Dietary Planning Across the Lifespan – NMDD221

Session 8

Nutrition and Dietary Planning in Adolescence

Nutritional Medicine Department
Session Overview

• Nutritional requirements in adolescence
• Nutritional screening and assessment in adolescence
• Food behaviours and influences
• Common nutritional deficiencies
• Specific dietary patterns - vegetarianism
• Eating disorders
• Energy drinks
Adolescence

- Adolescence is defined as the period from the beginning of puberty until maturity.
- Puberty is the period of life in which a person becomes physically capable of reproduction.
- Absolute energy and nutrient needs are greater during adolescence than any other time in life, except for pregnancy and lactation.

(Whitney et al., 2011)
Adolescence

• The biological, psychosocial and cognitive changes associated with adolescence have direct effects on nutritional status.
• Dramatic physical growth and development increases the need for energy, protein, vitamins and minerals.
• The struggle for independence often leads to the development of behaviours such as:
  – excessive dieting
  – meal skipping
  – fad diets
  – supplements.

(Brown, 2011)
Adolescence is the age at which children stop asking questions because they know all the answers.

Growth and Development

- Physiologic changes
- Puberty
- Sexual maturity rating (Tanner stage)
- Growth velocity
- Independence and autonomy
- Body image
Growth in Adolescence

- Adolescents gain about 20% of their adult height during puberty
- 18- to 24-month period known as the growth spurt
- Fastest rate of growth during this time is the “peak height gain velocity”
- 40% to 50% of adult body weight is gained during adolescence
Adolescence: The Vulnerable Life Stage

• Big changes: Biological
  – **Boys:** get tall, lean, and dense
    • Gain approximately 20% of adult height during puberty
    • Lean body mass doubles
    • Large energy needs—increase from approximately 8,500 kJ (2,000 kcal)/day at age 10 years to approximately 12,500 kJ (3,000 kcal)/day at age 15 years (depending on PAL)
Adolescence: The Vulnerable Life Stage

• Big changes: Biological
  – **Girls:** get taller and “fatter”
    • % body fat increases from the teens into the mid-20s
    • Gain almost 50% of their adult ideal weight 6-9 months before height rate increases during puberty
      – Dieting can have a negative impact on linear growth during this time
    • Energy needs increase by approximately 1,600 kJ (400 kcal)/day from age 10 years to age 15 years (depending on PAL)
Typical Growth Velocity Curves

(Source: Mahan et al., 2012)
Cognitive and Emotional Development

- Early adolescence (ages 13–15 years)
- Middle adolescence (ages 15–17 years)
- Late adolescence (ages 18–21 years)
Nutritional Requirements
Nutrient Requirements

- Energy: EERs are calculated based on gender, age, height, weight, activity with an additional 100 kJ (25 kcal)/day for energy deposition or growth.
- Protein: based on gender and grams of protein per kilogram of body weight method.
- Carbohydrate: 45-65% of energy intake.
- Fibre intake is often inadequate (due to poor intake of whole grains, fruits and vegetables).
- Fat: should be 20% to 35% of total energy.
Protein

- Protein is vital for physical growth, and should account for 15-25% of total energy. Protein deficiency is generally rare in western countries
  - May need emphasis in those following a vegetarian or vegan diet.
- If protein intake is inadequate during growth periods there could be delayed or stunted increases in height and weight.
- If protein intake is inadequate in physically mature adolescents there could be loss of lean body mass.
- Inadequate protein could result in impaired immune response and susceptibility to infection.

(Mahan et al., 2012)
Fats

- Many teens consume too much fat. Like adults, the diets of teenagers should contain no more than 35% of kilojoules as total fat and no more than 10% of total kilojoules calories as saturated fat.
- Teens should limit high-fat junk foods, and include foods containing essential fatty acids including deep cold sea fish, walnuts, flaxseeds, pumpkin seeds, sunflower seeds.

http://www.medpagetoday.com/PrimaryCare/DietNutrition/24919
Nutrient Requirements - micronutrients

