Body Composition

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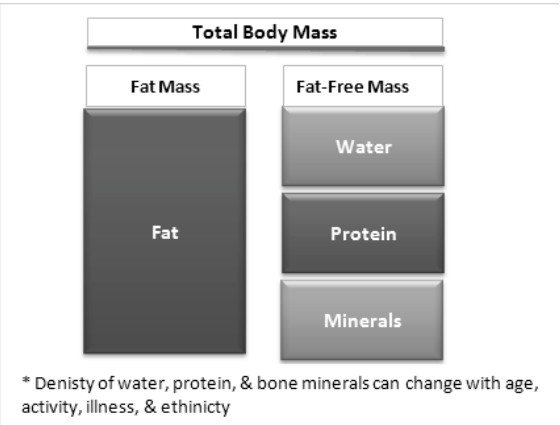
History

- 440BC Hippocrates
- Ancient Chinese scholars
- 980AD
- Late 1900's

http://www.bodysystems.co.nz/bodystat.shtml

Body Composition



http://www.exercisebiology.com/index.php/site/articles/which_is_the_most_accurate_body_fat_measurement_method_calculator/

Lean Build vs. Non-Lean Build

Aesthetic and weight dependent Sports

- Cross-country
- Track
- Swimming
- Body builders
- Wrestling/Boxing
- Dance/Ballet

www.livestrong.com

Non-weight dependent Sports

- Tennis
- Volleyball
- Basketball
- Soccer
- Hockey
- Lacrosse
- Field events from Track and Field

Nichols, J.F., Rauh, M.J., Barrack, M.T., Barkai, H., & Pernick, Y. (2010). Disordered eating and menstrual irregularity in high school athletes in lean-build and nonlean-build sports. *International Journal of Sport Nutrition and Exercise Metabolism, 17,* 364-377.

Analyzing Body Composition and Assessing Weight

- Physical measurements: Important for assessment of progress to achieve peak performance.
  - -Height
  - -Weight
  - -Somatotype
  - -Girth
  - -Body Composition

http://www.witweightloss.com/

Height & Weight

- Height (stature) & weight (body mass)
  - -optimal weight is relative to height
- For accurate measurements:
  - -measurement boards
  - -calibrated scales

Imagegs taken from: http://www.womansday.com/var/ezflow_site/storage/images/media/galleries-slideshows/_image.jpg
http://www.quickmedical.com/images/sku/tnails_250/78.jpg

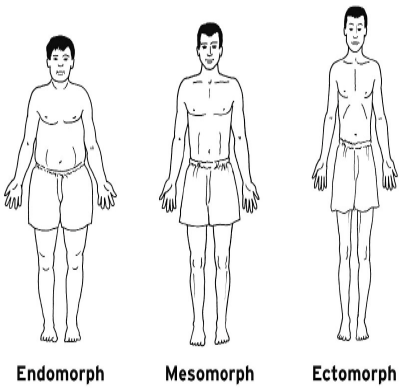
Somatotype (Body Build)

- Endomorph

  -stocky, gain fat easily
- Mesomorph

  -muscular, do not gain large amounts of fat
- Ectomorph

  -minor, small amounts of fat and muscle



Imagine taken from:http://www.pponline.co.uk/encyc/img/251Bfig1.png

Girth

- Circumference of different body parts

  -waist, hips, calves, thighs, arms, chest.
- Helps track changes in body size

Images taken from: http://www.topendsports.com/testing/images/girth-hip.jpg

Tools To Assess Body Composition

- Near-infrared interactance (NIR)
- Biolectrical impedance (BIA)
- Skinfold thickness
- Body plethysmography (Bod Pod)
- Hydrostatic (underwater) weighing
- Dual-energy X-ray absorptiometry (DEXA or DXA)

Tools To Assess Body Composition

Image taken from: http://s1.hubimg.com/u/1136328_f260.jpg

https://teach.lanecc.edu/naylore/225lectures/09a/thumbnails/09omronhandheldimpedence.jpg

Image taken from: http:///i2.cdn.turner.com/cnn/2009/HEALTH/01/02/healthmag.measuring.body.fat/art.calipers.arm.gi.jpg

Images taken from: http://www.ori.org/healthyweight/images/bodpod.jpg

Image taken from: http://www.livebetterwiki.com/Portals/0/underwater%20weighing.jpg

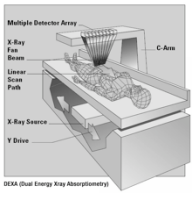


Image taken from: http://www.tappmedical.com/page_images/dexa.jpg

Weight Maintenance

- Athletes can face unwanted weight gain/weight loss
- Focus on a time in the pass when weight was maintained
- Periodization
- Change of training and competition season
  - May increase or decrease nutrient needs
- Injuries and Off Season

