

2016

The representation and production of visual gender bias in anatomy images and its effects on student attitudes

Rhiannon B. Parker
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**UNIVERSITY
OF WOLLONGONG
AUSTRALIA**

**The representation and production of visual gender bias in anatomy
images and its effects on student attitudes**

Rhiannon B. Parker

**This thesis is presented as part of the requirements for
the award of the Degree of Doctor of Philosophy**

**University of Wollongong
Faculty of Law, Humanities and the Arts**

September 2016

STATEMENT OF DECLARATION

I certify that this thesis has not been submitted for a degree to any other university or institution and, to the best of my knowledge and belief, contains no material previously published or written by any other person, except where due reference has been made.

Rhiannon B. Parker

9 September 2016

ABSTRACT

Background: Gender bias in medical discourse is persistent and influences the way medical professionals treat and diagnose patients, and thus has a meaningful impact on health. Medical education provides a pathway for improving the attitudes, beliefs and knowledge that future healthcare practitioners hold about gender. However, it also has the ability to contribute to the construction of gender bias. Research on the role that images, a critical part of medical education curricula, play in contributing to gender bias has been limited. Further, no research on images from medical education has adopted a framework that distinguishes between the sites of the image, its production and its audience. An account of these three sites provides a comprehensive understanding of not only what messages are portrayed in medical images but also of how these messages are constructed and perceived.

Aims: The purpose of this thesis was to examine the visual representations of gender in medical education through the medium of anatomical textbooks. The aims were threefold: a) to determine how gender bias is visually represented in anatomical textbooks; b) to investigate how the context of image creation influences the construction of gender bias in medical illustrations; and c) to determine what effects gender-biased images have on the implicit and explicit attitudes of anatomy students.

Methods: This research was comprised of three separate studies and employed a mixed methods approach in order to determine the representation, production and effects of gender bias in medical images. Study 1 included an extensive content analysis on the representation of gender in 6004 narrative and conceptual images from anatomical textbooks used in Australian Medical Schools. The study focused not just on gender ratios but also on other forms of gender bias that might be present. In Study 2, 83 illustrators from the Association of Medical Illustrators and the Medical Illustration Sourcebook participated in an online interview that gathered data in relation to the contextual factors that influence the construction of gender in medical images. Participants provided detailed information on their experiences with clients, reference materials, and their own work, with a particular focus on gender bias. The data were analysed using a mix of quantitative and thematic analysis. In Study 3, a randomised control trial was conducted with 457 students studying

anatomy at the University of Wollongong to assess the effect that gender-biased images from anatomical textbooks had on their implicit and explicit attitudes. In this study participants were randomly assigned to a treatment (gender-biased images) or control (non-gendered images) priming task before completing an Implicit Association Test and a questionnaire. The data was analysed using multiple regression.

Results: Study 1 found that females comprise only 36% of all images in anatomy textbooks, but 57% of all sex-specific images. Further, other forms of bias were found to exist in the visualisation of stereotypical gendered emotions, roles and settings; in the lack of ethnic, age and body type diversity; and in the almost complete adherence to a sex/gender binary. Study 2 indicated that multiple levels of proximal and distal context had an influence on how gender was represented in medical images, including the intrapersonal processes of the illustrator, the immediate physical and social context of the image and the broader institutional and societal contexts. A number of contextual themes were also identified in the data including the sexualisation of nudity, the use of gendered stereotypes, the impact of social networks, the limitations with diversity and pathology, the representation of average bodies and the tension between resource accuracy and accessibility. Lastly, Study 3 revealed that, compared with control images, gender-biased images significantly increased students' implicit gender bias (Cohen's $d = .33$) but had almost no impact on explicit attitudes.

Conclusions: This thesis provides evidence of the continued and complex gender bias present in images from anatomical textbooks. The research has revealed that the context of image production is multileveled and that there are a range of factors that influence the inclusion of gender bias in images. The finding that gender-biased images have an impact on the implicit attitudes of future healthcare providers is significant as this can contribute to perpetuation of gender bias in medical discourse and could have negative healthcare outcomes.

ACKNOWLEDGEMENTS

I would like to acknowledge and express my appreciation and gratitude to the people who assisted and inspired me during the undertaking of this thesis. I would first like to sincerely thank all the people who agreed to participate in my studies. First, thanks to the anatomy students from the University of Wollongong who took time out of their busy schedules to take part in my research. Second, thanks to all the medical illustrators who generously volunteered to share their experiences and perspectives with me. Without these participants this thesis would, of course, have been impossible to complete. My thanks and appreciation also go to my supervisors for their significant academic support: to Dr. Jon Cockburn, who generously offered personal insights and knowledge from his field of expertise; and to Dr. Theresa Larkin, whose tireless work and detailed comments allowed me to produce a thesis that is much stronger and on a larger scale than I had thought possible. I would like to offer this thesis in dedication to my partner, Philip Parker, who provided moral support and mentorship throughout this process. Finally, I would like to acknowledge the emotional support provided by my furry children. Their constant and joyful presence provided comfort when I needed it most.

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DEFINITION OF KEY TERMS

Attitudes. An attitude is as a relatively stable way of thinking or feeling about someone or something. In social psychology, attitudes are identified as existing at explicit and implicit levels.

Discourse. This thesis uses a Foucauldian definition of the term which states that discourse is the historically and culturally located way in which knowledge and truth are specified and which encompasses social rules, practices and power relations.

Explicit Attitudes. Explicit attitudes exist at the conscious level and require intentional effort to be activated.

Gender. Gender refers to the socially constructed difference between masculinity, femininity and other gender identities which encompasses the cultural and time specific characteristics, social roles, positions, behaviours, and practices that fit within these identities.

Gender Bias. For the purposes of this thesis, the term gender bias encompasses all forms of discrimination, prejudice and inequality based on someone's sex and/or gender.

Illustration. The term illustration has been used in this thesis to encompass all visual image design.

Implicit Attitudes. Implicit attitudes exist outside of conscious awareness and control and are activated automatically.

Representation. Representation is the process of re-presenting something that is recognised as referencing something else. Modes of representation can be linguistic or visual; they can depict the tangible, such as a person or object, or symbolise the intangible, such as an idea or belief.

Sex. In general, the term sex is used to refer to the biological difference between men, women and intersex individuals.

Social Constructionism. Social constructionism is the theory that all knowledge and meaning is a product of, and further shaped by, its social context. Social structures such as gender are understood as being constantly renegotiated due to historical and social processes.

PREFACE

This thesis is the result of a long engagement with scientific and medical imagery. As a graphic designer, schooled in visual analysis and deeply engaged in the discussion and production of visual communication, I realised that there was something missing from the disciplinary critique of anatomy images as they are presented to students of anatomy. I began to wonder if the images themselves were contributing to what I perceived to be a gender-bias in student understandings of sex, gender and the human body. Due to my interest in visual research I decided to undertake a project that would examine this issue by bringing together qualitative and quantitative approaches to produce a study that enabled readers to understand the disciplinary contributions of a mixed-methods, pluralistic approach to the image (Fuchs 2001). This thesis is the result.

