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REFERENCE VALUES FOR THE BODY SHAPE OF BOYS AND GIRLS

In 1980 a study was performed to obtain reference values for 14 anthropometric measurements: height, weight, arm span, sitting height, length of upper-arm, lower-arm, hand, tibia and foot, biacromial and biiliacal diameter, circumferences of upper-arm, thigh and calf. 1,246 boys and 1,105 girls ranging in ages from 0-17.75 years and living in the north of the Netherlands participated in the study. For each of the variables the mean was calculated by a cubic spline appproximation. The boys and girls of the study were taller than those in surrounding countries.
The children were divided according to age into 50 groups to calculate the standard deviations and from these the centiles were constructed. For each age group the correlation matrices with their confidence limits of two pairs of measurements were calculated. From the age of 3 years onwards an average correlation coefficient for all groups could be obtained. Using this average correlation coefficient and the SDS-scores (Z-scores) of two measurements an ellipse could be constructed which comprises 95% fo the pairs of scores. The typicality or atypicality of an individual can be graphically displayed using this ellipse and it can also be calculated using the squared distance of the pair of Z-scores.

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DEVELOPMENT OF A SOFTWARE PROGRAM PROVIDING A DATA BASE AND ENABLING MATHEMATICAL HANDLING AND GRAPHICAL PRESENTATION OF GROWTH DATA.

A computer software program was developed aimed at three goals; 1: to enable a retrospective or prospective analysis over one or more centers of the data proceeding from the diagnostic work-up and clinical follow-up of children with growth disturbances; 2: to transform the most common growth parameters as a function of the references for age and bone age; 3: to enable graphical representation of raw and transformed growth data. The database enables the storage and retrieval of administrative, clinical and laboratory data. Patients can be grouped into various study groups which all have their own specific data entry screens. In case of growth hormone therapy the weekly dosage per kg body weight and m^2 body surface are calculated. The mathematical part expresses height, sitting height and subischial leg length as SDS for age and bone age. Weight is expressed as a percentage of the median for height. From bone age readings height predictions are calculated with the TW-2 and Greulich-Pyle method. Height velocities are calculated between chosen dates of observation and expressed as cm/year, SDS for age or bone age and as the change of height SDS per year. The transformed growth data can be further used in reference to various periods of growth hormone treatment. All raw and transformed growth data can be shown graphically. The software program works on a microcomputer with multicolor screen and a mathematical coprocessor, using dbase III+/Clipper.

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PARENTAL HEIGHTS, TARGET-HEIGHT AND ADULT HEIGHT PROGNOSIS OF YOUNG FEMALE GYMNASTS AND SWIMMERS.

Intensive and regular physical training alters female reproductive function. Its potential role on growth is still controversal. A longitudinal study was designed to analyze growth characteristics of young elite female gymnasts (15-25h/wk training) and moderately trained swimmers (5-15h/wk). At the beginning of the study, data concern 37 gymnasts (GY), 19 swimmers (SWI) and 34 sedentary schoolgirls examined once in the 1st year of study and included as controls (CON). Bone age was estimated using the methods of Greulich & Pyle and Tanner (TW2-RUS score) and adult height prognosis (AHP) using the methods of Bayley & Pinneau (BP), Roche (RWT) and Tanner (T). Parental heights of GY are significantly shorter than those of SWI and CON (fathers: $p = .004$, mothers: $p < .001$, one-way ANOVA), as are target-heights ($p < .001$). At first visit, GY are shorter and lighter than SWI and CON for age. Their bone age (11.0 ± 1.3 y, mean ± SD) is retarded ($p < .001$) when compared to chronological age (12.6 ± 1.2 y) and their AHP are lower than those of other girls (BP: $p < .001$, RWT: $p = .023$, T: $p < .001$). In each group, average AHP corresponds to average target-height. At the onset of our study, the relative shortness of stature (with pubertal delay) observed in female gymnasts remains appropriate for parental heights and is most probably due to selection. Follow-up should tell whether long-lasting physical training has any deleterious effect on growth.
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A NEW KNEMOMETER FOR ASSESSING LINEAR GROWTH.

