

Longhurst Georga (Orcid ID: 0000-0001-7408-6829)

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Letter to the Editor

The importance of diverse and accurate descriptions of genital anatomy in textbooks

Rebecca Beni, Lauren Fisher, Georga J. Longhurst*

Department of Anatomical Sciences, St George's University of London, London, United Kingdom.

Running title: descriptions of genital anatomy in textbooks

*Correspondence to: Ms. Georga J. Longhurst, Department of Anatomical Sciences, University of London St George's, Cranmer Terrace Tooting, London SW17 0RE, United Kingdom. E-mail: glonghur@sgul.ac.uk

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To the Editor, *Anatomical Sciences Education*:

With great interest we read the manuscript titled 'New context, new content - Rethinking genital anatomy in textbooks' by Hayes and Temple-Smith (2022). The readers are taken on a journey through the history of genital descriptions and imagery in prominent anatomical textbooks throughout the 18th – 21st centuries. The authors stress the need for an accurate and diverse representation of genital anatomy within anatomical textbooks to ensure that medical students are prepared for clinical practice and refer to the importance of understanding genitals in relation transgender anatomy (Finn et al., 2021).

The historical descriptions and depictions of the clitoris were of particular interest. The authors describe how the portrayal of the clitoris shrinks from its "prominent" premier appearance as a black and white illustration in the first edition of *Gray's Anatomy* (Gray and Carter, 1858, p 1491) to a relatively smaller structure in the 13th edition (Pick, 1893, p 1047). It took almost 100 years before the depiction was updated to include a color illustration and color photographs (Standring, 2005, p 1355). This was 13 years after the first publication of 'living anatomy' photographs of genitals in *Clinically Orientated Anatomy* (Moore, 1992).

Even today there persists a lack of photographic images depicting the clitoris within anatomical textbooks. An analysis of 32 anatomical textbooks published between 2007 and 2021, (Monkhouse, 2007; Snell, 2007; Dudek and Louis, 2011; Sinnatamby, 2011; Smith and Turek, 2011; Moses et al., 2013; Patton and Thibodeau., 2013; Moore et al., 2014; Moore et al., 2015; Standring, 2015; Gosling et al., 2016; Rohen et al., 2016; Agur and Dalley, 2017; Detton et al., 2017; Loukas et al., 2017; Drake et al., 2018; Hall and Stephens, 2018; Hansen

et al., 2018; Paulsen and Waschke, 2018; Smith et al., 2018; Ellis and Mahadevan, 2019; Harrell and Dudek, 2019; Loukas et al., 2019; Netter, 2019; Soames et al., 2019; Waschke et al., 2019; Weber et al., 2019; Abrahams et al., 2020; Brennan et al., 2020; Drake et al., 2020, 2021; Spratt, 2021) performed by the authors (R.B. and G.L.), illustrated that only 14 (43.8%) published photographs of undissected clitorises in the lithotomy position (Dudek and Louis, 2011, p 170; Moses et al., 2013, p 486; Moore et al., 2014, p 428; Standring, 2015, p 1288; Rohen et al., 2016, p 361; Agur and Dalley, 2017, p 443; Drake et al., 2018, p 249; Smith et al., 2018, p 57; Harrell and Dudek, 2019, p 183; Loukas et al., 2019, p 262; Abrahams et al., 2020, p 289; Brennan et al., 2020 p 551–552; Drake et al., 2020, p 516–519; Drake et al., 2021, p 258–259) . Moreover, within these 14 textbooks, photographs of clitorises from only nine different women were used, as images were re-purposed across multiple textbooks. For example, the same photograph was re-proposed in *High-Yield Gross Anatomy* (Dudek and Louis, 2011, p 170), *Clinically Orientated Anatomy* (Moore et al., 2014, p 428), *Grant's Atlas of Anatomy* (Agur and Dalley, 2017, p 443) and *Lippincott® Illustrated Reviews: Anatomy* (Harrell and Dudek, 2019, p 183), while another photograph was shared in *Gray's Anatomy: The Anatomical Basis of Clinical Practice* (Standring, 2015, p 1288), *Gray's Basic Anatomy* (Drake et al., 2018, p 249) *Gray's Anatomy for Students* (Drake et al., 2020, p 518) and *Gray's Atlas of Anatomy* (Drake et al., 2021 p259). In fact, only one textbook, *Gray's Anatomy for Students* (Drake et al., 2020, p 516–519) published photographs of more than one clitoris. There was also an evident lack of diversity within the textbooks as only one, *Gray's Surgical Anatomy*, utilized a photograph of a woman of color (Brennan et al., 2020, p 551).

