The Good, Bad, and Ugly of an Athlete's Training

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The Good, Bad, and Ugly
Hot Topics

- Exercise IS Medicine™
- Resistance Training
- Sports Nutrition
- Performance Enhancers
- Over the Counter Medicines in Athletics
- Overtraining
- Overuse injuries
The Good, Bad, and Ugly
Exercise IS Medicine™

“Daddy, if I join Little League, will I get a signing bonus?”
The Good, Bad, and Ugly

Exercise IS Medicine™

- Adults need minimum 30 minutes of physical activity on most days of the week
- KS 2004 = 22.3% obese adults
  - CO (16%) and Miss (29%)
- Obesity is a direct major risk factor for
  - Asthma, Cardiovascular disease, Diabetes, Hypertension, Osteoporosis, some cancers
- Research supports benefits of exercise
The Good, Bad, and Ugly
Exercise IS Medicine™

• School age kids need 60 minutes of physical activity on most days of the week
• 30% of school age kids are overweight
• Overweight in kids translates into obese adults (40-60% chance of being obese adult if overweight at age 14)
• Overweight in kids = major risk factor for chronic disease/psychosocial problems!
The Good, Bad, and Ugly
Exercise IS Medicine™

• Basic of Training - exercise should involve:
  – Cardiorespiratory Training
    • Aerobic exercise = running, biking, swimming
  – Resistance Training
    • Strengthening
  – Flexibility & Balance Training
The Good, Bad, and Ugly Resistance Training

“We drafted him right out of preschool. He’s a long-term project, but we’re fairly certain he has a future in the NBA. ... Those are his parents over there.”
The Good, Bad, and Ugly Resistance Training

• Resistance Training is just one part of well rounded fitness program
• Children in organized sports = ready for strength training
  – Adult training/guidelines should not be imposed on youth
    • Due to anatomic, physiologic, psychological factors
  – Goal of youth strength training:
    • Improve musculoskeletal strength
    • Exposure to safe, effective, fun methods
The Good, Bad, and Ugly
Resistance Training

- Prepubescent = gain strength, not size (lack muscle-building hormones)
- Adolescent = strength gains + ↑ muscle size
- Resistance training in youth can increase muscular strength, and...
  - Enhance motor fitness skills (run/jump)
  - Enhance sports performance
  - Some evidence for decrease in # of sports injuries
The Good, Bad, and Ugly Resistance Training

• Guidelines – childhood resistance training:
  – Careful supervision (competent instructor)
    • Focus on participation, technique (not amount of resistance)
  – Avoid 1-rep maximum training, instead use gradual progression
    • Perform 8-15 reps per exercise (only add weight when can do all reps in good form). Ex. Can’t do 8 reps = too much
  – Age appropriate equipment, vary equipment
  – Comprehensive program to increase motor/fitness
  – Maturity (significant signs, adulthood) = can increase intensity of lifts, add more difficult lifts
The Good, Bad, and Ugly Resistance Training

- Weight class in schools, problems…
  - Goofing around, poorly supervised (injuries)
  - Too much weight, grades based on 1 rep max
  - Too much emphasis on weight, not enough on technique, sport/motor skill
  - Not well designed for beginners/overweight kids…set up often for the football team, not the everyday JOE.
The healthiest part of a donut is the hole. Unfortunately, you have to eat through the rest of the donut to get there!
The Good, Bad, and Ugly Sports Nutrition

- The same diet that promotes good health is also the ideal diet for the athlete
  - Eating a balanced diet is key
  - Right combination of fuel from carbohydrates (60-70% of daily calories), protein, and fats
  - Provides adequate fluids, vitamins and minerals
  - Based on USDA Food Guide Pyramid and Dietary Guideline For Americans

- Energy Balance
  - energy intake (diet) relative to energy expenditure (physical activity)
  - Equations for Estimated Energy Requirements children age 9-18 (also adds in activity levels)
The Good, Bad, and Ugly
Sports Nutrition

- **Calcium/Vit D**
  - 1300 mg / day
  - Bone health for life starts in childhood