Designers are trained in the impact and manipulation of visual images. Although my background is in design rather than medicine, I have held a long interest in scientific and medical imagery and I am fascinated by the histories of anatomical illustration. In particular, the detailed and morbidly beautiful illustrations from Andrea Versailles' *De Humani Corporis Fabrica* (1543) have been an obsession of mine. And yet, throughout history, illustrations of the human body have been predominantly of the male body. The female form in medical texts has largely been ignored or minimised. I began to wonder if this gendered approach to the body contributed to a social view that women are objects to be looked at rather than people who require healthcare as much as men.

When I began my exploration of this topic I had assumed that male and female representation in the 21st Century would be equal in anatomy texts. However, in the nascent stages of this research project, I encountered an article by Mendelsohn and colleagues (1994) which identified that gendered images within anatomy texts were unequally comprised of 21% female and 44% male bodies. I thus began the journey of examining if and how this and other types of gender bias existed, 20 years later, in anatomy texts, and to find out if these images had a direct impact on the way that students perceived gender. I began to realise a broader concern with the social body

and how society might understand gender inequity. This thesis contributes some tools by which we might begin to understand the ongoing inequalities in our society.

I believe that images are powerful tools which not only convey information, but which can also normalise social practice and attitudes. I also believe that, in order to overcome gender inequality and bias, we need equal and unbiased representation in all forms of social communication. The best way to examine the representation of gender in medical illustration was to adopt a quantitative approach that gave me the facts and figures, and compliment this with a qualitative touch that enabled an understanding of overt and subtle forms of bias. This mix-methods approach reflects the inherently multimodal and diverse nature of design and visual research. In this spirit, I extended my consideration of theory and research practice beyond the traditional purvey of the design discipline to include approaches from quantitative sociology, medicine and social psychology. This integration of multidisciplinary methods expanded and improved my critical investigation while also fostering the ultimate goal of visual research in examining how images contribute to the construction of the social world.

I would lastly like to note that thesis project began with what I now see as a very narrow examination of the way in which visualisations of women in medicine were biased. As my research progressed, it quickly became apparent that normative and stereotypical beliefs about gender, which are often harmful to healthcare outcomes, were not as straightforward as I had thought and often diverged or were made worse when they intersected with other marginalised and minority identities. The exclusion of the female body in medicine has been extreme and persistent, and physicians' dependence on restrictive stereotypes about women's health can lead to misdiagnoses and errors in treatment. Yet gender bias in medicine unfortunately encompasses much more than this. For example, men's health is significantly impacted by the social and medical promotion of normative masculine stereotypes. Indeed, evidence has been found that the media's visual portrayal of unhealthy behaviours in men, such as excessive smoking, drinking and violence, has a real world impact on health behaviour (Courtenay 2000a). Even more disturbingly, the almost complete and systematic dominance of the gender binary in medical discourse

has excluded and othered sex and gender variant people. Finally, the stereotyping and/or underrepresentation of ethnic, age, ability and body type diversity, especially when looked at in connection to gender, highlights that way in which systems of discrimination or disadvantage in mainstream medical discourse intersect. This thesis marks the beginning of my use of intersectional feminism within my practice as a design researcher. It is a journey of continual learning and difficulty. It is also one that will never be complete as the social privileges I experience mean that I have not lived, and thus cannot fully hope to understand, the realities of marginalised and minority peoples' lives.

1 INTRODUCTION

The issue of gender bias and sexism in the field of medicine became particularly prominent in the Australian media in 2015 (Lillebuen 2015a; Lillebuen 2015b; Medew et al. 2015; Singer 2015). The instigating situation was a report on a senior female surgeon advising young, female, surgical trainees to remain silent about sexual abuse in the workplace (Lillebuen 2015a). When interviewed, the surgeon claimed that sexism was so widespread and accepted in the field of surgery that making a complaint was far more damaging to an individual's career and reputation than it was personally beneficial (Lillebuen 2015b). The social interest in this story led a number of journalists to uncover a pervasive practice of sexism and gender discrimination within the medical industry (Matthews 2015; Medew et al. 2015; Scott & Matthews 2015; Singer 2015). These reports revealed to the public the existence of a culture of sexism in the field of surgery. However, these stories were just a small part of the larger discourse within medicine that preferences and promotes a number of, often less overt, gender biases (Baggio et al. 2013). The maintenance and promotion of normative and unequal ideas about gender within medical discourse are not necessarily as obvious as the gender discrimination faced by female surgeons, yet they can have a significant impact on healthcare outcomes. For this reason, all areas of medicine should be scrutinised in order to identify and address how gender bias is represented and promoted within the healthcare system. The current research aims to contribute to research on gender issues in medicine by focusing on how gender is visually framed within medical education resources.

Over the last four decades there has been a slow but growing interest within the field of medicine in the concept of gender and its implications for health (Klinge 2010). Gender is a significant factor to take into account within any field where cultural attitudes have the ability to impact outcomes. Within the field of medicine a diverse number of studies have demonstrated the numerous ways in which gender is a significant determinant of health that influences disease symptoms, treatment, diagnosis and prognosis (Doyal 2003; Klinge 2007; Lagro-Janssen 2007; Oertelt-Prigione & Regitz-Zagrosek 2012; Philips 2005; Regitz-Zagrosek 2012; Verdonk et al. 2009). However, despite the growing awareness of, and literature on, gender issues in healthcare, there remain significant areas in medicine where a number of

gender biases still occur (Baggio et al. 2013; Klinge 2010). Indeed, gender is often a neglected dimension within medical research and, consequently, within medical education and clinical practice. Medical research and literature on women and their intersecting marginalised and minority identities has been underdeveloped and has framed women as ‘other’ (Bekker 2003; Bredström 2006; Zimmerman 2000). Further, some of the attention that is already given to gender in research or healthcare reflects sexist and often damaging stereotypical preconceptions, such as female symptoms being perceived and misdiagnosed as psychological rather than somatic (Hamberg 2008; Munch 2004). These forms of gender bias have harmful consequences for the treatment, diagnosis and health outcomes of patients.

As authoritative discourses, science and medicine have a strong influence on how society views the gendered body. The content of these discourses, including their imagery, are presented as accurate and transparent representations of the natural world. However, all content produces are situated within a socio-cultural and political context that, often unconsciously, can influence and inculcate socially normative ideologies in their work (Kress & van Leeuwen 2006). Therefore, the work produced by illustrators, including those within the context of science and medicine, will to some degree be inscribed with meaning that reflects, and even actively constructs, cultural beliefs, values and attitudes (Frascara 2006; Shoemaker & Reese 1991). The power of visual communication to either maintain or impact change on cultural ideologies is seen through its ability to establish socially acceptable norms and facilitate the internalisation of these norms by individuals (Tyler 2006). This is particularly significant when considering the capacity of cultural constructs such as race, gender and class to impact marginalised or minority groups in either positive and negative ways.

