.01$ ), except lower-extremities explosive strength, which was not significantly associated with physical activity in males.

**Conclusion:** The results suggest that a high SES is

associated with a higher leisure-time physical activity and an improved physical fitness level in adolescents.

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### **Programming effect of birth weight on later body fat distribution in adolescents; The AVENA Study\***

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**Objectives:** The aim was to assess the association between birth weight (BW) and later body fat distribution in adolescents.

**Methods:** A total of 1223 adolescents now aged 13-18 y (553 males and 670 females) born at term, were selected from a cross-sectional multi-centre study conducted in five Spanish cities in 2000-2002. Current weight (kg) and height (m) were measured and body mass index (BMI; kg/m<sup>2</sup>) was calculated. Triceps, biceps, suprailiac, subscapular, thigh and calf skinfold thickness (ST; mm) were measured on the left side and fat mass, and hence fat free mass, were calculated by the Slaughter formula. Body fat distribution was assessed by means of the ratio of subscapular to triceps (STR), the central to total (CT) (subscapular + suprailiac)/ (sum of triceps, biceps, suprailiac and subscapular ST) and the central to peripheral (CTP) skinfolds ratio (subscapular + suprailiac)/ (triceps + thigh). BW was taken from questionnaires.

**Results:** Birth weight Z-score was inversely associated with STR (P<0.001), CTP (P<0.05) and CT

(P<0.001) ratios in male and female adolescents, after controlling for age, Tanner stage, gestational age, socioeconomic status, physical activity and current height squared.

**Conclusions:** Our results are consistent with the hypothesis that small size for gestational age at birth may program more central fat deposition in adolescents.

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### **Valoración del efecto de un programa de educación física orientado a la mejora de la condición física sobre diversos factores de riesgo cardiovascular en escolares de 12 a 14 años\***

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**Introducción:** Un bajo nivel de condición física ha sido reconocido recientemente como un potente factor de riesgo cardiovascular. Plantear estrategias orientadas a la mejora de la condición física desde el ámbito educativo y valorar sus consecuencias sobre la propia condición física y otros factores de riesgo cardiovascular, resultan de gran interés social, y es el objetivo del proyecto que por la presente se expone.

**Métodos:** Se elaborará un programa de intervención en educación física orientado a la mejora de la condición física, en alumnos de 1° de E.S.O. de un centro educativo de la Región de Murcia. Dicho programa consistirá en introducir de forma transversal la condición física, sin alterar la programación didáctica del centro, estructura y duración habitual de las sesiones. Se contrastarán los resultados entre los alumnos que reciben 2 clases de Educación Física (EF) con total normalidad (grupo control), los alumnos que reciben 4 horas EF (grupo experimental 1) y aquellos alumnos que reciben 4 horas de EF orientadas específicamente a la mejora de la condición física (grupo ex-



perimental 2). Entre las variables dependientes estudiadas se encuentran: condición física, actividad física, antropometría y composición corporal, perfil lipídico-metabólico, parámetros ventilatorios, tensión diastólica y sistólica, y rendimiento escolar y cognitivo.

**Resultados:** Se establecerán los beneficios potenciales que la mejora de la condición física desde el ámbito educativo posee sobre la salud de los adolescentes. Paralelamente, se estará proporcionando una herramienta docente de gran utilidad, que podrá ser utilizada por los profesionales de la EF, adaptándola a su realidad educativa.

**Conclusión:** En función de los resultados obtenidos en este y otros estudios de similares características, las políticas estatales tendentes a la reducción curricular de horas de EF semanales, deberán reconsiderar las posibles consecuencias sobre la salud de los adolescentes que dichas medidas conllevan.

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### **Sleep duration affects body composition and sedentary behaviours in adolescents. The AVENA study\***

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**Background:** It has been suggested that sleep duration can affect several lifestyle factors. The aim of this study was to examine the relationship of sleep duration with total and abdominal adiposity, physical activity and sedentary behaviours in an adolescent sample.

**Methods:** A total of 2181 (1041 males and 1140 females) Spanish adolescents, aged 13-18.5y from the AVENA study took part in this report. Body mass index (BMI) and percentage of body fat (%BF), and

waist circumference were selected as total and abdominal adiposity indexes, respectively. These indexes were dichotomized as above (high) and below 75<sup>th</sup> percentile. Self-reported sleep duration, leisure-time physical activity (PA) and sedentary behaviours (i.e. watching TV and playing videogames) were assessed by questionnaire. The age, sexual maturation status, socio-economic status, birth weight, breast feeding time, having/skipping breakfast, and cardiovascular fitness (from 20m shuttle run test) were analyzed as confounders in the Binary Logistic Regression analysis.

