

Introduction to Materials in sporting applications

Advances in equipment, **materials** and manufacturing techniques mean that sports that were seen as dangerous or 'extreme' until relatively recently are now becoming more main stream

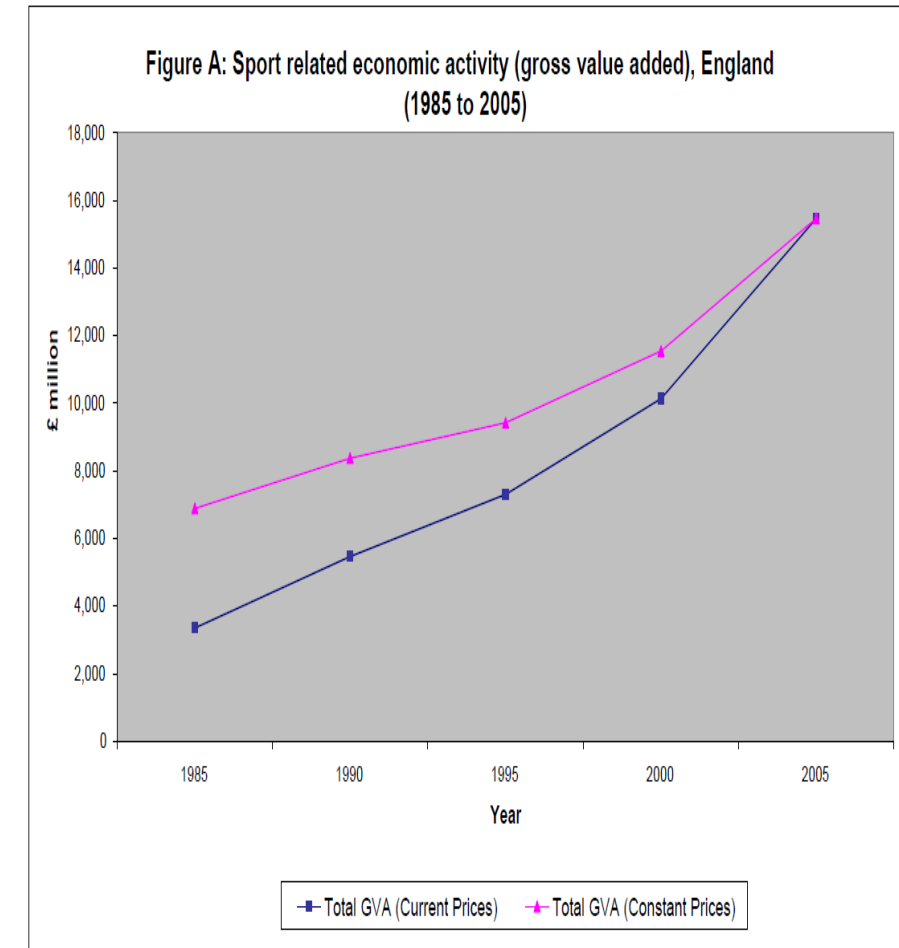
Industry growth

Sports industry

- >22 million people in the U.S. participate in 'extreme' sports (Active Marketing Group, 2007)
- 'action sports' generate one-third of sporting goods sales (Active Marketing Group, 2007)
- sport participants in the U.S. growing, despite the fact that participants in dominant sports such as basketball have decreased (Park, 2004).
- Sport in England: £3,358m (1985) to £10,373m (2000) to £15,471m (2005) (Sheffield Hallam University, 2007)

'Extreme Sports'

- ~4.2 m adults in UK engage in extreme sports (2006). Heavily biased to 15 to 19 year-olds (Manley, June 2007)



Growing Employer in SMEs of well engineered products

- Sport employment has grown by ~19% in 5 years to 434,000 (1.8% of employment in England in 2005)
(Sheffield Hallam University, 2007)
- Sport manufacturing has grown by ~24% in 4 years and employs 11,500 people in England (2008)
(Sport industry research centre, August 2010)
- 2005 the UK exported £7.6m of watersports equipment.
(Manley, June 2007)
- UK surf industry sales of £200 million pounds in 2007 (£62m due to manufacturing in Cornwall)
(The independent, 2004)
- Manufacturers can not compete commodity products - bias to well engineered products
(Manley, June 2007).
- Composite manufacturers in Wales exceeds the aerospace and the automotive industries
(Sienz, 2009).
- 430 producers of sports equipment in UK in 2006.
 - Average turnover of £544,000
 - 25 achieving £5m or more in annual sales
 - 260 had fewer than 5 employees, with many of these expected to be sole traders
(Manley, June 2007)