One area of particular concern in medical discourse is the field of medical education “where gender bias has the potential to influence the culture and process of medical care” (Zimmerman 2000, p.121). The medical discipline in which images play a primary role, especially in the education of students, is the field of human anatomy. Illustrations, photos, diagrams and models are important tools in learning anatomical knowledge. Further, anatomical science can play a particularly significant role in the

social construction of bodies as it deals directly with bodily structures. As a part of the broader medical environment, anatomical education therefore has the capacity to play a role in reinforcing visual gender bias. Existing research has explored whether gender bias exists within anatomical textbook images by examining the lack of female representation and providing a quantitative breakdown of the female to male ratio within these texts (Giacomini et al. 1986; Lawrence & Bendixen 1992; Mendelsohn et al. 1994). The underrepresentation of women in textbooks is a significant issue; however, this research has ignored the numerous other ways in which gender bias can be visualised. Additionally, these studies were conducted over two decades ago and more contemporary and relevant research is needed.

This thesis not only provides an update on previous research by examining the ratio of female and male representation in contemporary anatomical textbooks but it also provides a more comprehensive exploration of how medical images may represent other forms of gender bias. In addition, this research investigates how the production of medical images influences the inclusion of gender bias and assesses the effect that biased imagery has on students' attitudes. Advancing previous research, this thesis employs a mixed methods approach that involves three separate but related studies: 1) a visual content analysis of images from anatomical textbooks to identify if and how gender bias is portrayed; 2) a computer-assisted self-interview with medical illustrators which explores how the contexts in which medical images are produced influences the visual construction of gender bias; and 3) an experimental, randomised control trial design which uses the Implicit Association Test (IAT) and a questionnaire to examine the effect of gender-biased images on the implicit and explicit gender attitudes of students studying anatomy. This research also explores the broader discourse of the medical institution, particularly the hegemonic ideologies that exist about the gendered body, through a review of the literature. This review provides an understanding of the historical and contemporary context of gender bias in medical discourse and the consequences this has for healthcare outcomes.

1.1 Thesis Overview

This thesis has been designed around three major studies. Taken together, the design of this thesis is consistent with a sandwich thesis approach, common in the United

States, in which a set of to be published papers are bookended by a global theoretical and literature review and a discussion chapter. The three studies in this thesis were designed to be independent and can be read alone. However, they also fit within the larger framework of the thesis as a whole. Several themes are discussed in both the global and individual study literature reviews in order to facilitate the studies' dual purpose as both independent papers and part of a larger integrated thesis, although attempts have nevertheless been made to keep repetition to a minimum. Overall, this thesis is comprised of eight chapters. Chapters 2, 3 and 4 provide a theoretical, literary and methodological framework, respectively, for the research presented in the subsequent chapters. Chapters 5, 6 and 7 present each study. The final chapter provides a discussion of the research when taken together.

Chapter 2 discusses the theoretical insights that frame the research in this thesis. The theory of social constructionism is outlined and identified as the overarching framework. Foucault's theoretical perspectives on discourse, knowledge and power are explored and integrated with relevant concerns from feminist theory. Lastly, feminist theory on gender and intersectionality is presented.

Chapter 3 reviews literature related to gender bias within medical discourse. The historical and social context of gendered representations in medicine is examined in order to trace the emergence and broader context of gender bias in contemporary healthcare. An examination of the way in which gender bias occurs in medical discourse and of the consequences this has for health establishes the significance of the gender ideologies that are dominant in medicine. Finally, the way in which visual culture contributes to the construction of gender bias in medicine is discussed.

Chapter 4 introduces the aims and three-part methodological approach of this thesis. The research is comprised of three separate but related studies: the visual content analysis of contemporary anatomical textbooks; a computer-assisted self-interview with medical illustrators; and a randomised control trial that examines the influence of gender-biased images on the implicit and explicit attitudes of medical students. The literature surrounding these approaches, as well as an explanation and justification of their relevance to this thesis, are given.

Chapter 5 covers all aspects of the first study on the visual analysis of gender representations in contemporary anatomical textbooks used at Australian Medical Schools. This chapter provides a focused literature review on how gender is portrayed in medicine and an examination of the primary stereotypes that contribute to a normative gendered body. The methodological approach of visual content analysis is outlined and the results of the study are presented and discussed.

Chapter 6 presents the second study which examines the context of medical image production via the perspectives of medical illustrators. Literature is reviewed on how the context in which medical imagery is constructed contributes to the way in which gender is represented. A theoretical model for these contextual influences is outlined. The methodological approach of data collection via a computer-assisted self-interview and the procedures of quantitative and thematic analysis are explained. The results of the analyses are reported and discussed.

Chapter 7 outlines the third study in which the impact of gender-biased imagery on the attitudes of medical students is examined. A focused review of the literature is provided which addresses the significance of explicit and implicit attitudes. The research design is explained including the use of a priming task, the Implicit Association Test and a questionnaire to examine the effect of visual bias on the attitudes of university-level students of anatomy. The procedures for analysis are explained and the results are given and then discussed.

Finally, Chapter 8 provides an overall discussion of the studies presented in this thesis. These empirical findings are reviewed in light of their interconnectedness and used as a basis from which to identify implications for theory, research, methodology and practice. Avenues for future research are discussed.

2 THEORETICAL FRAMEWORK

Chapter Abstract

An investigation of the visual representation of the gendered body and the social meanings that are attributed to it requires an overarching theoretical framework. In the following chapter, the theoretical approaches that have guided this research are outlined and investigated in detail. A social constructionist approach is set out in order to provide a context for a Foucauldian explanation of discourse, knowledge, power and discipline, as well as a feminist examination of the constructs of gender, sex and identity. The discursive approach to constructionism, exemplified by the writings of Michel Foucault, allows various meanings and values to be understood in the broader context of their social practice and institutional regulation and provides an understanding of the relationship between power and knowledge in contemporary society. The shortcomings and limitations of these theories are addressed from a feminist perspective and alternate approaches are identified.

2.1 Introduction

This thesis integrates a social constructionist approach with Foucauldian and feminist perspectives in order to explore the representation and construction of the gendered body in a medical context. Of particular interest is the visual representation of gender within medical education content. Drawing on Michel Foucault's (1972; 1975; 1976) development of social theories on discourse, knowledge, power and discipline, authoritative discourses are identified as having the power to maintain and contribute to the social construction of normative gender prescriptions. Feminist theories are used to further define the concept of gender and explore how intersecting identities can have a significant impact on the gendered experience. Taken together, these theories are used in this research to frame an examination of how visual representations of the gendered body within medicine act to construct and reflect socially normative ideas about the gendered body.

