

Short Communication

Recorded physiological periods in the oldest Chinese medicine classic-*Huangdi Neijing*

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The recorded physiological periods in *Huangdi Neijing* is re-built using allometric scaling laws. Physiological periods are multiples of 7 years for females while 8 years for males. The oldest findings can be used for modern health policy, education and labor agreement considering sexual difference.

Key words: Allometric scaling, ancient Chinese medicine, ancient Chinese mathematics

INTRODUCTION

Ancient Chinese people made contribution to mathematics (Fan, 2008; Lan, 2009; Zhang, 2008; Zhong, 2009; Zhao, 2008), astronomy (He 2006, 2008), and medicine (Zhang and Sun, 2008). *Huangdi Neijing* is an ancient Chinese medical text that has been treated as the fundamental doctrinal source for Chinese medicine for more than 2 millennia (Zhang and Sun, 2008). For a detailed introduction to the oldest classic, the readers are referred to Unschuld's monograph (Unschuld, 2003). According to *Huangdi Neijing* (Zhang and Sun, 2008), kidney becomes prosperous and hair and teeth begin to grow at the age of 7 for a female, while 8 for a male.

Tianguai (天癸) begins to appear for a female at the age of 14 when menses appear, so she can be pregnant. For a male, however, Tianguai appears at the age of 16 when spermatorrhea appears, so he can be a father. Generally Tianguai is exhausted at the age of 49 for a female when her menstruation stops and at the age of 64 for a male though there are few exceptions.

Tianguai (天癸) is a matter-like sex hormone to promote generation, to develop the second sexual symbols and to make growing and aging in body (Lee et al., 2000).

It is interesting to note that physiological periods are multiples of 7 years for females; while 8 years for males. In this short note, we will give an explanation of the record using the allometric law in biology (West et al., 1997, 1999; He and Huang, 2006).

ALLOMETRIC SCALING

Allometric laws in biology enable us to estimate

physiological periods for both a female and a male. Generally a biological variable Y is related allometrically to the body mass M by a power law (Kuikka, 2003, 2006; West et al., 1997, 1999; He and Huang, 2006):

$$Y \propto M^{3/4} \text{ or } Y \propto M^b \quad (1)$$

Where b is the so-called allometric exponent and Y can be, for example, a physiological period, such as heart beats, the time between respirations and longevity, which all scale as body weight to the 1/4 power or multiples of 1/4 powers.

Body mass or body size, which, fat or thin, depends strongly upon various conditions for human beings, is widely used in biological allometric scalings, however, it is not accurate to estimate physiological periods of human beings. Instead of body mass, height is expected to have wide implications for prediction of various physiological periods.

The scaling relationship between height and mass of human beings reads (Shiner, 2001)

$$H \propto M^{0.430} \text{ for females} \quad (2)$$

$$H \propto M^{0.431} \text{ for males} \quad (3)$$

We, therefore, have

$$\frac{Y_{female}}{Y_{male}} = \left(\frac{M_{female}}{M_{male}} \right)^{3/4} = \frac{H_{female}^{1.743}}{H_{male}^{1.740}} \quad (4)$$

Where Y_{female} is the physiological period for females, and

Y_{male} for males.

Assuming that the average height of females is 1.6 and 1.7 m for males, we predict that

$$\frac{Y_{female}}{Y_{male}} = \frac{1.6^{1.743}}{1.7^{1.740}} = 0.9 \approx \frac{7}{8} \quad (5)$$

This implies physiological periods for females and males are, respectively, 7 years and 8 years, or their multiples. According to Huangdi Neijing (Zhang and Sun, 2008), a female is fully developed at the age of 28, while 32 for a male, just as the prediction of Equation (5).

DISCUSSION AND CONCLUSION

Without advanced science and technology, the ancient Chinese people accomplished many glorious achievements in various fields. Some achievements have been or are being confirmed by modern science, such as some classic principles in mathematics, medicine and astronomy, while others are still marked with mystery, such as Qigong, Yijing and the magic 8 ancient divination symbol and need to be explored further for the answer from future scientific research.

In this paper, we give a modern explanation of the recorded physiological periods in Huangdi Neijing. The oldest findings can be used for modern health policy, education and labor agreement considering sexual difference. The oldest findings can also explain why female pupils in tens always learn faster than their male partners. For an employer, it is important to find a vigorous employee, 28 year-old female employee or 32 year-old male employee is the best choice.

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REFERENCES

- Fan J (2008). Application of He's frequency-amplitude formulation to the Duffing-harmonic oscillator, *Topol. Method. Nonl. An.*, 31: 389-394.
- He JH (2008). An elementary introduction to recently developed asymptotic methods and nanomechanics in textile engineering, *Int. J. Mod. Phys. B* 22: 3487-3578.
- He JH (2006). Some asymptotic methods for strongly nonlinear equations, *Int. J. Mod. Phys. B*, 20: 1141-1199.
- He JH, Huang ZD (2006). A novel model for allometric scaling laws for different organs, *Chaos Soliton. Fract.*, 27: 1108-1114
- Kuikka JT (2003). Scaling laws in physiology: Relationships between size, function, metabolism and life expectancy, *Int. J. Nonlin. Sci. Num.*, 4: 317-327.
- Kuikka JT (2006). Fractal analysis of organ structure, function and

- interactions, *Int. J. Nonlin. Sci. Num.*, 7: 239-243.
- Lan JC, Yang Z (2009). Continued Fraction Method for an Ancient Chinese Musical Equation, *Int. J. Nonlin. Sci. Num.*, 10: 167-169.
- Lee YB, Heo GH (2000). Study on Tianguai(天癸) Focusing on the Neijing(內經) commentators'views, *Korean Medical Database*, 13: 174-188
- Shiner J (2001). Body mass index: a measure for longevity, *Medical Hypotheses*, 57: 780- 783.
- Unschuld PU (2003). *Huang Di Nei Jing Su Wen: Nature, Knowledge and Imagery in an Ancient Chinese Medical Text*, Berkeley: University of California Press.
- West GB, Brown JH (1997). Enquist BJ, A general model for origin of allometric scaling laws in biology, *Science*, 276: 122-126.
- West GB, Brown JH (1999). Enquist BJ, The Fourth Dimension of Life: Fractal Geometry and Allometric Scaling of Organisms, *Science* 284: 1677-1679.
- Zhang DB, Sun LJ (2008). Annotated edition of *Huangdi neijing, Suwen* (in Chinese), New World Press, Beijing.
- Zhang HL (2008). Application of He's frequency-amplitude formulation to an $x(1/3)$ force Nonlinear oscillator, *Int. J. Nonlin. Sci. Num.*, 9: 297-300.
- Zhao L (2008). Chinese mathematics for nonlinear oscillators , *Topol. Method. Nonl. An.*, 31: 383-387.
- Zhong T (2009). Ancient Chinese Musical Scales: Best Approximations, but Why? *Int. J. Nonlin. Sci. Num.*, 10: 161-166.