Weight Reduction

- Identify an Appropriate Weight Range
- Evaluate Current Dietary and Exercise Practices
- Establish Energy and Macronutrient Requirements
- Devise a Dietary Plan for Achieving Goals on Established Needs
- Educate the Athlete; Review the Dietary Plan, Monitor Status

Weight Gain

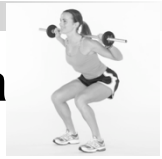
- Gaining body weight requires consistent excess energy intake
- Gain lean weight or muscle mass
- Increase Carbohydrates, Proteins, and Fats
- Similar five steps from Weight Reduction

Four steps to achieving optimal performance weight

1. Assessment
2. Goal Setting
3. Action Plan
4. Evaluation and Reassessment

http://www.behaviortherapyassociates.com/histepsummersocialskillsprogramnewjersey.html

Gain Muscle, Lose Excess Fa



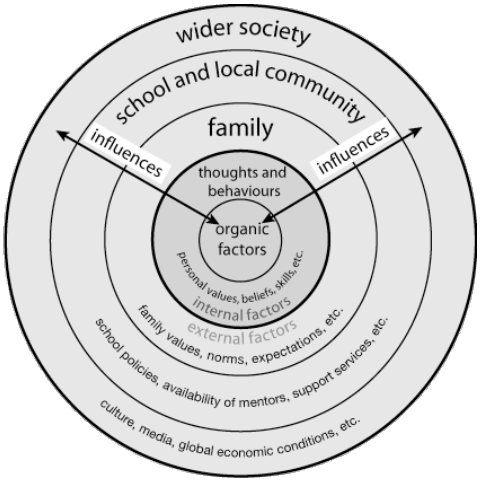
http://1.bp.blogspot.com/_3yPI33hffzs/S_KDIKt0FqI/AAAAAAAAAD0/1nnqeoWeTP0/s1600/weight-lifting-for-women.jpg

- In order to do this recommendations are:
  - Aerobic activity
  - Resistance Training
    - keeps fat off and increases muscle mass
- Aerobic workouts and weight training along with proper nutrition enables an athlete to get their desired body composition

More Protein?

- Do athletes need excess protein to build muscle?
  - Do not need excessive amounts of protein
  - No benefits from excess protein
    - Lower carbohydrate intake
    - Excessive caloric intake
    - Greater fluid losses
    - Higher food costs

HET



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Articles

Body composition assessment in athletes with spinal cord injury: comparison of field methods with dual-energy X-ray absorptiometry

- Mojtahedi, M., Valentine, R., & Evans, E. (2009). Body composition assessment in athletes with spinal cord injury: comparison of field methods with dual-energy X-ray absorptiometry. *Spinal Cord*, *47*(9), 698-704. Retrieved from http://libproxy.csun.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=2010398878&site=ehost-live

http://seriousaccidents.com/spinal-cord-paralysis-injury/paralysisinjury-blog/paralyzed-celebrities/paralympians-25-years- fundraising-spinal-cord-injury-research/

Purpose

- Purpose of the study was to compare estimates of body fat % from SKF and BIA with the DXA estimates in athletes who have spinal chord injury.

Methods (Participants)

- 16 Caucasian athletes with SCI
  - 8 women & 8 men
  - 12 wheelchair basketball & 4 wheelchair racing programs.
  - 11 complete SCI & 5 incomplete SCI

Methods (Procedures)

- No alcohol
- No exercise 16hr before testing
- Empty bladder
- Women: during days 7-14 from start of last menstrual period
- Anthropometric & BIA measured during morning after 12 hr fasting

Methods (Procedures cont.)

- Anthropometry
- SKF
- BIA
- Compared to DXA
- Statistical analyses

Results/Conclusions

- Men taller & weighed more than Women
- Women had greater %Fat than men
- %Body Fat for the BIA equations were closer to DXA %Body Fat than SKF estimates for both men and women
- Believe neither measurements accurately estimate %Body Fat

Relationship between body composition, leg strength, anaerobic power, and on-ice skating performance in division I men's hockey athletes

Potteiger, J.A., Smith, D.L., Maier, M.L. & Foster, T.S. (2010). Relationship between body composition, leg strength, anaerobic power, and on-ice skating performance in division I men's hockey athletes. *Journal of Strength and Conditioning Research, 24(7),* 1755-1762.

www.bluestreakst.com

Purpose

- To examine relationships between laboratory tests and on-ice skating performance in division I men's hockey athletes.