- **Calcium**: needs are greater because of rapid bone, muscle, and endocrine development
- **Iron**: needs are greater because of increases in lean body mass and blood volume
- **Folic acid**: needs increase in later adolescence
- **Vitamin D**: low levels are a health risk with higher risk in northern climates
Calcium

• Nearly half of all skeletal growth occurs during adolescence. As a result, large amounts of calcium are needed during the teenage years.
• To ensure proper absorption and utilisation of the calcium, vitamin D is also needed.
• Females accrue approximately 92% of their bone mass by age 18 years, so adolescence is a crucial time for osteoporosis prevention.
• **In Australia approximately 82-89% of girls aged 12 to 16 years have calcium intakes below recommendations.**
  
  (Whitney et al., 2011; Mahan et al., 2012)
Iron

- Teenage males and females have increased requirements for iron.
- For boys, the increase in muscle mass that occurs during adolescence is accompanied by greater blood volume.
- In females, iron is lost during the menstrual cycle.
Zinc

- Zinc is vital in adolescence because of its role in growth and sexual maturation.
- Serum zinc levels decline in response to the rapid growth and hormonal changes that occur during adolescence.
- Serum zinc levels indicative of mild zinc deficiency (<10.71 x10^-6 mol/L) have been found in 18% to 33% of female adolescents.
- The RDI for zinc for males and females ages 9-13 is 6 mg/day.
- For males aged 14-18 years the zinc RDI increases to 13 mg/day
- For females aged 14-18, the RDI increases to 7 mg/day.
Zinc (cont.)

- Zinc is naturally abundant in red meats, shellfish, and whole grains. Additionally, many breakfast cereals are fortified with zinc.

- Zinc and iron compete for absorption, so elevated intakes of one can reduce the absorption of the other.

- Adolescents who take iron supplements may be at increased risk of developing mild zinc deficiency if iron intake is over twice as high as that of zinc.
## Dietary Planning - Males

<table>
<thead>
<tr>
<th>Food Groups</th>
<th>9-11 years No. of serves/day</th>
<th>12-13 years No. of serves/day</th>
<th>14-18 years No. of serves/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetables and legumes</td>
<td>5</td>
<td>5 ½</td>
<td>5 ½</td>
</tr>
<tr>
<td>Fruit</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Grain (cereal) foods</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Lean meats and poultry, fish, eggs, tofu, nuts and seeds, and legumes/beans</td>
<td>2 ½</td>
<td>2 ½</td>
<td>2 ½</td>
</tr>
<tr>
<td>Milk, yoghurt, cheese and/or alternatives, mostly reduced fat</td>
<td>2 ½</td>
<td>3 ½</td>
<td>3 ½</td>
</tr>
</tbody>
</table>

(NHMRC, 2013)
## Dietary Planning - Females

<table>
<thead>
<tr>
<th>Food Groups</th>
<th>9-11 years No. of serves/day</th>
<th>12-13 years No. of serves/day</th>
<th>14-18 years No. of serves/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetables and legumes</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Fruit</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Grain (cereal) foods</td>
<td>4</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Lean meats and poultry, fish, eggs, tofu, nuts and seeds, and legumes/beans</td>
<td>2 ½</td>
<td>2 ½</td>
<td>2 ½</td>
</tr>
<tr>
<td>Milk, yoghurt, cheese and/or alternatives, mostly reduced fat</td>
<td>3</td>
<td>3 ½</td>
<td>3 ½</td>
</tr>
</tbody>
</table>

(NHMRC, 2013)
Daily intake of fruit and vegetables

• In 2014-2015:
  – 68.1% of children aged 2-18 years met the guidelines for recommended daily serves of fruit
  – 5.4% met the guidelines for serves of vegetables
  – only one in twenty (5.1%) children met both guidelines (ABS, 2016).
Nutritional Assessment
Nutrition Screening, Assessment, and Counseling

• Recommend annual screening
  – Iron studies
  – Include weight, height, and BMI-for age

• Nutritional assessment should include evaluation of the nutritional environment, including parental, peer, school, cultural, and personal lifestyle factors
Key Indicators of Nutrition Risk

- Medical conditions
- Food choices
- Eating behaviours
- Physical activity
- Food resources
- Growth
- Weight and body image
- Lifestyle