Alternative imagery of the clitoris within these textbooks included diagrams, medical illustrations and/or dissected cadaveric photographs. While these modalities do have the advantage of allowing internal structures to be visualized, only 12 (37.5%) included labels for all named components of the clitoris (glans, body, crura, bulb of the vestibule, frenulum and prepuce), often across multiple figures (Smith and Turek, 2011; Moore et al., 2014; Standring, 2015; Rohen et al., 2016; Agur and Dalley, 2017; Detton et al., 2017; Drake et al., 2018; Paulsen and Waschke, 2018; Netter, 2019; Brennan et al., 2020; Drake et al., 2020, 2021).

In terms of clitoral measurements, only two inconsistent numerical figures are provided for the combined length of the body and glans within the textbooks; 2.0 cm (Moore et al., 2014, p 430) or ranging from 3.0 – 4.0 cm (Waschke et al., 2019, p 386). However, when comparing these lengths to empirical data within the scientific literature it is evident that these figures are spurious. For example, this average length has been recorded as greater than 4.0 cm in a cadaveric (4.5 cm) (Kelling et al., 2020) and magnetic resonance imaging study (4.3 cm) (Vaccaro et al., 2014). Furthermore, two additional cadaveric studies report average measurements towards the higher end of the range provided in Sobotta Anatomy Textbook (Waschke et al., 2019), as 3.7 cm (Jackson et al., 2019) and 3.9 cm (Blayney et al., 2021), respectively.

Another clitoral measurement provided within the textbooks is the distance between the clitoris and external urethral meatus (n = 9). This measurement is documented as 2.5 cm (Sinnatamby, 2011, p 307; Standring, 2015, p 1289; Loukas et al., 2017, p 249; Paulsen and Waschke, 2018, p 386; Ellis and Mahadevan, 2019, p 120; Waschke et al., 2019, p 386;

Brennan et al., 2020 p 551), ranging from 2.0 cm – 2.5 cm (Brennan et al., 2020, p 524) or (2.0 cm – 3.0 cm (Smith and Turek, 2011, p 134; Moses et al., 2013, p 480; Moore et al., 2014, p 430). If comparing these figures to the scientific literature, the average distance remains consistent, however, it is important to note that multiple studies have reported normal ranges of greater than 3.0 cm (Llyod et al., 2005; Basaran et al., 2008; Cao et al., 2015; Kreklau et al., 2018; Ellibeş Kaya et al., 2020; Tappy et al., 2021; Agrawal et al., 2022), implying that textbooks do not represent variations adequately.

As part of the textbook analysis, we also aimed to investigate the unequal representation of the word 'clitoris' compared to 'penis' in anatomical textbooks (within the main text, figure legends and labels). We elucidated that the word "penis" was mentioned 2.6 times more than the word "clitoris" (3,507 and 1,182, respectively). Perhaps this is due to the penis' dual function in both micturition and reproduction (Chicharro and Parrilla, 2010). However, we stress that the clitoris should not be overlooked in medical education, for a number of reasons. Firstly, the historical narrative is that the clitoris' sole function is limited to sexual pleasure (Master and Johnson, 1966). This dogma has recently been challenged by Levin (2018, 2020) who demonstrated that when stimulated, the clitoris has an ulterior reproductive role in initiating physiological changes that coordinate with biochemical changes of semen and spermatozoa that are necessary for conception (see details in Levin, 2020). This refutes the traditional view that the clitoris is the 'seat of sexual pleasure' and has an important role in procreation (Laqueur, 1986; Bell, 2005).