2.2 Representation

This thesis is primarily concerned with visual representation. Representation is the process of re-presenting something that is recognised as referencing something else (Buchanan 2010). Modes of representation can be linguistic or visual; they can depict the tangible, such as a person or object, or symbolise the intangible, such as an idea or belief (Hall 1997). This is particularly important when investigating not only how the body is physically represented but also what cultural ideas about constructs such as gender and identity are visually ascribed to the body. Dominant representations reflect and help to define social values, meanings and beliefs (Hall 1997). Further, these representations do not necessarily demonstrate reality, but they nevertheless contribute to social understandings of reality (Sturken & Cartwright 2001). In this way, the practice of representation contributes to the production of not only meaning but also culture (Hall 1997). As dominant representations of marginalised and minority groups are often associated with negative social consequences, an examination of the functions and effects of representation is an essential part of social justice work (Foucault 1980a). In recent decades, numerous studies have investigated the ways in which visual representations of gender have maintained and contributed to definitions of femininity and masculinity (see for example Berger

1972, Dyer 1988, Goffman 1979 and Mulvey 1975). As an early example, Erving Goffman's (1979) well-known book *Gender Advertisements* provided a thorough analysis of gender constructions in the media that uncovered a cultural pattern of stereotypical femininity (for example, women being predominantly represented in subordinate roles) and masculinity (for example, men being predominantly represented in dominant roles). The current research similarly explores representation from a social constructionist approach where the role of representation in society is understood as reflecting, maintaining and also constructing social meaning. Specifically, it examines how visual representations in medical textbooks construct intangible social ideas and beliefs about gender, how the context in which these representations are created influences this and how these visual ideas and beliefs have an impact on the attitudes of audiences.

2.3 Social Constructionism

In basic terms, social constructionism is the theory that all knowledge and meaning is a product of, and further shaped by, its social context (Berger & Luckman 1966). It is a key framework that is used to explain how concepts such as gender (Lorber & Farrell 1991), motherhood (Badinter 1981) and medicine (Treacher & Wright 1982) are social structures that result from historical and social processes (Hacking 1999). Such social structures are never stable or fixed as they are constantly being renegotiated within their changing historical and cultural contexts (Hall 1997). For instance, contemporary gender conceptualisations of colour assign pink as feminine and blue as masculine. However, these assignments were completely reversed over a century ago, thereby revealing one such instability in the construction of feminine and masculine structures (Frassanito & Pettorini 2008). A social constructionist approach has been employed in this thesis to guide an investigation of how both the physical and the social body is shaped by structural and cultural conditions. In the social sciences, social constructionism is used and understood in a number of ways and has been influenced by a diverse range of theories and theorists (Elder-Vass 2012). The two main approaches to constructionism are the *semiotic* approach (influenced by work of the Swiss linguist, Ferdinand de Saussure [1959]) and the *discursive* approach (as identified in the work of philosopher and social theorist, Michel Foucault [1972]). Unlike the theory of semiotics that examines representation

as a collectively agreed signifying practice within a closed system, a discursive approach sees representation as an open system that is closely linked to social practices and issues of power that act to produce social meaning (Hall 1997). For this reason, the constructionist theories used in the current research take a discursive approach that is based on the work and insights of Foucault. Foucault's account of knowledge and discourse (1972), and his theory on power and discipline, including the concepts of surveillance and normalisation (1975), are used to provide a framework for understanding how images contribute to the construction of the body. A feminist approach to social constructionism is also important as it allows the current research to examine the way that medical discourse represents and constructs gendered bodies. At its very foundation, feminist criticism has aimed to deconstruct and challenge socially constructed knowledge that marginalises and subjugates women. Through the use of Foucauldian concepts of disciplinary power and subjection, feminist scholars have been able to investigate how social identities are created and changed over time and how the hegemony of prevailing social groups is produced and challenged (Fraser 1992). Despite this, some tensions exist between feminist and Foucauldian theory. This issue will be considered before Foucault's relevant theories are outlined.

Before proceeding further into the chapter, the theoretical constructs of key terms used in this discussion are explained below.

2.4 Definition of Key Theoretical Concepts

2.4.1 Ideology, hegemony & discourse

An important social justice task within the social sciences is to provide an account for and of the unequal hierarchical systems of social power that exist in society. The theoretical concepts of ideology, hegemony and discourse have been helpful in providing an explanation for “the intersections between the social production of knowledge and the perpetuation of inequitable power relations” (Stoddart 2007, p.192). Likewise, these concepts are useful for providing a theoretical link between the unequal gender systems in our society broadly, and in the medical context specifically, including the visual production and dissemination of knowledge in

medical textbooks. The use of the terms 'ideology', 'hegemony' and 'discourse' are common in the humanities and social sciences, but they are rarely defined. Indeed, the complexity of these terms means that their use is often either imprecise and therefore unclear, or precise but varied in definition. The following section provides an explanation for how these terms will be used in this thesis.

Ideology. Ideology is a particularly difficult concept to define as it can be used in multiple ways, some of which contradict each other (Eagleton 2007). For example, ideology can have a narrow and negative definition or it can be understood in a broader and more neutral way. The current research draws on Michael Freeden's (2005, p.438) definition of ideology as:

... a set of ideas, beliefs, and attitudes, consciously or unconsciously held, which reflects or shapes understandings or misconceptions of the social and political world. It serves to recommend, justify or endorse collective action aimed at preserving or changing political practices and institutions.

From this perspective, many values could be labelled as ideological and this definition does not necessarily identify ideology as pejorative. However, by identifying which ideologies are dominant, Freeden's (2005) definition helps to reveal how social power works within society by integrating individuals into oppressive systems. When ideology is examined within the process of hegemony, we can see how the naturalisation and consequent internalisation of these dominant ideologies works to secure power for certain social groups (Lull 2011).

Hegemony. Hegemony is the process through which one social group dominates or claims power over others (Connell 2005). The concept of hegemony used in this research is similar to Antonio Gramsci's (1971) theory of cultural hegemony, where power relations are represented as natural and rational in a way that society not only accepts but also does not question. Hegemony is hence understood as an ideological position that is arrived at by stealth and therefore taken for granted by the masses (Stoddart 2007). Specifically, the process of hegemony acts to normalise and naturalise existing ideologies and therefore reinforce power structures (Fiske 1990).

For example, the dominant ideologies of masculinity and femininity are viewed as natural and innate in our society and are therefore used successfully to justify inequalities. Gramsci's (1971) discussion of hegemony concentrated on the top-down hegemonic influence of the state on social relations. From this viewpoint, institutional systems (such as education, religion and media) are identified as playing a role in subtly influencing and inducting people into ways of thinking that reinforce hegemonic power relations (Gramsci 1996). Foucault built on Gramsci's concept of hegemony by focusing on how this power occurs within the individual (Lash 2007). Foucault (1975) argued that the success of hegemony lay in the way that ideologies of power relations are internalised by individuals (discussed in greater detail below). Further, he identified hegemonic power as operating through discourse (Foucault 1972). Elements of a Gramscian theory of hegemony have also been recognised as useful within feminist research (Connell 2005; Lather 1984; Maroney 1988; Pringle 2005). For example, Raewyn Connell (2005) identified how hegemonic masculinity promotes the dominant position of men within the social gender hierarchy and the way in which social practices consistently represent this as natural.