© Endeavour College of Natural Health
endeavour.edu.au
Key Indicators of Nutrition Risk

Food choices:
- Consumes < 2 serves of fruit per day
- Consumes < 5 serves of vegetables per day
- Consumes < 3 serves of calcium-rich foods per day
- Consumes < 2 ½ serves of protein-rich foods per day
- Consumes < 5 serves of grains per day
- Consumes excessive intake of saturated and/or trans fats
Key Indicators of Nutrition Risk

Eating behaviours:
• Exhibits poor appetite
• Eats fast food > 3 times per week
• Skips breakfast, lunch or dinner > 3 times per week
• Poorly planned vegetarian or vegan diet
• Follows a fad diet
Key Indicators of Nutrition Risk

Food resources:
• Has inadequate financial resources to buy food
• Insufficient access to food
• Lack of access to cooking facilities.
Key Indicators of Nutrition Risk

Lifestyle:

• Alcohol, tobacco or other recreational drug use
• Inappropriate use of dietary or other supplements (e.g. protein powders, herbal supplements for weight loss)
Key Indicators of Nutrition Risk

Weight and body image:

• Unhealthy eating behaviours (e.g. chronic dieting, vomiting, using laxatives, diuretics, diet pills, etc.).
• Excessively concerned about body size or shape.
• Has exhibited significant weight change in past 6 months.
Key Indicators of Nutrition Risk

Growth:
• BMI < the 5\textsuperscript{th} percentile
• BMI > the 95\textsuperscript{th} percentile
Key Indicators of Nutritional Risk

Medical Conditions:
• Has chronic condition(s)
• Has hyperlipidaemia
• Has iron-deficiency anaemia
• Has dental caries
• Is pregnant
• Is taking prescribed medication

(Brown, 2011)
Additional indicator of Nutrition Risk

Computer games:
• The increased prevalence of electronic game play (computer and video games) has been paralleled by an increase in body weight.
• Observational studies show a direct connection between electronic games and overweight as well as obesity.
• An inverse relation between time spent playing seated video games and daily physical activity has also been reported.
• In addition, playing computer games has been shown to reduce the time that teenagers spend on meals (Chaput et al., 2011).
Additional indicator of Nutrition Risk

Computer games:

• Heart rate and systolic and diastolic blood pressures were found to be significantly higher during the 1 hour computer game play condition than during the resting condition (P < 0.01).

• Energy expenditure was found to be significantly higher during the 1 hour computer game play condition than during the resting condition (mean increase over resting: 89 kJ; P < 0.01).

• Ad libitum energy intake after the video game play condition exceeded that measured after rest by 335 kJ (P < 0.05), resulting in a positive energy balance of 246 kJ (59 kcal; P < 0.05) after 1 hour of computer game play (Chaput et al., 2011).
Food Habits

(Source: Del Mar Surf Camp http://www.delmarsurfcamp.com/2013/03/19/healthy-tips-for-teen-athletes-optimum-performance)
Food Habits

• Irregular meals
• Excessive snacking
• Eating away from home
• Fast food is the main food eaten away from home
• Dieting and meal skipping
• Cooking ability / knowing how to cook
Factors Influencing Food Habits

- Decreased influence of family
- Increased influence of peers
- Increasing media exposure
- Increasing prevalence of employment outside of home
- Greater discretionary spending capacity
- Increasing responsibilities (less time to eat with families)
The Meaning of Food

- Study of 93 Canadian adolescent girls
- Eating “Junk food” was associated with pleasure, being with friends, weight gain, independence, guilt, affordability, and convenience.
- Eating “healthful food” was associated with family, meals, and being at home.
Eating Away from Home

- US Teens (78% of whom are in school) directly spend more than
  - $5.4 billion in fast food restaurants
  - $9.6 billion in food and snack stores
  - $736 million in vending machines
- Fast foods tend to be low in iron, calcium, riboflavin, vitamin C, and folic acid
- More meals missed at home thus the choice of foods away is more important than the time or place.
Positive Influence of Family Meals