Furthermore, lack of objective and clinical descriptions alongside images of genital structures opens the door for the distribution of distorted images by the pornographic

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industry and the mainstream media. In fact, multiple studies have demonstrated that understanding of genital anatomy within the general public is lacking. A study demonstrated that while 71% of females and 69% of males could accurately label the clitoris on a simple diagram of the vulva, this proportion decreased for other genital structures, including the urethra (42%), labia (53%) and vagina (47%) (Waldersee, 2019). These common misunderstandings have been mirrored in alternative studies (Reid et al., 2017; El-Hamamsy et al., 2021) and suggest that anatomy educators could help to educate the public on the normal variations of genital anatomy in the form of public outreach. Furthermore, the lack of documented variations within normal genitals, together with distorted images supplied by the pornographic industry and the mainstream media, has led some people to develop feelings of genital inadequacy. This has led to an increase in female genital cosmetic surgeries (Deans et al., 2011; Moran and Lee, 2014; Mowat et al., 2015). As such, the American College of Obstetricians and Gynecologists currently recommend that medics reassure patient's that size, shape and color of external genitalia vary considerably, prior to elective surgery (ACOG, 2020).

An extreme manifestation of this sense of female anatomy inadequacy is female genital mutilation (FGM). This is a deeply rooted practice, performed for complex sociocultural factors in some cultures, and has affected over 200 million people (El-Dirani et al., 2022; WHO, 2022). It involves the partial or total removal of external female genitalia for non-medical reasons. Often, the clitoris is the first organ to be removed, due to its protruding nature (WHO, 2022). Female genital mutilation can lead to immediate and long-term gynecologic and obstetric complications, such as infection, chronic pain, urinary tract infections, dyspareunia including loss of pleasure during sexual activity (Lurie et al., 2020;

WHO, 2022). A possible solution for these women is a clitoral reconstruction (Puppo, 2017), however, at present, this procedure is not recommended by the Royal College of Obstetricians and Gynecologists, due to lack of evidence of its benefits (Low-Beer and Creighton, 2015). However, recent studies have demonstrated possible sexual and physiological benefits to this procedure is performed sufficiently (Puppo, 2017; Wilson and Zaki, 2021).

While we understand it is impossible for textbook editors to consider all advances from scientific literature, it is evident that accurate measurements of the clitoris and its relations should be included in future editions. Moreover, a broader representation of genital diversity would improve the inclusivity of anatomical education to represent the wider population. In fact, the lack of accurate descriptions of normal genital variations in anatomical textbooks, commonly used by medical students can influence their expectations of the appearance of female external genitalia and this may impact patient care (Simonis et al., 2016).

In an era of where diversity is celebrated and an inclusive agenda is spreading throughout the education sector, we echo the call by Hayes and Temple-Smith (2022) and call for an updated and expanded representation of the clitoral structures within anatomy textbooks to increase awareness and knowledge amongst future medical professionals and the general public alike.

Rebecca Beni, (Medical Student)

Institute of Medical and Biomedical Education,

*St George's University of London,
London, United Kingdom.*

Lauren Fisher, B.Sc. (Hons)., Ph.D., F.H.E.A.

*Department of Anatomical Sciences,
St George's University of London,
London, United Kingdom.*

Georga J. Longhurst, B.Sc. (Hons)., M.Sc., P.G.Cert.H.B.E.,

S.P.Cert., F.H.E.A. *

*Department of Anatomical Sciences,
St George's University of London,
London, United Kingdom.*

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