- **Iron**
  - Critical during growth / maturation
  - Iron deficiency

- **Protein**
  - 0.8 g / kg / day for all ages
The Good, Bad, and Ugly
Sports Nutrition

• Water/Hydration
  – Children in general have high body surface area to body mass ratio compared to adults
    – Greater fluid and energy requirements in youth
    – Increased risk for heat illness
  – Avoid dehydration by…
    • Pack a water bottle
    • Drink during day (am, lunch), prepractice, and regularly during practice, + replenish after
    • Watch urine color (should be light yellow – not clear & not dark)
The Good, Bad, and Ugly
Sports Nutrition

Hydration, Fluid Recommendations:

<table>
<thead>
<tr>
<th>Situation</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-3 hours before exercise</td>
<td>16-24 ounces (light-colored urine)</td>
</tr>
<tr>
<td>30 minutes before exercise</td>
<td>5-10 ounces</td>
</tr>
<tr>
<td>During exercise</td>
<td>5-10 ounces every 15 minutes</td>
</tr>
<tr>
<td>After exercise</td>
<td>20 ounces for every pound lost during exercise</td>
</tr>
</tbody>
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The Good, Bad, and Ugly Sports Nutrition

• Body image disorders, eating disorders
  – Athletes consistently diet
  – Significant health risks with consistent energy balance problems
  – Youth are most at risk
    • Both men and women
    • Gymnastics, figure skating, ballet, distance running, wrestling, rowing
The Good, Bad, and Ugly Sports Nutrition

- Female Athlete Triad
  - Disordered eating
  - Amenorrhea (no periods)
  - Low bone density
- Warning signs
  - Fatigue, poor performance, feeling cold, moods, irregular periods, body image disorder, excessive focus on exercise/calories, depression
- Risks
  - Fractures/Stress fractures, GI Complications, Cardiovascular (life threatening arrhythmias)
- Team approach to treatment
  - Psych, Med, Nutrition
The Good, Bad, and Ugly
Performance Enhancers

The tortoise’s celebration was cut short, however, when lab tests came back positive for performance-enhancing drugs.
The Good, Bad, and Ugly Performance Enhancers

- Pros and recreational athletes alike
- Readily available
- Multi-billion dollar industry (US sales 12-18 billion)
- Aggressive marketing aimed at young athletes
- Athletic success = scholarships/big money/fame
  - Social pressure to succeed
  - Economic factors
- Most have little or no scientific data to support the manufacturer’s claims
The Good, Bad, and Ugly Performance Enhancers

Poll of 198 elite athletes reported in Sports Illustrated in 1997:

- Would you take a banned substance if you were guaranteed to win and not get caught? (98% yes)
- What if it would kill you in five years, but allow you to win every competition until then? (50% yes)
- “Better Dead then Second”
- “What Price Glory?”
The Good, Bad, and Ugly Performance Enhancers

• Creatine
  – Extremely common (13% NCAA athletes)
  – **THEORY:** Increases availability of initial energy source phosphocreatine (PCr) in skeletal muscle = enhanced muscle performance, greater force of muscle contraction & prolonged anaerobic exercise
  – **FACT:** Ergogenic potential shown in some studies = increases brief (<30 sec), repeated, high-intensity work & time to exhaustion. Those with low baseline stores may benefit (quicker recovery).

• Does not help aerobic ability or hand eye coordination
The Good, Bad, and Ugly Performance Enhancers

• Creatine
  – Cost: $17 - $40 for 16 doses
  – Loading dose 5g QID for 5 days, then 2g daily
    • Rapid muscle hypertrophy (water uptake)
    • maximal muscle levels of creatine in 5 days
    • Average weight gain is 1.5 - 3 kg (weight gain is the only “proven” side effect)
    • Can skip load & use maintenance dose only & will reach maximal muscle levels in 1 month
    • More than the maintenance dose is not better & just leads to expensive urine
The Good, Bad, and Ugly Performance Enhancers