- At home, teens consume:
  - more calcium, fruits, and vegetables
  - less soft drinks
- Family meals correlate with academic success
- More meals with the family associated with less obesity

http://www.thetimes.co.uk/tto/health/child-health/article3853935.ece
Common Nutrient Deficiencies

- Some adolescents may be deficient in protein (e.g. poorly-planned vegetarian diets)
- Dietary fibre
- Calcium
- Iron
- LC-omega-3 FA
- Insufficient fruits and vegetables (phytochemicals)
Specific Dietary Patterns

- Vegetarianism
- Eating disorders
- Consumption of energy drinks

http://www.thekitchn.com/
Vegetarianism
Vegetarian Dietary Patterns

• Plant-based diets, including vegetarian and vegan diets, are becoming well accepted.
• Approximately 3.3% of American adults are vegetarian or vegan and about 46% of vegetarians are vegan.
• The same poll revealed that 6% of young adults (18 to 34 years) are vegetarian or vegan.
• Whereas, only 2% of those 65 years or older are vegetarian (Melina et al., 2016).
Vegetarian Dietary Patterns

• A well-planned vegetarian diet containing vegetables, fruits, whole grains, legumes, nuts, and seeds can provide adequate nutrition (Melina et al., 2016).

• Very restrictive diets may signal disordered eating.

• Vegan diets do not provide vitamin B12 and may be low in calcium, vitamin D, zinc, and iron.

• Inappropriately selected vegetarian diets can result in malnutrition.
Reasons to be Vegetarian

- Religious
- Ethical
- Health
- Environmental
- Animal Welfare
- Economical

http://healthmade.net/vegetarian-health-benefits/
Types of Vegetarians

- **Lacto-Ovo Vegetarian**: does not eat meat, fish or fowl. Eats dairy and egg products. Most common.
- **Ovo Vegetarian**: does not eat meat, fish, fowl or dairy products. Eats egg products.
- **Lacto Vegetarian**: does not eat meat, fish, fowl or eggs. Eats dairy products.
- **Vegan**: does not eat any animal products including meat, fish, fowl, eggs, dairy, honey, etc. Most vegans do not use any animal products such as silk, leather, wool, etc. as well.
Health Benefits of Vegetarian Diets

• Appropriately planned vegetarian, including vegan, diets are healthful, nutritionally adequate, and may provide health benefits for the prevention and treatment of certain diseases.

• These diets are appropriate for all stages of the life cycle, including:
  – pregnancy
  – lactation
  – infancy
  – childhood
  – adolescence
  – older adulthood
  – for athletes (Melina et al., 2016).
Health Benefits of Vegetarian Diets

• Plant-based diets are more environmentally sustainable than diets rich in animal products because they use fewer natural resources and are associated with much less environmental damage.

• Vegetarians and vegans are at reduced risk of certain health conditions, including ischaemic heart disease, type 2 diabetes, hypertension, certain types of cancer, and obesity (Melina et al., 2016).
Health Benefits of Vegetarian Diets

• Low intake of saturated fat and high intakes of vegetables, fruits, whole grains, legumes, soy products, nuts, and seeds (all rich in fibre and phytochemicals) are characteristics of vegetarian and vegan diets that produce lower total and low-density lipoprotein cholesterol levels and better serum glucose control (Melina et al., 2016).
Overall Health Benefits of Vegetarian Diets

• Reduced risk of:
  – Cardiovascular disease
  – Hypertension
  – Hyperlipidaemia
  – Some cancers
  – Diabetes
  – Obesity / overweight
  – Kidney disease / renal stones
  – Gallstones
  – Diverticular disease
Vegetarians

Nutrient Considerations

- Protein
- Iron
- Zinc
- Calcium
- Vitamin D
- Vitamin B12
- Iodine
- Omega-3 fatty acids – EPA/DHA/DPA
  - While α-linolenic acid (ALA) intakes of vegetarians and vegans are similar to those of non-vegetarians, dietary intakes of the long-chain omega-3 fatty acids, EPA and DHA, are lower in vegetarians and typically absent in vegans (Melina et al. 2016).
Vegetarian Protein Sources