Discourse. In *The Archaeology of Knowledge* (1972), Foucault went to great lengths to theorise a concept of discourse. In the most general and basic terms, Foucault (1972, p.193; p.117) defined discourse as “a certain ‘way of speaking’” or “a group of statements in so far as they belong to the same discursive formation”. More specifically, his theorisation identified discourse “as historically variable ways of specifying knowledge and truth, which function as sets of rules, and the exercise of these rules and discourses in programs that specify what is or is not the case” (Powell 2013, p.47). Discourse is usually employed as a linguistics concept that refers to written or spoken communication (Mchoul & Grace 1993). However, a Foucauldian conception of the term views it as inclusive of both language and social and ideological practice (Fairclough 1992). These practices encompass all forms of communication, including visual modes of representation such as illustrations, photographs and films (van Dijk 1995). Gunter Kress (1985, p.6) has argued that discourses “define, describe and delimit what it is possible to say and not possible to say (and by extension – what it is possible to do and not possible to do)”. In this way, discourse plays a powerful role in constructing social reality (Milliken 1999). This

process includes the regulation and establishment of meaning and knowledge as truth and the reproduction of social power relations (Baxter 2003). When a discourse becomes a dominant part of society it acts to reproduce “collectively held subconscious ideas about what constitutes normal and natural reality” (Galtung 1996, p.211). Dominant discourse can consequently work to exclude or silence alternative truths and discourses (Milliken 1999). Mark Stoddart (2007, p.193) has pointed out, “where discourse is mobilised to reinforce systems of social power it functions as ideology”. Deborah Lupton (1994, p.29) has similarly stated, “because discourses attempt to persuade audiences to accept a particular version of reality they are ideological”. Discourse is therefore a valuable concept for exploring how truth and meaning are constructed and linked to cultural values and experiences, acting to help constitute the way individuals think and behave. Further, the theory of discourse is useful for understanding the way in which alternative discourses that resist normative constructions of gender are repressed but can also be promoted.

2.5 Foucauldian Theory

2.5.1 A note on tensions between Foucault and feminism

Concepts surrounding the female body could be seen to exemplify Foucault’s arguments about discipline and the body, yet his discussion of women and gender-specific disciplinary practices is limited (McLaren 2002). It was not until his later work in the *History of Sexuality* that Foucault (1976, p.104) identified the female body as subject to objectification and control within medical and psychological discourses via tools such as pathologisation and ‘hysterization’. Undoubtedly Foucault’s work is significant and highly regarded. However, he does not engage directly with feminist theory or critically respond to the problematic construction of female bodies. Instead, as Sandra Bartky (1990) has argued, Foucault offers a historical description that ignores how power relations reduce women to passive, powerless bodies. Foucault’s theories (particularly in his early work) positioned the human subject (our sense of self and our position in society) as being constructed by and subjected to power. Judith Butler (1990, p.2) has asserted, “subjects regulated by such structures are, by virtue of being subjected to them, formed, defined, and reproduced in accordance with the requirements of those structures”. Foucault’s

propensity to construct the human subject as docile in his exposition of power is seen as particularly problematic for the feminist objective of improving women's agency and autonomy.

Despite these tensions, many feminist theorists have identified the significance of Foucault's work on disciplinary power as an important tool for critically examining practices of normative femininity and subjection. Indeed, Foucault's writings on power and discourse have been immensely important for feminist theorists such as Sandra Bartky (1990), Judith Butler (1990), Jana Sawicki (1991), Elizabeth Grosz (1994), Susan Bordo (1999), Margret McLaren (2002) and Cressida Heyes (2007). Further, Foucault's positioning of the body as a cultural construct has provided the framework for "an analysis in which the very processes by which bodies are made become apparent" (Price & Shildrick 1999, p.218). Incorporating Foucauldian and feminist theories allows for an understanding of gender both within and outside of historically patriarchal constructions and reveals how the body becomes a site on which culturally constructed gender norms are inscribed (McLaren 2002). This approach also helps to position the current research as an attempt to reveal, and in this way challenge, the dominant discourses that endorse normative perceptions surrounding gendered bodies within medical education. The following section delineates Foucauldian theory while also addressing key feminist issues.

2.5.2 Discourse, knowledge & power

Foucault's understanding of discourse and knowledge are inextricably linked with concepts of power. Foucault (1976, p.93) demonstrated that power exists in the claims to truth exercised within dominant discourse, asserting, "we cannot exercise power except through the production of truths". By producing and then deploying "expert knowledge", discourse is able to exercise this power (Kent 2012, p.130). Further, Foucault (1975, p.27) showed how power and knowledge presuppose each other: "There is no power relation without the correlative constitution of a field of knowledge, nor any knowledge that does not presuppose and constitute at the same time, power relations". In other words, knowledge is not only a tool of power that enables possibilities of control, it also, in turn, offers opportunities to further generate more power.

If discourse constructs truth and is therefore the arbiter of power, then all aspects of its representation, including language, symbols and imagery, are important arenas for investigation. Acting within discourse, images and visual experiences are socially constructed but they are also part of the process for constructing the social and are therefore recognisable as “as a place for examining the social mechanisms of differentiation” (Dikovitskaya 2012, p.76; Mitchell 2002; Rose 2007). Consequently, this research focuses on anatomical illustrations as they are a form of authoritative knowledge that exist within the dominant discourse of medicine and therefore act to construct reality and define power in a way that could marginalise women and minority groups.

Foucault’s (1972) earlier work on the theoretical construction of discourse was significant. However, his analysis viewed historical power/knowledge regimes as though they were isolated, static and disconnected from other social phenomena. It was not until his later work in *Discipline and Punish* and *The History of Sexuality, Vol. 1* that Foucault (1975; 1976) adopted the method of genealogy. This allowed him to explore the ways in which discourses, practices and institutions are interconnected and evolve over time. Genealogy is a social constructionist method of historical analysis that Foucault used to examine the emergence of new practices, forms of knowledge, discourses and power relations in modern society and their impact on the formation of its culture. It is a type of critical analysis that questions currently accepted philosophical, ideological and social beliefs by tracing their historical and social construction in order to understand the conditions of their existence. Analysis using Foucault’s technique of genealogy sees history, not as linear, but as irregular and full of plural and inconsistent discourses and ‘truths’. Judith Butler (1993, p.282) succinctly describes genealogy as “a specifically philosophical exercise in exposing and tracing the installation and operation of false universals”. What is therefore significant about Foucault’s genealogy is that it recognises the political and polemical interests involved in the writing of history and negates its authority as absolute truth. The multifarious and uncertain nature of discourse and its ‘truth’ is highlighted by Foucault’s (1980a, p.131) claim that:

Each society has its régime of truth, its ‘general politics’ of truth; that is, the types of discourse which it accepts and makes function as true; the mechanisms and instances which enable one to distinguish true and false statements, the means by which each is sanctioned; the techniques and procedures accorded value in the acquisition of truth; the status of those who are charged with saying what counts as true.