• Creatine Recommendations
  – Avoid usage before or during activity (possible GI side effects)
  – Avoid usage when exercising in the heat or trying to cut weight for wrestling
  – Never use if pregnant, breast feeding or under 18 years old
  – Avoid usage if previous renal impairment, diabetes or another condition that predisposes to renal impairment (another possible side effect)

• WE TELL IT LIKE IT IS and LET THEM MAKE A WELL EDUCATED DECISION
The Good, Bad, and Ugly Performance Enhancers

- Amino Acids/Protein Supplements
  - **THEORY:** increasing availability will increase protein synthesis, some AA’s can stimulate release of human growth hormone, promote muscle growth, increase strength, and ward off fatigue.
  - **FACT:** Exercise does require protein metabolism, but normal dietary intake exceeds even the needs of endurance athletes. No evidence to support. Weight lifting & endurance training will increase GH w/ no further effect by AA.
The Good, Bad, and Ugly Performance Enhancers

• Amino Acids/Protein Supplements
  – No good studies, equivocal at best
  – Side effects
    • Few, small quantities are relatively safe
    • GI symptoms with increased dosages
  – Protein needs (athletes 1.2 – 2.0 g/kg/day)
    • Average Athlete 1.6 g/kg/day
    • Elite Athletes 1.8 g/kg/day
    • Average American Diet 1.4 g/kg/day
  – Diet suffices & is cheaper!
The Good, Bad, and Ugly Performance Enhancers

• Caffeine
  – Oldest, very commonly used stimulant
  – Increased alertness, Wards off drowsiness
  – Many proposed mechanisms (most likely CNS/Neural)
  – **THEORY:** Directly enhances muscular contraction & spares muscle glycogen in favor of fat for energy fuel
  – **FACT:** Many well-controlled studies support ergogenic/muscle glycogen sparing effect (enhanced endurance and power events)
The Good, Bad, and Ugly Performance Enhancers

• Caffeine
  – Moderate/High Doses = tremors, anxiety, palpitations, HA, withdrawal symptoms
  – Banned at levels:
    – IOC --- 12mg/kg
    – NCAA --- 15mg/kg
    – Detected by urine drug screen (very inaccurate)
  – Bottom Line
    • Ergogenic effect (2-3 cups of coffee)
    • Side effects at higher doses (8-10 cups)
The Good, Bad, and Ugly Performance Enhancers

- Antioxidant Vitamins (C, E, beta-carotene, coenzyme Q, selenium, glutathione)
  - **THEORY:** Protect against exercise induced oxidative tissue damage due to free radical production
  - **FACT:** May protect against oxidative tissue damage, no documented effects on performance. Low Vit C can impair performance, excessive Vit C can be dangerous.
  - **Bottom Line:** Supplementation at 100% of RDA levels appears safe
The Good, Bad, and Ugly Performance Enhancers

• Testosterone Precursors, Andro, Steroids
  – All can be converted to testosterone (prodrugs)
  – Direction of conversion depends on the initial concentration of testosterone & lutenizing hormone
  – **THEORY:** Raises testosterone level imparting strength & performance gains
  – **FACT:** No documented gains in strength, lean body mass, or performance. No rise in free or total testosterone. Rise noted in estradiol & estrone.
  – • Anabolic & androgenic effect possible ---&gt; increased muscle size & strength possible but no studies to confirm yet
The Good, Bad, and Ugly Performance Enhancers

cholesterol → progesterone → DHEA

androstenediol androstanedione

DHEA → TESTOSTERONE

estradiol estrone

epitestosterone
The Good, Bad, and Ugly Performance Enhancers

- Testosterone Precursors, Andro, Steroids
  - Banned by IOC, NCAA, NFL, IAAF (not yet by MLB, NHL, NBA)
  - Detectable by urine drug screening
  - Safety Concerns:
    1. Liver effects, Liver tumors
    2. Decreased HDL – good cholesterol (increased risk for heart disease & stroke)
    3. Potential steroid side effects such as early growth plate closure and precocious puberty in adolescents, acne, behavioral change, violence, abnormal sexual characteristics
    4. Increased estradiol levels (associated w/ pancreatic cancer).
The Good, Bad, and Ugly Performance Enhancers