Methods

- 21 men (age 20.7 ± 1.6 years
- Assessed body comp., isokinetic force production in quadriceps and hamstring muscles, and anaerobic muscle power (AMP)
- Air displacement plethysmography (% body fat)
- Wingate 30-second cycle ergometer test (AMP)
- On-ice skating performance measured during 6 timed 89-m sprints
  - Subjects wore full hockey equipment


www.yorkblog.com

- **Results:**
  - %Fat 11.9 ± 4.6
  - Avg. skating times were moderately correlated to %Fat
  - Greater %Fat => slower skating speeds
  - Faster speeds correlated with Wingate Fatigue index
- **Conclusions:**
  - Laboratory testing of select variables can predict skating performance in ice hockey athletes.
  - Info used to develop targeted and effective strength and conditioning programs to improve skating speed


www.yorkblog.com

Dietary Intake and Body Composition of Prepubescent Female Aesthetic Athletes

Soric,M., Misigoj-Durakovic, M., & Pedisic, Z. (2008). Dietary intake and body composition of prepubescent female aesthetic athletes. *Journal of Sports Nutrition and Exercise Metabolism,8*, 343-354.

http://www.mp3runningworkouts.com/wp-content/uploads/2010/02/article_image_Athlete_Nutrition.jpg

Purpose

- To assess energy and nutrient intakes in prepubescent athletes practicing different aesthetic sport disciplines as well as to assess possible differences that there might be between these groups of athletes.

Methods

- 39 female athletes (9 artistic gymnasts, 14 rhythmic gymnasts, 16 ballet dancers).
- Actively training for at least 5 years
- Age 9-13 (median 11)
- National level competition

- Control – 15 premenarcheal females
- Age 10-12 (median 11)
- No history of participation in competitive sports
- Recruited from a public school in Zagreb

- No dieting was reported

Methods Cont.

- Anthropometry

  -Height, weight and 2 skinfold thickness sites measured (triceps and calves).

  -Taken by skilled tech. before morning training.

- Food Intake

  -Quantitative Food Frequency Questionnaire

  -7 day diet record

  -qFFQ readministered after 30 days

  -Diet analysis includes: food, beverage, supplement

Results/Conclusions

- Rhythmic gymnasts: sig. taller, no difference in weight or BMI than artistic gymnasts.
- Significant diff. in body fat % between artistic gymnasts and ballet dancers. (12.4% ± 1.8% to 17.4% ± 4.7%)
- No difference between artistic & rhythmic gymnasts

Results/Conclusions

- Energy & Macronutrients

  -No significant difference in energy intake

  -Difference in macronutrient contribution to total energy intake. Higher CHO, lower fat.

  Artistic gymnasts: 57% ± 6% , 29% ± 5%

  Rhythmic gymnasts: 48% ± 6%, 36% ± 5%

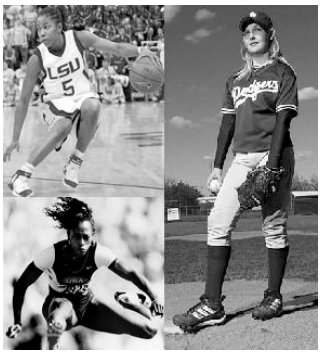
  Ballet dancers: 51% ± 4%, 34% ± 3%

  Controls: 51% ± 5%, 34% ± 4%
- No difference in intake of minerals/vitamins

  -Sodium above upper limit, potassium & calcium below adequate intake, all other minerals/vitamins higher than current daily recs.
- Hydration inadequate in all except controls.

Sport and training influence bone and body composition in women collegiate athletes

- Carbuhn, A.F., Fernandez, T.E., Bragg, A.F., Green, J.S. , & Crouse, S.f. . (2010). Sport and training influence bone and body composition in women collegiate athletes. *Journal of Strength & Conditioning Research (Lippincott Williams & Wilkins)*, *24*(7), 1710-1717.



http://www.womenatworkmuseum.org/archive-exhibits-2005.html

Purpose

- This is a novel descriptive study to characterize off-season, preseason, and postseason bone and body composition measures in women collegiate athletes.

Methods

- -Athletes from five sports (softball, basketball, volleyball, swimming, track jumpers)
- -Analyzed their total body mass, lean mass, fat mass, percent body fat, bone mineral density, arm, leg, pelvis, and spine BMD during three different parts of the season.
- -They were analyzed during the off-season, preseason, and post season.

Results

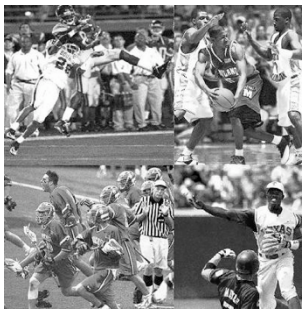
- Significant off-season to preseason or postseason changes in %BF, LM, and BMD within each sport were as follows, respectively:
- Softball, -7, +4, +1%;
- Basketball, -11, +4, +1%;
- Volleyball, unchanged, unchanged, +2%;
- Swimming, unchanged, +2.5%, unchanged;
- Track jumpers and sprinters, -7, +3.5, +1%.