Foucault’s identification that there is no single, infallible truth, but rather many ‘truths’ located in various discourses may seem to contradict the feminist agenda. If the goal of feminist theory is to reform patriarchal society, then how can this be achieved unless ‘real’ knowledge and truth can be used to empirically adjudicate and challenge claims of female inferiority? Foucault’s theories disrupt the idea that objective truth claims can be made, instead locating ‘truth’ within powerful discourses that exclude or silence alternative views. Jane Flax (1992) has argued that the aim of feminism cannot, therefore, be to produce or construct a moral authority, but to disrupt existing knowledges. Additionally, there will always be plural and competing discourses constituting power relations within any given context and hence it should not be assumed that only one discourse is responsible for determining constructs such as gender. Resistant or oppositional discourses also exist that challenge stereotypical assumptions and endorse ideas such as gender diversity. Feminist efforts need to strategically resist the ‘truths’ of hegemonic discourse by analysing and bringing attention to their problems, but they also need to support and publicise the subjugated discourses that benefit marginalised and minority groups.

The belief that institutional truth can be infallible and plural is particularly important when considering the powerful and influential discourses of contemporary science and medicine that are extolled in our society for their universal and empirical contribution to knowledge. An essential and generally accepted characteristic of these discourses is that they maintain an image of objectivity and are value neutral. Darin Weinberg (2009, p.287) has pointed out that because “scientific knowledge is the archetypal empirical example of valid knowledge in Western societies ... It therefore provides the indispensable critical case for social constructionists who would hope to move beyond the sociology of error”. Indeed, social constructionist

theory posits that certain ideas and values, such as those associated with gender, sexuality or race, are often imposed on the construction of a discourse's culture and emerging knowledges (Pauwels 2005). For example, Bonnie Spanier (1991, p.330) has asserted that scientists "bring with them their socio-political beliefs about what is natural". She provided the example of the way in which belief in male superiority influenced gendered definitions in biology such as labelling the largest bees as King bees and minimising the role that female lions play in hunting (Spanier 1991). Mira Hird and Jenz Germon (2001, p.172) have argued that the ideological belief in heterosexuality as the natural standard has resulted in a "medical obsession with constructing pseudo-male and female bodies from intersexed bodies". Donna Haraway (1988, p.576) has contended that social constructionist perspectives therefore help to identify the fact "that official ideologies about objectivity and scientific method are particularly bad guides to how scientific knowledge is actually made". Research in contemporary science and medicine may strive to rigorously remove subjective influences but it is important to remain aware of the fact that such discourse is unable to entirely escape the forces of its cultural context. A clear example of this in anatomical textbooks is the use of narrative images (e.g. an individual participating in sport) to provide visual interest for students. Such images have no scientific constraints in terms of how best to display the body. Rather, they are subjective and can be indicative of the dominant social context in which the medical institution is embedded.

2.5.3 The body and power

One of Foucault's most significant and influential genealogies is his analysis of the changing nature and function of power and its relation to the body in modern society. Foucault (1976; 1975, p.82) traced the transformation of power from sovereign, that is, embodied in the king, associated with hierarchy and maintained through public displays of violence, to disciplinary, that is, hidden, subtle and ubiquitous forms of control that seek "to insert the power to punish more deeply into the social body". Monarchs in the pre-modern era used public torture and execution to physically inscribe and force their power on the body (Foucault 1975). Foucault (1975, p.34) explains that in this context, mechanisms of power such as torture were used to:

... mark the victim: it is intended, either by the scar it leaves on the body, or by the spectacle that accompanies it, to brand the victim with infamy; even if its function is to 'purge' the crime, torture does not reconcile; it traces around or, rather, on the very body of the condemned man signs that must not be effaced.

This public and physically inscribed form of power changed during the 17th century with the growth in populations and the subsequent rise of new scientific discourses, including the social sciences and modern medicine, that tended to "the administration of bodies and the calculated management of life" (Foucault 1976, p.140).

Foucault's (1975; 1976) analysis of modern power illustrates how knowledge produced within new scientific discourses worked to manage society and social bodies, both efficiently and without force, as a 'disciplinary power'. The increasing focus of modern nations and states on the care and management of their growing populations promoted "an explosion of numerous and diverse techniques for achieving the subjugations of bodies and the control of populations" (Foucault 1976, p.140). Unlike pre-modern techniques such as torture, the disciplinary practices of modern society were able to forgo explicit forms of repression and restraint since social control was now achievable through subtler methods. These new, subtle methods included social surveillance and personal examination, which increased the visibility of the individual through the observation and documentation of their everyday lives (Foucault 1975). Further, these methods contributed to processes of 'normalisation' whereby society began to judge the individual in comparison to a general standard of normalcy.

The effect of surveillance as a method of disciplinary power are epitomised in Foucault's (1975) discussion of the Panopticon. The Panopticon was a prison system designed by the philosopher and social theorist Jeremy Bentham (1748-1832) in the late 18th century (Figure 1). This system was designed so that a limited number of guards could observe inmates and monitor their activities from a hidden position within a central watchtower. As prisoners could not be certain they were being watched, the effect was to "induce in the inmate a state of conscious and permanent visibility that assures the automatic functioning of power" (Foucault 1975, p.201).

The consequence of this internalised, panoptic gaze was that prisoners would embody disciplinary power by policing their own behaviour. Rather than forcefully prohibiting or constraining, disciplinary power worked through the individual who actively and ‘voluntarily’ subjected themselves to self-surveillance and self-regulation. Foucault’s conception of the Panopticon “makes it clear that, just like the prisoners who assume they are under surveillance, and act accordingly, the subjects of modern society take over the role of policing themselves” (Chanter 2006, p.57).

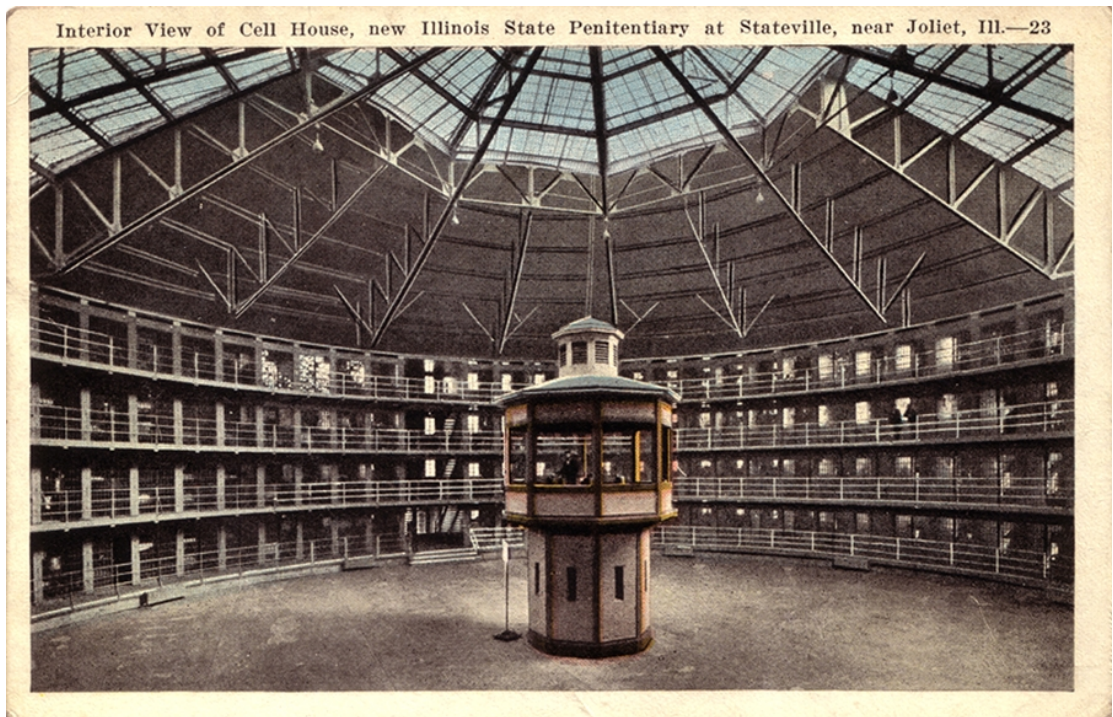


Figure 1. The Panopticon structure of the Illinois State Penitentiary (Foucault 1975, p.173).