**Results:** Adolescents who slept nine hours/day or longer showed a lower prevalence of having a high BMI, %BF and waist circumference, as well as a lower prevalence of not doing any leisure-time PA and spending more than two hours/day on watching TV or playing videogames. Binary Logistic Regression analysis, controlled for age and sexual maturation status, showed that male adolescents who slept less than eight hours/day doubled the odds of having a high %BF, compared to those adolescents who slept more than nine hours/day. Shorter sleeping time was also associated with higher odds of spending two hours/day or longer on sedentary behaviours. This association remained also significant after additionally controlling for all the confounders above mentioned.

**Conclusion:** Short sleep duration seems to be inversely related to total adiposity, especially in male adolescents. The results also show that short sleep duration is associated with a much sedentary lifestyle. This increased sedentary behaviour could have a probability effect in young people. Health authorities and parents should encourage adolescents to sleep more than nine hours daily.

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### **Sedentary behaviours and socioeconomic status in Spanish adolescents. The AVENA study**

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**Background:** Several studies have analyzed the relationship between sedentary behaviours and social class in adolescents, but this association is not well established yet. The aim of this study was, therefore, to test the relationship between sedentary behaviour and socioeconomic status (SES) in Spanish adolescents.

**Methods:** A multicentre cross-sectional study was performed in 2428 Spanish adolescents aged 13-18.5 years, from five cities: Granada, Madrid, Murcia, Santander and Zaragoza in 2000-2002 (AVENA study). Self reported sedentary behaviours were established using three variables: daily time watching television, computer and videogames use during weekdays and computer or videogames use during the weekend. Social class was measured by means of two variables: SES (low, medium and high), and paternal and maternal educational level: elementary school, high school, Bachelor or Master Degree.

Bivariate analyses (Chi square-test) were performed to study the association between dependent (sedentary behaviours) and independent variables (SES). Significant dependent variables in the Chi-square were used in the logistic model in two categories, the "best" category for each variable being used as a reference.

**Results:** Daily TV viewing was inversely and independently associated with maternal and paternal educational level and SES (all  $p < 0.001$ ). Computer use and playing videogames during weekdays were inversely associated with paternal educational level and with SES (both  $p < 0.05$ ). In the logistic regression model, the risk for watching TV for more than 3 hours per day increased with decreasing maternal educational level, that is an OR= 1.697 CI 95%;1.28-2.345 for elementary school, an OR= 1.490 CI 95%;1.60-2.92 for high school, an OR= 1.478 CI 95%;1.83-2.16 for Bachelor degree, when compared to adolescents whose mother had a Master Degree.

**Conclusion:** In this study, adolescents whose mot-

her had a low educational level showed a higher prevalence of watching TV. More research is needed in order to achieve more understanding in the relationship between social class and sedentary behaviour.

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### **Heart rate perception and RPE is not accurate in physical activity and sport sciences university students**

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**Background:** Exercise intensity can be described by means of Heart Rate (HR) and Ratings of Perceived Exertion -RPE-. The aim of the study was to describe if university students - Faculty of Sport Sciences and Physical Activity, University of Granada- could accurately perceive their own HR as well as RPE, both to be related to the measured HR when practicing aerobic exercise.

**Methods:** 143 subjects (22.7±2.1 years) were monitored using HR monitors covering HR values (beats per minute -bpm-) with a sticker. Six exercises involving large muscles and continuous aerobic exercise were performed (walking, running at two intensities, and also these 3 exercises but while bouncing a ball). After each exercise subjects were asked to perceive their HR just at the end, their HR as an average for the task, and a value of RPE (6-20 Borg's scale) for the same task. Perceived HR (HRp) was related to the measured HR (HRm) at the end of each of the 6 tasks, as well as perceived average HR (HRavg-p) was related to measured average HR (HRavg-m), and RPE value for the task was related to HRavg-m. After descriptive and correlational statistics, a T-test was developed to check possible differences due to the average error of those activities without bouncing a ball and those bouncing it.

**Results:** Comparing the measured and perceived values, the absolute average differences (bpm) between HR<sub>p</sub> and HR<sub>m</sub> were 16.31±3.32 for the first 3 tasks, and 20.66±2.72 for those bouncing a ball; between HR<sub>avg-p</sub> and HR<sub>avg-m</sub> were 16.23±2.33, and 20.75±0.89, respectively; and between RPE (RPE×10=bpm) and HR<sub>avg-m</sub> were 27.43±2.94, and 31.79±2.37 respectively. Correlations between perceived and measured variables ranged from 0.260 to 0.692 ( $p \leq 0.001$ ). Significant differences were found comparing those tasks without bouncing a ball and those bouncing it ( $p \leq 0.000$ ).

**Conclusion:** The weak correlations and the differences (bpm) between the perceived HR and measured HR showed that subjects did not perceive their own HR accurately, and this difference was greater between RPE and HR. Subjects' HR and RPE perception seem to be negatively affected by external focus of attention as bouncing a ball.