- Vegetarian, including vegan, diets typically meet or exceed recommended protein intakes, when caloric intakes are adequate (Melina et al., 2016).
- Assortment of plant foods throughout day provides all essential amino acids (Melina et al., 2016).
- Quality of plant protein varies.
- Isolated soy protein can meet protein needs as effectively as animal protein; wheat protein alone may be 50% less usable than animal protein.
- Typical intakes of protein for lacto-ovo and vegans appear to meet/exceed requirements.
- Recommendations for protein intake are 46 grams per day for women and 56 grams per day for men.
Good Sources of Protein

- Legumes/Beans combined with grains
- Tofu
- Veggie burger or other meat substitutes
- Soymilk
- Peanut butter and nuts
- Dairy products
Nutrition Considerations for Vegetarians - *Iron*

- Vegetarians generally consume as much iron as, or slightly more than, omnivores.
- Despite having similar iron intakes, the iron stores of vegetarians are typically below those of non-vegetarians.
- Lower serum ferritin levels may be an advantage because elevated serum ferritin levels have independently been associated with the risk of developing metabolic syndrome (Melina et al., 2016).
Nutrition Considerations for Vegetarians - *Iron*

- Iron intake of vegans typically higher than lacto-ovo; lacto-ovo higher iron than non-vegetarians.
- Iron deficiency anemia among vegetarians similar to that of non-vegetarians.
- Plant foods contain only nonheme iron.
- Vitamin C enhances iron absorption.
- Calcium and dairy foods *decrease* iron absorption.
- Take calcium supplements between meals not with meals.
Good Sources of Iron and Vitamin C

• Iron
  - Enriched bread and cereal
  - Whole wheat bread and other whole grains
  - Dried apricots, figs, prunes
  - Leafy green vegetables
  - Tomato juice
  - Beans
  - Nuts
  - Soybeans and tofu

• Vitamin C
  - Citrus fruits
  - Pineapple
  - Strawberries
  - Kiwi fruit
  - Broccoli
  - Peppers
  - Tomatoes
  - Melons
Eating Disorders

http://www.thefix.com/
Dieting and Body Image

• Body dissatisfaction is associated with a range of adverse outcomes, including:
  – impaired psychological health
  – low physical activity
  – disordered eating (Craike et al., 2016)

• The nurturing of a healthy body image is a challenge during adolescence, particularly for girls.
Dieting and Body Image

• An Australian survey of 14,461 young people aged 15–19 years found that 42.1% of adolescent females were concerned about body image and body image was the third major issue of personal concern (behind coping with stress and school/study problems).
• Among adolescent females, body dissatisfaction is associated with:
  – impaired emotional well-being
  – low self-esteem
  – elevated depressive symptoms
  – low physical activity
  – disordered eating (Craike et al., 2016)
Dieting and Body Image

- Given the detrimental outcomes associated with poor body image, it is important to identify:
  - whether negative body image perceptions tend to decrease over time, as adolescents transition into young adulthood, or whether negative body image remains high
  - subgroups that might be particularly vulnerable to experiencing body image concerns (Craike et al., 2016)
Dieting and Body Image

- A study of Australian girls in Grades 8 and 10 (where data were collected at two time points over 12 months) found a significant decrease in body satisfaction.
- A 5-year longitudinal study found that body satisfaction:
  - decreased for girls between the ages of 13 and 15 years
  - stabilised between the ages of 15 and 18 years (Craike et al., 2016)
Eating Disorders

The continuum of weight-related concerns and disorders

- Body dissatisfaction
- Dieting behaviours
- Disordered eating
- Clinically significant eating disorders

(Brown, 2011)
Eating Disorders

• Third most common chronic illness in adolescent girls
• Anorexia nervosa (AN)
• Bulimia nervosa (BN)
• Eating disorders not otherwise specified
• Binge eating disorder
Eating Disorders

• Complex psychiatric illnesses that require psychological assessment and ongoing treatment.