- Testosterone Precursors, Andro, Steroids
  - **Bottom Line:** Risks Outweigh Benefits
The Good, Bad, and Ugly Performance Enhancers

- Training to increase agility, quickness, balance, aerobic capacity, strength & general athleticism along with sport-specific knowledge & technical skill should be taught before any thought is given to ergogenic aids that may have unforseen side-effects
- A pill is not a substitute for hard work, dedicated training & personal effort
The Good, Bad, and Ugly
Over the Counter Medicines

“You have been taking that shark cartilage again, haven’t you, Mr. Witherbeck?”
The Good, Bad, and Ugly Over the Counter Medicines

• NSAIDs (i.e. Ibuprofen, Aspirin, Naprosyn)
  – Effect: anti-inflammatory, analgesia (pain), antipyretic (fever), platelet inhibition (clotting)
  – Mechanism: reduce pain by reducing inflammation & possibly by direct pain blockage by a poorly understood mechanism

• Cyclooxygenase inhibition leading to decreased prostaglandin production (prostaglandins help produce protective lining in stomach as well as playing a role in inflammation).
The Good, Bad, and Ugly Over the Counter Medicines

• NSAIDs
  – Risks:
    • Gastropathy-ulceration, Dyspepsia-heartburn, GI Bleeding
    • Neurologic
      – Headache
      – Tinnitus (aspirin)
      – Depression
    • Skin
      – Urticarial rash
    • Allergic reactions
      – Reactive airway disease, nasal polyps, rhinitis
      – Angioedema, anaphylaxis
    • Kidney effects
      – Renal failure (rare)
      – Prostaglandins regulate renal blood flow thus decreased blood flow
      – Worse with dehydration
The Good, Bad, and Ugly
Over the Counter Medicines

• NSAIDs
  – Avoid risk by
    • Taking with food
    • Taking recommended doses for short burst, avoid chronic use
    • Stop if GI upset of blood in stool
The Good, Bad, and Ugly Over the Counter Medicines

- Acetaminophen (i.e. Tylenol)
  - Effect: Analgesia (pain), Antipyretic (fever)
  - Risks
    - Excellent safety record, few side effects at doses <90mg/kg/d or < 4 g (4000mg)/day
    - Metabolized in the liver
      - Hepatotoxicity main side effect
The Good, Bad, and Ugly Over the Counter Medicines

- Antihistamines
  - Effect: Indicated for allergic symptoms
  - Side Effects: potentially sedating (newer meds are nonsedating)
  - All antihistamines potentially predispose one to dehydration and heat illness due to their drying effect
The Good, Bad, and Ugly Over the Counter Medicines

- OTC Dietary Supplements (Vitamins/Minerals/Herbal)
  - B-Complex, Antioxidants, Iron, Calcium, Zinc, etc.
  - Role in energy production, hemoglobin synthesis, maintenance of bone health, adequate immune function, and protection from oxidative damage
  - Required to help build and repair muscle tissue following exercise
  - Exercise may increase the need for vitamins and minerals
  - Restrictive diet practices place athletes at risk for deficiencies
The Good, Bad, and Ugly Over the Counter Medicines

• OTC Dietary Supplements
  – 89 brands with > 300 different products
  – Most have little or no scientific data to support the manufacturer’s claims
  – USP (U.S. Pharmacopeia) - designation on the label of a supplement means that the product passes tests for amount, potency & purity
  – No efficacy guarantee
  – www.consumerlabs.com - info on supplement purity
The Good, Bad, and Ugly
Overtraining

“We did blood tests, CAT scan, MRI, colonoscopy, spinal tap, EKG and biopsies up the ying-yang, and they all point to the same conclusion: You’ve got no game.”
The Good, Bad, and Ugly
Overtraining