Results Cont.

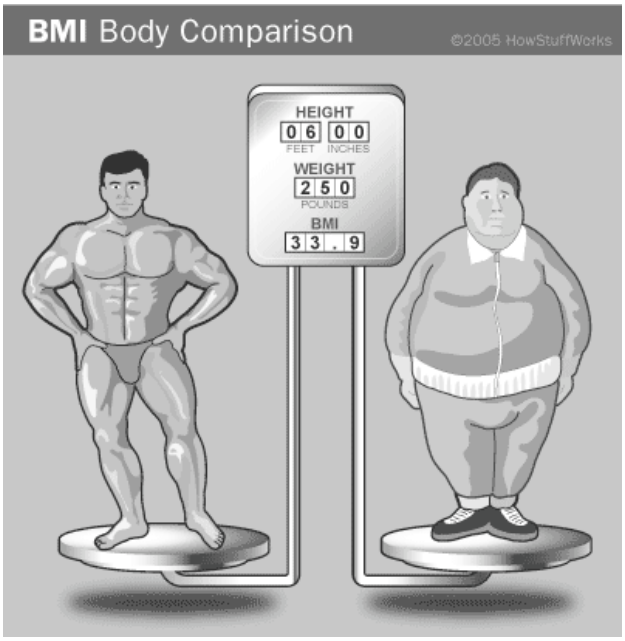
- Comparisons among athletes in each sport showed bone measurements of swimmers averaged 4-19% lower than that of athletes in any other sport,
- Track jumpers and sprinters, %BF and FM averaged 36 and 43% lower compared with other sports at all seasonal periods.
- Athletes playing basketball and volleyball were most similar
- Softball athletes' values fell between all other athletes.
- These data serve as sport-specific reference values for comparisons at in-season and off-season training periods among women collegiate athletes in various sports.

Body Mass Index as a Predictor of Percent Fat in College Athletes and Nonathletes

- Ode, J. , Pivarnik, J. , Reeves, M. , & Knous, J. (2007). Body mass index as a predictor of percent fat in college athletes and nonathletes. *Medicine & Science in Sports & Exercise,* 39(3), 403-409.



http://ironterp84.tripod.com/sitebuildercontent/sitebuilderpictures/backgroundweb3.jpg



http://medicaldude.com/2010/07/obesity-guidelines-should-be-revised-for-seniors-revised-body-mass-index-bmi/

Purpose

- The purpose of this study was to evaluate the relationship of Body Mass Index (BMI) and percent body fat focusing on the college athlete and the college nonathlete
  - Why?
    - there have been some misclassifications in the college athlete populations when athletes are given BMI that state they are overweight when they actually have healthy body fat percentage

Methods/Materials

http://www.2sports.info/img/Softball2.jpg

- Total of 440 participants
  - 213 college aged nonathletes (78 male/ 135 male)
    - undergraduate kinesiology majors in an exercise physiology class
  - 226 varsity college athletes (149 male/ 77 female)
    - Males: football, basketball, hockey and wresting
    - Females: basketball, crew, and softball
- 3 male groups and 2 female groups
  - male athletes, male nonathletes, and linemen
  - female athletes and female nonathletes
- Calculated BMI and calculated their percent fat with the BOD POD
  - BMI: reading greater or equal to 25 kg per meter was defined as overweight.
  - PERCENT FAT: A score of 20% fat for males and 33% fat for females was deemed overfat

Results

- Male Athletes
  - 67% of the participant's BMI scores said they were overweight but they were in the normal fat percentage range
  - Small proportion of participants were given normal BMI scores when they were actually deemed overfat
- Male Nonathletes
  - 25% of the participant's BMI scores said they were overweight but they were in the normal fat percentage range
- Linemen
  - No linemen had a BMI lower than 25– all deemed overweight based on this number
  - only one was less than 20% body fat
- Female Athletes
  - 31% of the participant's BMI results said they were overweight but they were in the normal fat percentage range
- Female Nonathlete
  - only 7% of the participant's BMI scores said they were overweight but they were in the normal fat percentage range
  - 44% of the participants were given normal BMI scores when they were actually deemed overfat

Conclusion

- "BMI should be used cautiously when classifying fatness in college athletes and nonathletes. Our results support the need for different BMI classifications of overweight in these populations" (Ode, Pivarnik, Reeves, & Knous, 2007, p. 403).
- Athletes have a greater muscle mass than the general population and therefore the BMI system often misclassifies them as overweight.
- Coaches, athletes, trainers, and registered dietitians
  - BMI has been found unreliable for athletes

Reference

- Carbuhn, A.F., Fernandez, T.E., Bragg, A.F., Green, J.S. , & Crouse, S.f. . (2010). Sport and
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