International
Paralympic Committee

Unique Considerations – the Female Paralympic Athlete

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Overview

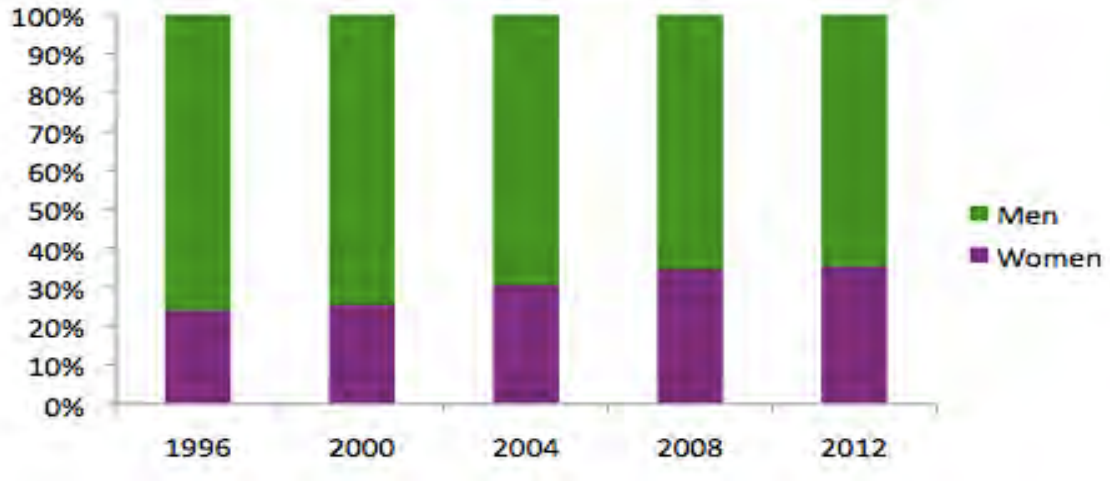
- **For most clinical topics – minimal variance amongst the needs of Olympic and Paralympic Female Athletes**

- **For some, however, significant differences exist**
  - *Focus on the Female Athlete Triad/RED-S*

Why Differentiate?

- **The unique needs of female athletes with an impairment have often received little attention**
- **What we know - the evidence - is in its infancy**
  - Clinical standards of care
  - Diagnostic algorithms
- **Involvement of female athletes with a disability is expanding rapidly**
  - From the grassroots to elite

Participation Trends



Gender participation by proportion at the Summer Paralympic Games, 1996-2012

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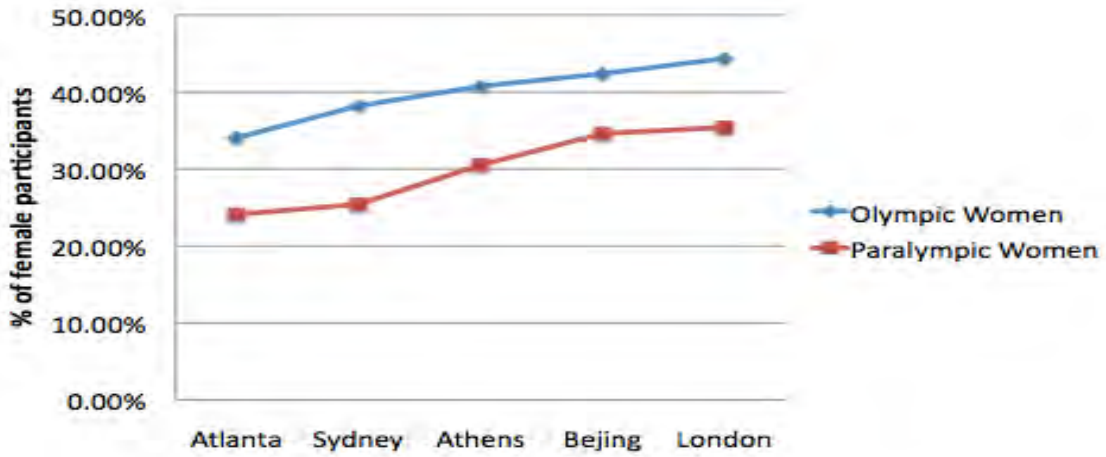


Trends in female athlete participation in the Paralympic Games in comparison to the Olympic Games

Female Athlete Triad/RED-S

Female Athlete Triad (Triad) and Relative Energy Deficiency in Sport (RED-S)

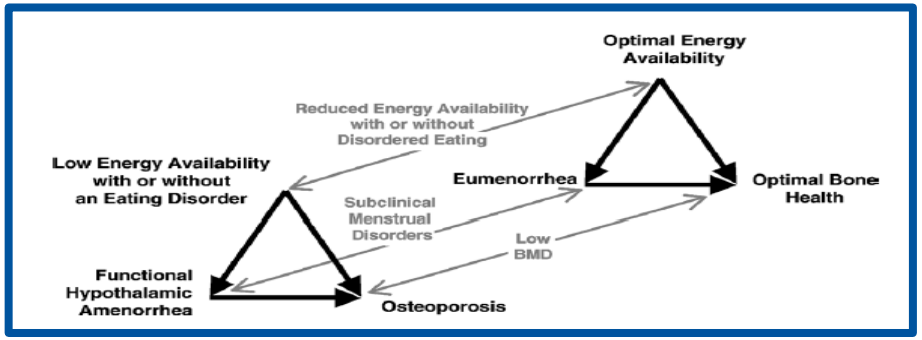
The Female Athlete Triad (Triad)