The most widely used knemometer is fairly time-consuming and laborious for clinical application. We have therefore constructed a knemometer which is relatively simple and fast to operate. The construction is sturdy and the instrument is mobile and can be used in large scale screening studies. During measurements the child is placed on a fixed chair and plates of different thickness are placed under the foot, untill the angle between the thigh and the lower leg is app. 70°. The footplates are arranged on rails and with a smooth movement the foot and the footplates may be moved in the forward and backward direction. During this movement the measuring plate on the knee reaches a maximum which is recorded automatically. Three measurements are performed, after which the child walks for one minute. This is repeated until a total of 3x3 measurements. The resolution of the instrument is 0.01 mm. Growth hormone treatment is known to cause sodium retention which may result in variable hydration and thus influence the measurements. Consequently, the new extended knemometer offers the option to compress the soft tissue by placing different weights (up to 2.5 kg) on the measuring plate, as the top of the knee and the plate are fixed during the measuring procedure. Preliminary data show that the inter-observer variation (SE) is app. 0.3 mm and the intra-observer variation app. 0.4 mm.

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HORMONAL, AUXOLOGICAL AND ANTHROPOMETRIC ASPECTS IN YOUNG FOOTBALL PLAYERS.

Hormonal parameters (SmC, GH, Testosterone (T) and DHAS),lenght and width measures, body composition and biological maturation (bone age, pubic hair, testicular volume) indicators were used to evaluate during puberty the sport effects in boys playing football. We examined 150 pubertal boys 10-16 yrs aged (mean 12.98±150) (B.A.: 10-18 yrs) playing football 6-14 hrs weekly over 2-9 yrs and 110 control subjects (physical activity lower than 3 hrs weekly). All the boys were divided, according to C.A., into 3 groups (10-12, 12-14, 14-16 yrs). 10-12 and 12-14 yrs groups football players were equally tall as controls, while leg lenght was lower ($p < 0.05$) and the ankle width was higher ($p < 0.05$); their biological maturation indicators were equal to controls. In 14-16 yrs group several anthropometric parameters (height, weight, sitting height, biacromial diameter) were higher than controls, but pubic hair ($p < 0.0001$), testicular volume ($p < 0.001$) and B.A. ($p < 0.08$) were more advanced in these group compared to controls. Considering B.A. instead of C.A., in 14-16 yrs group the differences between football players and controls disappeared. Regarding hormonal parameters basal levels of SmC, T and DHAS in young athletes were no different from those of peer controls, while GH basal levels were significantly higher in 10-12 and 12-14 yrs groups. In conclusion boys that play football show an increase of anthropometric parameters with an earlier adolescent spurt.

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POTASSIUM DEFICIENCY LEADS TO RAPID AND REVERSIBLE INHIBITION OF GROWTH AND PROTEIN SYNTHESIS IN YOUNG RATS

Potassium (K) deficiency interferes with growth in young animals as well as in children. This has been related to inhibition of protein synthesis, a process which is known to depend on K.
In order to quantify the K requirement, 4-13 week old rats were maintained on K-deficient fodder (1 mmol/kg). Within 3 days, growth had ceased and the incorporation of ^{3}H-leucine into muscle protein in vivo was reduced by 28-38% ($P<0.005$). Following 14 days on this K-deficient fodder, the incorporation of ^{3}H-leucine or ^{14}C-glutamine into muscle protein was further reduced and weight gain was only 10% of that measured in age-matched controls. K repletion caused rapid weight gain, and the incorporation of ^{3}H-leucine into muscle protein reached 76 and 104% of the control level within 24 and 72 hours, respectively. In spite of early growth acceleration, normal weight was not attained until after 7 weeks on normal fodder. Thus K deficiency caused a serious set-back in growth. Rats maintained for 7 days on moderately K-deficient fodder (20 mmol/kg) showed 26% inhibition of growth ($P<0.005$) and 17% reduction of the incorporation of ^{3}H-leucine into muscle protein ($P<0.02$) even though muscle K content was only reduced by 5% (NS). Parallel in vitro studies showed that in isolated muscles, the incorporation of ^{3}H-leucine into protein was much less sensitive to K depletion than in vivo.
It is concluded that in the intact organism, even moderate K depletion leads to inhibition of growth and protein synthesis. As decreased cellular K content can only in part account for this inhibition, other regulatory (endocrine?) factors may be of importance. The observations emphasize the need for adequate K supplies to ensure optimum utilization of food elements for protein synthesis and growth.