From a feminist perspective, Foucault’s description of disciplinary power can be understood as a gendered practice. Sandra Bartky (1990) identified some of the ways in which practices of disciplinary power establish a normative femininity that constructs female bodies as docile. She used the panoptical concept of surveillance to explain how women have internalised disciplinary practices of femininity, such as dieting or using cosmetics, and police themselves accordingly (Bartky 1997). Bartky (1997, p.101) claimed that “a panoptical male connoisseur resides within the consciousness of most women: they stand perpetually before his gaze and under his

judgement”. Bartky (1997) also identified this kind of power as a subtle but pervasive, rather than hierarchical, form of repressive power. Susan Bordo (1988) similarly argued that eating disorders reveal the way in which disciplinary power can construct women to voluntarily attempt to attain, in one of the most extreme ways possible, a female body that is ideal according to normative views.

Foucault’s notion of the panoptic gaze emphasises the role that observation, judgement, normalisation and examination play in the management of social life. By surveying and collating knowledge about the everyday lives of individuals, and by categorising identities and behaviours, modern science gained the power to shape normative ideas about the body (Foucault 1976). Society has increasingly depended on “giving things meaning by assigning them to different positions within a classificatory system” (Hall 1997, p.235). A preoccupation with classification and other modern mechanisms of knowledge placed increasing importance on the construction of ‘fixed’ identities that could be easily classified into binary oppositions. For example, the binaries of male/female, Black/White or heterosexual/homosexual are often viewed within society as fixed but opposite identities, which cannot be transgressed without consequence. The preoccupation with hegemonic systems of identity classification can be seen particularly well within the dominant representation of the gender binary which restricts individuals and erases alternate genders. The field of anatomy also displays a binary opposition categorisation in the pairing of normal and pathological bodies (Wall 2009). As Stuart Hall (1997, p.236) has argued, society’s growing dependence on these binaries means that they have also become increasingly necessary for cultural stability:

Stable cultures require things to stay in their appointed place. Symbolic boundaries keep the categories ‘pure’, giving cultures their unique meaning and identity. What unsettles culture is ‘matter out of place’ – the breaking of our unwritten rules and codes ... What we do with ‘matter out of place’ is to sweep it up, throw it out, restore the place to order, bring back the normal state of affairs.

Determining which of these identities are normal and therefore socially acceptable consequently determines which are abnormal and therefore subject to social stigmatisation and correction (Foucault 1975; Miller 2008). When the socially symbolic boundaries of what is normal and abnormal are defined, represented and disseminated by dominant discourse they are internalised by the individual who self-monitors and regulates their body and behaviour in order to maintain a socially correct identity. In this way, bodies are disciplined and constructed to socially conform or are instead labelled as ‘other’ and therefore as deviant (Terry & Urla 1995). The disciplinary power of normalisation combined with the authoritative role that medicine plays in our society makes biased and discriminatory views of the female body within contemporary medical discourse particularly dangerous and signifies the importance of investigating the visual construction of normalised bodies within medical discourse (Ussher 2011).

2.5.4 Identity and otherness

Socially constructed meanings and identities are drawn from the norms, values and cultural preferences of society. These norms, values and preferences are created and maintained through the discourses that occupy the most dominant position within society, and processes such as socialisation shape how we understand social identities. Therefore, social identities are not natural but are part of an individual’s ideological identity that comes from their membership in social groups (Jenkins 2008; Turner & Oakes 1986). Further, these identities represent a social hierarchy where dominant in-groups have been able to establish their superiority over marginalised out-groups by defining themselves in relation to the ‘other’.

Philosopher and second wave feminist Simone de Beauvoir (1949, p.6) argued that otherness “is the fundamental category of human thought. No group ever defines itself as the One without immediately setting up the Other opposite itself”.

Political activist and literary critic Edward Said (1978) popularised and provided a strong account of the concept and process of othering in his book *Orientalism*. In this text, Said (1978) critically traced the West’s construction of ‘Orientalism’, revealing the fundamentally erroneous assumptions that existed in the Western world’s beliefs and attitudes towards the Middle and Near East. He identified the way in which the

concept of Orientalism established the East as inferior and other through prejudiced representations of the Orient, allowing the West to maintain a dominant and unequal power relationship. This classification as other was used to highlight the weaknesses of the East and to therefore justify political actions such as colonisation. Said (1978) argued that ideas and beliefs about Orientalism were so ingrained in European thought because of the textual authority of writing from academics, institutions and governments, and the appearance of reinforcement from the ‘experiences’ of Westerners in the East. However, the knowledge that informed Orientalism was gained superficially through surveillance from a distance rather than from actual experience of the culture or interaction with its people. The hegemony of Western dominance and superiority was facilitated by biased accounts that were afforded legitimacy by the context of science and academia.

The theoretical concept of the other has become significant in research on cultural constructions of the human body and identity. In particular, it has been used to call attention to discriminatory power relationships (see for example Fitzsimmons 2014, Grant 2016, Jensen 2011 and Riach 2007). Otherness is created when a socially dominant in-group identifies and distinguishes marginalised out-groups in order to construct a sense of belonging, identity and social status for themselves. Susan Hiller (1991, p.3) has observed that the other is perceived in our society as “always distant as well as different, and against this difference the characteristics of self and society are formed and clarified”. It is specifically the stigmatisation of perceived difference that acts to classify individuals into the hierarchal binary of ‘them’ and ‘us’. Sociologist Zygmunt Bauman (1991, p.14) has noted that within this binary “The second member is but *the other* of the first, the opposite (degraded, suppressed, exiled) side of the first and its creation. Thus abnormality is the other of the norm”. The often pejorative or limited representation of marginal identities within dominant discourses has, as Andrew Okolie (2003, p.2) pointed out, negative and harmful consequences for those identified as other:

These definitions of self and others have purposes and consequences. They are tied to rewards and punishment, which may be material or symbolic. There is usually an expectation of gain or loss as a consequence of identity claims. This

is why identities are contested. Power is implicated here, and because groups do not have equal powers to define both self and the other, the consequences reflect these power differentials.