• Nutrition rehabilitation includes:
  – nutrition assessment
  – medical nutrition therapy
  – nutrition counselling
  – nutrition education.
Anorexia nervosa

- Anorexia nervosa is a complex mental disorder with an unknown aetiology.
- There is a growing body of evidence indicating that risk for Anorexia nervosa is genetically linked and that underlying neural networks may sustain the illness (Fuglset et al., 2016).
Anorexia nervosa

• Reduced perception of pain is a well-established phenomenon in Anorexia nervosa.
• A study found increased amygdala activation in Anorexia nervosa patients when feeling hungry, consistent with heightened fear or emotional response to taste stimuli.
• Food restriction and the pursuit for thinness in Anorexia nervosa has previously been linked to the reward system (Fuglset et al., 2016).
Anorexia nervosa

- Anorexia nervosa is of growing concern within our community.
- Early identification of negative relationships with food is crucial, and these will be the cases likely to show up in our clinics.

“Everyday anorexia”

https://www.youtube.com/watch?v=gQ7SyD1jnqw
• Anorexia nervosa
  – Self-starvation, weight loss, intense fear of weight gain, body image distortion
Anorexic and Bulimic Behaviours

• Expressed in 10-20% of adolescent girls.
• Mimic behaviors in Anorexia nervosa and Bulimia nervosa but are not done with the frequency or severity to classify as mental illness.
• Half of teen girls and 15% of boys report dieting behaviors
  – Ranging from eating less fat to fasting
  (Neumark-Sztainer, 2000)
Obesity

- Increasing prevalence of overweight and obese teenagers
- Multifactorial health issue
- Short- and long-term health outcomes
- Importance of early identification and intervention
- Concern over bariatric surgery
Obesity in children
Children aged 5-17 years - Body Mass Index, 2007-08 to 2014-15

In 2014-15, around one in four (27.4%) children aged 5-17 years in Australia were overweight or obese, comprised of 20.2% overweight and 7.4% obese (ABS, 2016).
Overweight Prevalence Increasing

Figure 1. Prevalence of overweight among children and adolescents ages 6-19 years


SOURCE: CDC/NCHS, NHES and NHANES.
Overweight tracks into Adulthood

- Overweight and obesity (as well as adiposity) have been shown to track from childhood into adult life (Singh et al., 2008).
- Overweight teenagers are 4-5 times as likely to be obese adults (Guo and Chumlea, 1999).

**FIGURE 2.** Odds ratios of overweight at age 35 y for boys and girls with BMIs at the 95th percentile compared with those of boys and girls with BMIs at 75th percentile.

From: Guo and Chumlea, 1999
Stages of Obesity in Adolescence

- **Stage 1**: no comorbid conditions, not completed growth spurt, and treated with general education
- **Stage 2**: more structured approach that includes monitoring of dietary intake and exercise
- **Stage 3**: uses a multidisciplinary medical team with a highly structured meal plan
- **Stage 4**: for very obese adolescents with comorbidities, uses clinical approaches by highly trained professionals and intensive diet intervention
Hyperlipidaemia and Hypertension

- Onset of Cardiovascular diseases during youth
- Many risk factors are comorbid conditions
- Diagnosis and treatment
- NCEP and DASH diets
### Classification of LDL and Total Cholesterol Levels in Adolescents

<table>
<thead>
<tr>
<th></th>
<th>Acceptable (mmol/l)</th>
<th>Borderline (mmol/l)</th>
<th>High (mmol/l)</th>
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<tbody>
<tr>
<td><strong>Total cholesterol</strong></td>
<td>&lt; 4.4</td>
<td>4.4-5.1</td>
<td>&gt; 5.2</td>
</tr>
<tr>
<td><strong>LDL cholesterol</strong></td>
<td>&lt; 2.8</td>
<td>2.8-3.3</td>
<td>&gt; 3.4</td>
</tr>
<tr>
<td><strong>HDL cholesterol</strong></td>
<td>&gt; 0.9</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td><strong>Triglycerides</strong></td>
<td>&lt; 1.7</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>
Physical Activity

• Numerous health benefits from physical activity
• 60 minutes/day and should include muscle and bone strengthening from age 14 years onwards (light weights only)
• Teenage athletes at high risk for dehydration
• Sports that emphasise weight increase the risk of disordered eating in teenage athletes
Energy Drinks
Energy Drinks