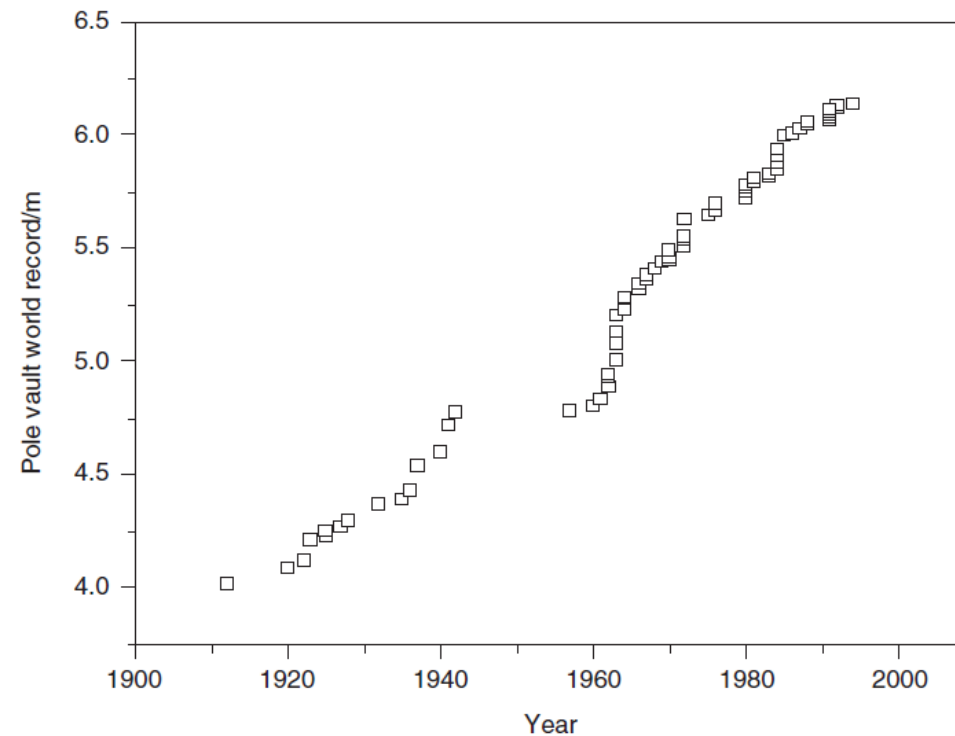
Improved performance over time

Factors determining sports performance

- Human Element
- Equipment used

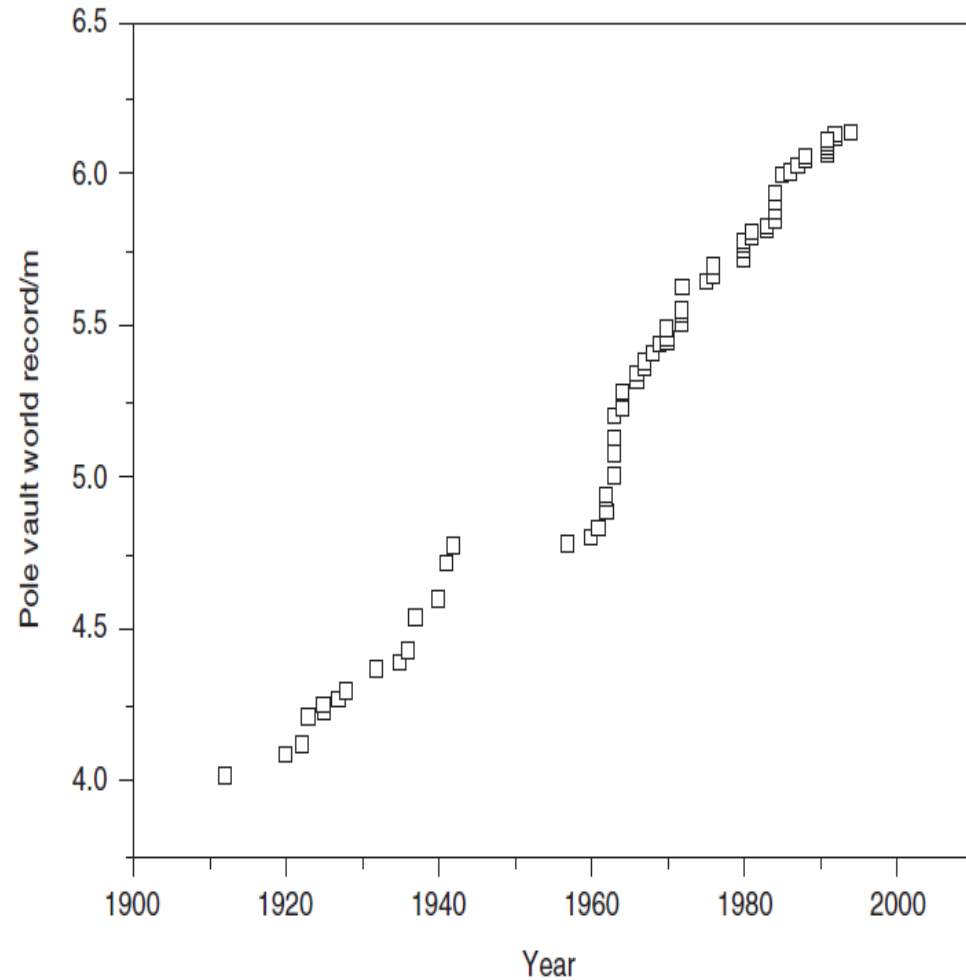
E.g. Polevolt

- Step change post war



1.2 Variation of pole vault world record with time.

Improved performance over time – The role of materials

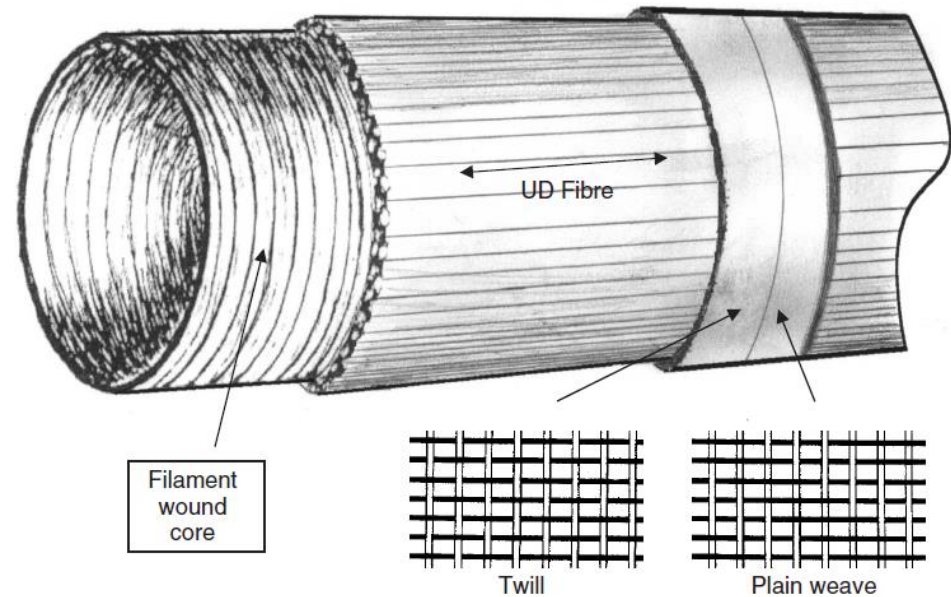


1.2 Variation of pole vault world record with time.

Pole construction

- Solid wood
- Bamboo
- Aluminium (1950s)
- GFRPs (1960s)
- GFRPs
 - High Strength
 - Intermediate stiffness
 - Low density
- High K.E. > High S.E. > High P.E.

Improved performance over time – The role of materials



Manufacturing, Design and Materials

- Filament winding
- Lay-up sequence
- Number of plies
- UD v 2D v 3D composites

Polevolt example: Notes adapted from/further reading

- Materials in sports equipment, Mike Jenkins, 2003

References

Active Marketing Group. (2007). *The Action Sports Market*. Retrieved December 23rd, 2013, from www.activemarketinggroup.com

Park, H. (2004). *Masters Thesis: Analyzing Motivational Factors of Action Sports Participants*. Retrieved December 23rd, 2013, from www.dissertations.wsu.edu/Thesis/Fall2004/h_park_122104.pdf

Sheffield Hallam University. (2007). *The economic importance of sport in England 1985-2005*. Retrieved December 23rd, 2013, from www.archive.sportengland.org

Manley, J. (June 2007). *Market Report 2007 Sports Equipment*. Retrieved December 23rd, 2013, from Sports Equipment Design Keynote 2007.pdf: www.designbusiness.wikispaces.com

Sport industry research centre. (August 2010). *Economic Value of Sport in England 1985-2008*. Retrieved from economic-value-of-sport-in-england-1-.pdf: www.sportengland.org

The independent. (2004, July 27th). *Catching the wave*. Retrieved December 23rd, 2013, from <http://www.independent.co.uk/news/uk/this-britain/catching-the-wave-6164803.html>

Sienz, H. (2009). *Composite in Wales*. Retrieved December 23rd, 2013, from P3 Composites in Wales 070709.pdf: www.welshcomposites.co.uk