- First defined by ACSM in 1992 (Yaeger, 1993)
- Updated diagnostic criteria and definition in 2007 (Nattiv, 2007)

- **Relative Energy Deficiency in Sport (RED-S)** (Mountjoy, 2014)

Female Athlete Triad (Triad) and Relative Energy Deficiency in Sport (RED-S)

- **Defined by the inter-relationship of three conditions:**
  - Low energy availability (with or without disordered eating)
  - Menstrual dysfunction
  - Low bone mineral density



(Nattiv, 2007)

Systematic Review of the Triad/RED-S and Athletes with an Impairment

Rationale:

- Currently, little available literature on the prevalence or impact of the three components of the triad in athletes w/ disability

Method:

- Comprehensive lit search cross linking Triad/RED-S terms with six major impairment categories
- Search yielded **75** articles or book chapters; only **4** were original research papers on a component of the Triad and athletes with a disability

Search Results

	Energy availability (EA)*	Menstrual dysfunction (MD)+	Impaired bone health (BMD)≠
Spinal cord injury (SCI)	6 (3G, 3A)	4 (4G)	15 (13G, 2A)
Spina bifida (SB)	4 (4G)	0	4 (4G)
Central neurologic injury (CP/TBI)	5 (5G)	3 (3G)	11 (11G)
Amputee (AMP)	5 (5G)	0	2 (2G)
Short stature (achondroplasia) (SS)	3 (3G)	0	3 (3G)
Visual impairment/blind (VI)	6 (6G)	0	4 (4G)

Legend:
G=general population; A=athletes

Search Terms (sample):
*Low EA: energy expenditure, energy availability, disordered eating, eating disorder, dieting
+Menstrual dysfunction: amenorrhea, menstrual function, menstrual irregularity
≠Impaired bone health: osteopenia, osteoporosis, bone health, bone mineral density, stress fractures

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- **Amputees**
  - Increased energy expenditure due to gait asymmetry

Disability Impacts Energy Needs

Key examples

- Amputees have higher energy expenditure (Gonzales 1974)
  - Unilateral BKA - 25%
  - Bilateral BKA - 41%
  - Unilateral AKA - 60-70%
  - Bilateral AKA - >200%

- Athletes with SCI have lower energy expenditure during exercise (Price 2010)
  - 26-85% dependent on level of injury

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- **Others**
  - No available literature on menstrual dysfunction in cases of SCI, SB, AMP, SS, or VI – likely minimal differences

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  - Fractures most commonly involve the distal femur or proximal tibia (Frotzler 2015)

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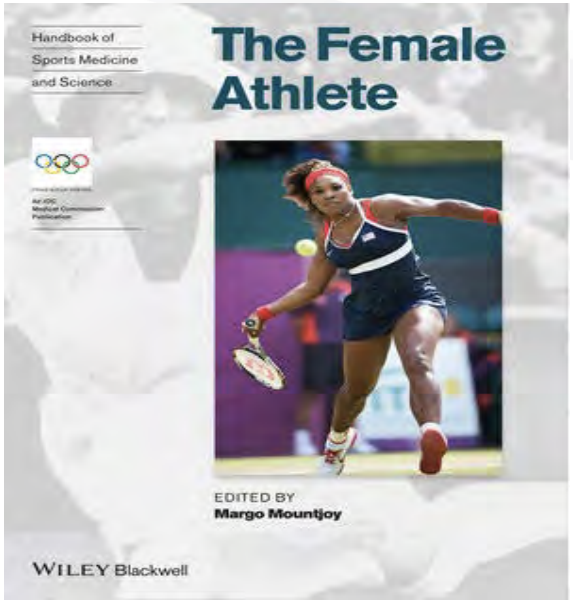
- **Others**
  - Affected athletes in high speed sports have much higher risk of injury due to reduced BMD

Disability Type	Energy Expenditure* #	Menstruation*	Bone Mineral Density*
Spinal Cord Injury	Reduced (wheelchair users) or increased (ambulatory – due to gait inefficiency)	Minimal variance beginning approximately 5 months post-injury	Severely reduced in lower extremities (paraplegia, wheelchair users) or both upper/lower extremities (tetraplegia, wheelchair users)
Spina Bifida	Reduced (wheelchair users) or increased (ambulatory – due to gait inefficiency)	Unknown	Reduced in lower extremities (wheelchair users)
Central Neurologic Injury	Reduced (wheelchair users) or increased (ambulatory – due to gait inefficiency)	Menstrual dysfunction may be present in severe injuries	Reduced (wheelchair users, those with poor nutritional status and/or higher GMFCS≠ score)
Amputee	Increased due to asymmetry of gait	Unknown	Reduced in limb affected by amputation
Short Stature	Minimal variance or increased (achondroplasia)	Unknown	No variance or reduced (achondroplasia)
Visual Impairment	Minimal variance	Unknown	No variance or reduced in sedentary individuals

Summary of Findings

- **Female athletes with a disability are at disproportionate risk for the Triad/RED-S dependent on sport and disability type**
- **Awareness is very low – a concerning problem**
- **Future research priorities should include:**
  - Assessment of the prevalence of the three Triad components in athletes with a disability
  - Assessment of knowledge of the Triad/RED-S in athletes with a disability
  - Characterization of energy needs in athletes with various disability types and various sport disciplines

Growing Collaborations



Growing Collaborations

Female Athlete Health Interactive Learning Module
https://www.olympicresources.com/Home/Welcome

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Obrigado!