- Energy drinks are "non-alcoholic water based beverages that contain caffeine and carbohydrates or sweeteners and can contain amino acids, vitamins and other substances for the purpose of providing or achieving real or perceived psychological effects".
- Often contain taurine, glucuronolactone, caffeine, B vitamins (often in excess of daily requirements), ginseng, inositol, green tea extract, ginger and ginkgo).
- Caffeine content varies from 50 mg to 505 mg per serve. (1 shot espresso = 47 – 75 mg of caffeine)

(Burrows et al., 2013)
Energy Drinks

• Popularity is increasing.
  – 240% increase in sales between 2004 and 2009.
• 18 – 34 year old males are the biggest consumers.
• 31% of 12 – 17 year olds and 34% of 18-24 year olds consume energy drinks regularly.
• By 2006, there were over 500 brands around the world, with sales estimated at around $500 million per year in the US alone.

(Burrows et al., 2013; Pennay et al., 2012)
Energy Drinks
Effects on Health

• There is very limited data available on the effects of complete energy drinks.
  – A significant amount of research exists on individualised ingredients, rather than the synergistic interaction of them all.

• There is also limited information available on the effects of energy drink consumption at different life stages, with medication use and different dietary patterns.

• Much of the concern about energy drinks stems from the high levels of caffeine often included in the preparations.

(Burrows et al., 2013; Guilbeau, 2012)
## Energy Drinks

### Effects on Health

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<thead>
<tr>
<th>Ingredients</th>
<th>Sugar-Free</th>
<th>39 grams</th>
<th>31 grams</th>
<th>27 grams</th>
<th>52 grams</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sugar</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sodium</td>
<td>39 mg</td>
<td>140 mg</td>
<td>40 mg</td>
<td>180 mg</td>
<td>260 mg</td>
</tr>
<tr>
<td>Caffeine</td>
<td>150 mg</td>
<td>114 mg</td>
<td>160 mg</td>
<td>160 mg</td>
<td>260 mg</td>
</tr>
<tr>
<td>Niacin</td>
<td>10 mg</td>
<td>28 mg</td>
<td>20 mg</td>
<td>20 mg</td>
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<tr>
<td>Vitamin B-6</td>
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<td>7.2 mg</td>
<td>2 mg</td>
<td>2 mg</td>
<td>4 mg</td>
</tr>
<tr>
<td>Vitamin B-12</td>
<td>125 mcg</td>
<td>7.2 mcg</td>
<td>6 mcg</td>
<td>6 mcg</td>
<td>0.6 mcg</td>
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<tr>
<td>Vitamin C</td>
<td>50 mg</td>
<td>--</td>
<td>--</td>
<td>--</td>
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</tr>
<tr>
<td>Vitamin E</td>
<td>12.5 IU</td>
<td>--</td>
<td>--</td>
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<tr>
<td>Ready to Drink</td>
<td>--</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td>Different Flavors</td>
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[http://www.energydrinksports.com](http://www.energydrinksports.com)
Energy Drinks

Effects on Health - Caffeine

- At the cellular level, caffeine:
  - increases intracellular calcium
  - releases noradrenaline
  - intensifies dopamine receptors with stimulation of the cardiovascular system as well as the brain’s respiratory and vasomotor centres.

- Physical effects of caffeine include peripheral vasodilation, jitteriness, nervousness, difficulty concentrating, gastrointestinal upset and insomnia.

(Guilbeau, 2012)
Energy Drinks

Effects on Health - Caffeine

• Physiological effects of caffeine:
  – Dilation of the respiratory structures
  – Increased blood pressure
  – Increase stomach acid production
  – Alteration of blood glucose levels

• Caffeine at high doses results in:
  – Atrial fibrillation
  – Palpitations
  – Headaches
  – Seizures

(Guilbeau, 2012)
Main symptoms of Caffeine overdose

- **Central**
  - Irritability
  - Anxiety
  - Restlessness
  - Confusion
  - Delirium
  - Headache
  - Insomnia