• Vigorous training followed by recovery is essential for improving performance
• Some athletes will “overreach” when training hard
  – Have some of the below symptoms, but symptoms resolve quickly with period of lighter training (tapering)
• Chronic “Overreaching” can become “Overtraining Syndrome”:
  – Common cause for underperformance.
  – Symptoms: fatigue, muscle soreness, decreased coordination, weight loss, mood changes, frequent illness. (all of these could also be related to an underlying illness) = diagnosis difficult
The Good, Bad, and Ugly
Overtraining

- insufficient recovery
- overreaching
- overtraining

normal “periodization”

Recovery possible by tapering
The Good, Bad, and Ugly
Overtraining

• Endurance and strength/power sports both at risk
• If seeing persistent underperformance, try 2 weeks of lighter training (or complete rest)…if symptoms still don’t resolve = “overtraining syndrome”
  – Can last for weeks to months
The Good, Bad, and Ugly
Overtraining

• Overtraining Avoidance
  – Arrange training around the principle of periodization
  – Include at least 1 day each week of complete rest to allow recovery
  – Include at least 1 lighter training week each month mixed in with the heavier training weeks
  – Maintain a training log to evaluate training effects
The Good, Bad, and Ugly
Overuse Injuries

“"You think you’ve got a bad knee? Let me tell you about a bad knee, my brother."
The Good, Bad, and Ugly

Overuse Injuries

• 2 main Types of Injuries
  – Traumatic Overload (excessive, rapid resistance increase)
  – Overuse (repetitive motion leads to fatigue – without change in resistance)

• Overuse Injuries: 50% of all injuries seen in the primary care office
  – Due to soft tissue breakdown > repair
  – The reparative processes are overwhelmed
  – Can happen to anyone
  – Most commonly seen at peak performance or when starting new activity
The Good, Bad, and Ugly
Overuse Injuries

- Overuse Injuries…why?
  - Inflexibility
  - Muscle Imbalances or weakness
  - Poor balance
  - Anatomical abnormality (leg lengths, flat feet)
  - Period of rapid growth
  - Inadequate nutrition
  - Aging or chronic disease (change in reparative process)
  - Environment
  - Sport/equipment/position/technique
  - Training errors (cause 70% of overuse injuries)
  - Return to play too soon after injury
  - “overreaching” or “overtraining”
The Good, Bad, and Ugly
Overuse Injuries

- Overuse Injuries, tissues involved:
  - Tendon (acutely inflammed, leads to chronic scarring)
  - Ligament/Fascia (plantar fasciitis, knee MCL)
  - Joint (Synovitis, Osteoarthritis)
  - Bone (Apophysitis - tendon pulls on growing bone, Stress Fractures)
  - Muscle (delayed muscle soreness)
  - Bursa (overlying tendon problems)
  - Nerve (swelling lead to nerve impingement)
The Good, Bad, and Ugly
Overuse Injuries

• Can begin as microscopic, subtle trauma to the tissue that doesn’t heal well
• Ultimately Ideal healing rarely occurs
  – Can have good function despite scar healing
  – However, Deficiencies often remain
The Good, Bad, and Ugly
Overuse Injuries

• Overuse injuries are avoidable
  – Find underlying problems and fix those (inflexible, poor balance, etc...)
  – Listen to pain/soreness/fatigue as guides for needing rest, lighter workouts…
  – Train appropriately, allowing adaptation, adequate rest, and slowly increase work load. Good nutrition and hydration also play a role.
  – Cross-train, protect, educate, individualize
The Good, Bad, and Ugly Summarized

• Exercise IS Medicine™
  – Every child/adolescent, 60 minutes daily
• Resistance Training
  – Benefits > risk, supervision/technique
• Sports Nutrition
  – Energy in = energy out
• Performance Enhancers
  – Some work, but risk > benefits
• Over the Counter Medicines in Athletics
  – Use caution, recommended doses
• Overtraining
  – Time off
• Overuse injuries
  – Listen to the body…pain is not normal!
Thanks. Questions?

• My References:
  – www.exerciseismedicine.org
  – ACSM’s Guidelines for Exercise Testing and Prescription. 7th Ed.
  – Sports Nutrition A Practice Manual for Professionals. 4th Ed.