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### Intensity during physical education lessons can be sufficient to promote cardiovascular fitness and health

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**Background:** The American College of Sport Medicine recommends for developing and maintaining cardiorespiratory fitness and health a duration of 20-60 min of continuous or intermittent aerobic activity with an intensity of 55/65%-90% of maximum heart rate (HR<sub>max</sub>) or 40/50%-85% of maximum oxygen uptake reserve or HR<sub>max</sub> reserve. The aim of the study was to determine if work intensity during the physical education (PE) lessons is sufficient to promote cardiorespiratory fitness and health.

**Methods:** Twenty-nine secondary-school children (16 boys and 13 girls) from Granada (Spain) aged 17.1±0.8 years, took part in the study. Four lessons all pretending to develop cardiorespiratory fitness were analyzed: 1-juggling that consisted on practicing different abilities; 2- badminton, which consisted on short

matches; 3- soccer game (5a side), and 4- a lesson specifically designed to improve aerobic fitness based on continuous constant running, fartlek, circuit training and interval training. During the lessons, individual HR was continuously monitored (5seconds interval) using a HR monitor. Results of statistical analysis are presented as means and standard deviations.

**Results:** For both gender, mean HR, expressed in %HR<sub>max</sub>, obtained in juggling lesson (63.04±6.68% HR<sub>max</sub>), in badminton lesson (65.18±4.89% HR<sub>max</sub>), in soccer game (75.93±8.67% HR<sub>max</sub>) and in lesson designed to improve the aerobic fitness (84.77±3.13% HR<sub>max</sub>). For boys and girls, mean HR -expressed in %HR<sub>max</sub>- obtained in juggling lesson was 65.24±6.53 vs. 56.46±3.17% HR<sub>max</sub>, respectively, 66.12±4.32% vs. 62.91±5.76% HR<sub>max</sub> in badminton lesson, 79.71±4.87 vs. 62.70±10.53% HR<sub>max</sub> in soccer game and 85.02±3.51 vs. 84.23±1.95% HR<sub>max</sub> in the lesson specifically designed to improve the aerobic fitness.

**Conclusions:** Some authors have showed that work intensity during normal PE lessons is not enough to cause improvements at a cardiovascular level, but our results suggest that intensity of PE lessons can be made sufficient by the teacher to develop cardiovascular fitness and health, although this depends on the content carried out with different effect according to gender (i.e. girls were clearly less active in football, but similarly in badminton). A key point is the main objective pretended by the teacher in the lessons (i.e. motor skills vs. physical fitness). Another important question is if the frequency of PE lessons is enough to develop or maintain cardiovascular fitness and health.

### Lean mass, but not sedentary behaviours, is associated with bone mass in adolescents. The AVENA study\*

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**Background:** Immobilization and unloading bones has been previously associated with bone loss. Seden-

tarism is an increased concern worldwide. However, no previous studies have examined the relationship between inactivity i.e. sedentary behaviours, and the risk of a low bone mass during adolescence. Therefore, the aims of this report were to test whether sedentary behaviours increase the risk of low bone mineral content during adolescence; and to study the relationship between physical activity, sedentary behaviours, lean mass and bone mass.

**Methods:** A subsample of the AVENA Study (Zaragoza) has been included in this investigation, that is 278 adolescents (169 females and 109 males) aged 13.0–18.5 yr. Hours per day of television watching, videogames and computer usage, doing homework as well as the commuting to school and the physical activity level (active, non-active) were assessed by questionnaire. Bone mineral content (BMC) and lean mass were measured with DXA. Z-scores of BMC for age and sex were calculated, and binary logistic regression was used to estimate the odds of having a low BMC (under the 25<sup>th</sup> percentile of BMC Z-score) or the odds of having a high BMC (up to the 75<sup>th</sup> percentile of BMC Z-score), according to sedentary behaviours, physical activity and lean mass.

**Results:** Lean mass, hours of videogames usage

and hours per day doing homework were included in the logistic models as they were the only significant variables detected by the bivariate analysis (chi-square  $P < 0.05$ ) for low or high BMC. However, the logistic model revealed that only a lean mass under the 25<sup>th</sup> percentile was independently associated with increased risk of low BMC ( $P < 0.05$ ). Similarly only a lean mass up to the 75<sup>th</sup> percentile was independently associated with the probability of high BMC ( $P < 0.05$ ).

**Conclusions:** Sedentary behaviours were not associated with the risk of low BMC in adolescents. In contrast, low or high lean mass are associated with either odds of having low BMC or elevated odds of having a high BMC. The former relationship could be probably explained by genetic factors or by the influence of high tensions elicited by bigger muscles on bones due to exercise loads.

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