- **Visual**
  - Seeing flashes

- **Ears**
  - Ringing

- **Skin**
  - Increased sensitivity to touch or pain

- **Muscular**
  - Seizures
  - Trembling
  - Twitching
  - Overextension

- **Respiratory**
  - Rapid breathing

- **Urinary**
  - Frequent urination

- **Systemic**
  - Dehydration
  - Fever

- **Heart**
  - Rapid heartbeat
  - Irregular rhythm

- **Gastric**
  - Abdominal pain
  - Nausea
  - Vomiting (possibly with blood)

https://commons.wikimedia.org/wiki/File:Main_symptoms_of_Caffeine_overdose.png
Energy Drinks

- Potential harmful effects of energy drink consumption include:
  - Tooth erosion
  - Altered mental status
  - Anxiety
  - Irritability
  - Psychiatric events
  - Acute mania
  - Stroke
  - Increased heart rate
  - Palpitations
  - Chest pain
  - Arrhythmias
  - Headache
  - Tremors
  - Dehydration
  - Nausea and vomiting
  - Diarrhoea
  - Abdominal pain (Guilbeau, 2012)
  - Increased platelet aggregation
  - Increased mean arterial pressure (McEwen, 2014)
Energy Drinks and Alcohol
Energy Drinks and Alcohol

- A growing public health concern, especially among teens and young adults.
- Observational studies have highlighted higher levels of intoxication and increased risk of alcohol-related harm when alcohol and energy drinks are combined.
- Induce a state of being ‘wide-awake drunk”
  - May result in under-estimation of intoxication → drink for longer periods of time → increased risk of alcohol overdose.

(Attwood, 2012)
Energy Drinks and Alcohol

• A few studies have looked at the impacts of alcoholic energy drinks and ‘real world alcohol related behaviours’.

“The few studies that utilise behavioural control measures reported mixed findings, indicating that caffeine, when mixed with alcohol, improves alcohol-relate detriment on some measures of behavioural control, while have no effect or even worsening performance on others”

(Attwood, 2012)
Energy Drinks and Alcohol

• A Canadian study (conducted in 2008-2009) found that those who consume alcoholic energy drinks (as opposed to alcohol without the energy drink component) were at increased risk of:
  – Passing out from drinking or drug use
  – Taking advantage of someone else sexually or being taken advantage
  – Having unprotected sex with someone not well known to them
  – Riding home with a driver who has been drinking
  – Being in a verbal fight
  – Being injured or hurt

(Pennay, 2012)
Energy Drinks and Alcohol

• An Australian based study (Melbourne) investigated the patterns of consumption, social contexts, benefits and harms of consuming alcoholic energy drinks.

• Motivations for consumption:
  1. Wakefulness and energy
  2. Taste
  3. Counteracting the drowsy effects of alcohol
  4. Facilitating alcohol intoxication
  5. Social bonding

“You’re not a slurring or lethargic drunk; you’re an energetic happy drunk (Male, 24 years)”

(Pennay, 2012)
Energy Drinks and Alcohol

“If I’ve had a heap of them (alcoholic energy drinks) I fall asleep as soon as I get home, but four to five hours later I wake up and there is just no getting back to sleep. Your body feels like it’s dead and hung over and you don’t want to move but your mind won’t let you sleep” (Male, 28 years)

- Young people appear to consume alcoholic energy drinks because they enable them to enjoy a more intense psychoactive effect of alcohol for a longer period of time.

(Pennay, 2012)
Focal Points

• Adolescence is a period of tremendous physical and cognitive changes.

• Teens are nutritionally vulnerable because of increased need for all nutrients at a time when changes in lifestyle and food habits greatly affect nutrient intake.

• Adolescents with special needs, such as those who participate in sports, have a chronic illness, are pregnant, diet excessively, or use alcohol and drugs, are at high risk for nutritional inadequacies and have the greatest need for nutrition education and counseling.

• Educating adolescents about the optimal energy and fat intake and level of physical activity helps them to develop a healthy body and lifestyle and avoid overweight and obesity and its comorbidities of hypertension and hyperlipidemia.
Tutorial Activities
Tutorial

Review the Readings for this session related to eating disorders in adolescents.

Summarise the key points relevant for nutritionists/naturopaths.

Look up the Life Smart pilot program aimed at reducing the risk of both eating disorders and obesity. What do you think of this approach?
References


References


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