Otherness is a critical part of the way in which gender is constructed within society. The concept of gender not only distinguishes differences between the sexes but, in doing so, inherently positions men and women in an unequal power relationship (Lorber & Farrell 1991). As Simone de Beauvoir (1949) has argued, this social relationship usually frames women as man's other. Indeed, men are often viewed as the standard, and thus as more valued, in society (Hamilton 1991). For example, men are paid better despite the significant achievements that women have made (Goldin 2014), and they experience more freedom in a range of social arenas including sexual activity (Crawford & Popp 2003). Significantly, those who exist outside the gender binary, such as transgender people, are further othered and thus viewed by society as deviant (Overall 2012).

Importantly, the ways in which scientific and medical discourse establish definitions of a 'normal' body can construct a subordinated other. Jennifer Terry and Jacqueline Urla (1998, p.2) have argued that within our society social deviance "manifests in the materiality of the body". Indeed, notions of what a healthy normal body is and looks like depend on the existence of a deviant body. Thus, medical discourse, which is viewed in society as the authority on what is healthy, plays a dominant role in classifying and constraining the gendered body into a normal/abnormal binary (Terry & Urla 1998). As medical knowledge actively constructs the boundaries of normalcy, bodies that are either neglected or framed as pathological are thus positioned within the binary as abnormal and other (Johnson et al. 2004). For example, the more frequent representation of White women than women of colour within medical literature constructs women of colour as abnormal and other (Feldman & Tegart 2003). The concept of otherness is therefore central in examining how images within medical discourse perpetuate biases about gender, ethnicity, disability and other diverse bodies and identities.

2.5.5 The construction of the subject and issues of agency

According to Foucault (1975, p.138), the aim of disciplinary practices is to increase the body's capacity and social usefulness and to produce "subjected and practised bodies, 'docile' bodies". The reduction of the individual to a docile and subjected body has been problematic for feminist theorists as it seemingly negates the possibility of resistance to dominant discourses (Fraser 1989; Hartsock 1990). In his earlier work, Foucault (1972) had some interest in the way that individuals actively constructed the world but was more concerned with the impact of larger discourses, and the way subjects are positioned, and/or position themselves, through these discourses. He viewed individuals as possessing some power in making and assigning meaning in their worlds but understood this power to be limited by the range of meanings that dominant discourses made available. Foucault's (1982, p.777) constructionist goal was to "create a history of the different modes by which, in our culture, human beings are made subjects". For Foucault, subjectivity is not a natural given but a construct that is used to control and exercise power on the subject through the illusion of a fixed and stable self (Mansfield, 2000). Mansfield (2000, p.10) has pointed out that:

In this way, "subjectivity" is not the free and spontaneous expression of our interior truth. It is the way we are led to think about ourselves, so we will police and present ourselves in the correct way, as not insane, criminal, undisciplined, unkempt, perverse or unpredictable.

This position emphasises a social constructionist viewpoint but also limits the agency of the subject and leaves little to no room for resistance to powerful discourse (Fraser 1989). Jana Sawicki (1988) has argued that the adoption of this Foucauldian construction of the subject makes it difficult to account for a feminist defiance of normative disciplinary practices. Feminist theorists who have recognised their position within powerful disciplinary discourse, or who have felt the effects of it, have therefore moved to re-examine Foucault's arguments about power, the subject and agency in order to understand how these discourses could be resisted (see for example Butler 1990, 1993). These theories are necessary for understanding how

Foucault's theorisation of the subject allows for the possibility that agency can be exercised within dominant discourse.

Judith Butler (1990; 1993; 1997) has provided an account of gender identity and subjectivity that has been particularly helpful for reconciling Foucauldian theory and issues of agency. Her widely renowned theory of gender performativity states that gender identities are accomplished through *reiterated* performances that produce the effect of, or mimic, normative gender while simultaneously concealing how unstable, diverse and even contradictory an individual's gender is (Butler 1990). Butler (1990) posited that, while these gender performances are socially constructed through discourse, they do not necessarily negate individual agency. Instead the subject is "multiply constructed" and their identity is made up of a number of intersections through the repeated performance of discursively constructed normative gender (Barvosa-Carter 2001, p.127). From this perspective, agency is "located within the possibility of a variation on that repetition" (Butler 1990, p.145). In other words, variation, or at least the option to choose a variation, provides an avenue for agency. Agency is not, therefore, enacted through an individual's attempt to subvert gender discourses by becoming genderless but through their capacity to choose to vary the repetition of gender discourses (Barvosa-Carter 2001).

Butler's theorisation of the socially constructed subject has helped to identify the possibility of agency. However, Butler's (1990) position has also been criticised for not providing an account for *how* such resistance could be achieved (Benhabib 1992). Specifically, what influences and conditions need to exist in order to make agency a possibility for an individual? Further, if hegemonic gender roles and performance are perceived as natural and individuals are unaware of alternatives, then variations cannot be chosen and norms cannot be challenged. The focus of this research is on the construction of gender within medical discourse and so it is beyond the scope of this thesis to address how individual agency can be achieved. Nevertheless, by highlighting existing hegemonic gender structures in medicine, this thesis aims to denaturalise normative power relations and open avenues to more variations of bodies and identities than are currently being represented. By calling attention to the visual gender stereotypes that reiterate normative gender roles and

appearances, this thesis therefore sets out to encourage medical content producers to contribute to existing discourse and expand variation choices by representing more complex social relations and subject positions.

2.6 Feminist Theory

The egalitarian intentions of feminism are important, yet Haraway (1988) has warned that feminist approaches must be careful not to include their own bias or to dismiss all androcentric knowledge as biased and therefore irrelevant. It is necessary for feminist researchers to try to resolve, or at least negotiate, the tension that exists in trying to address the goals of a feminist agenda without subsuming all patriarchal knowledge and practice under a broad category of illegitimate bias. This can be achieved by dividing attention between contributing to, as well as evaluating, empirical evidence and understanding the social values that construct representations of that evidence (Anderson 1995). It is therefore important to undertake a critical investigation of the gender values and ideologies that exist in medicine while also acknowledging the significant advances that have been made, for example, in women's health and social roles (Longino 1992). Thus, although interrogating scientific discourse is important, utilising the tools of the scientific method and acknowledging its unique strengths (e.g. establishing causation) is still critical.

2.6.1 Intersectionality

Feminist endeavours have frequently only focused on, and been beneficial to, women who are already relatively privileged. Indeed, feminism has a long history of prioritising women who are White, middle class, cisgendered, straight and able-bodied, and dismissing those who fall outside of these categories (Eisenstein 1994). This approach of ignoring disadvantaged groups is at odds with the ideal of feminism to create equality for women. Intersectionality is an attempt to produce feminist politics that are more comprehensive and inclusive of the diverse ways in which women are further marginalised. The term intersectionality was coined by critical race theorist Kimberle Crenshaw (1989) in her analysis of discrimination against Black women in the legal system. Crenshaw (1989) argued that by focusing on only one social dimension of difference, gender or race, the reality of Black women's

lives were misrepresented or even erased. By treating multiple aspect of a person's identity as mutually exclusive, people who are part of multiple marginalised and/or minority groups are then further excluded or marginalised (Crenshaw, 1991).

Intersectional theory in the current context provides greater insight into the multileveled construction of gender identities.

There is a growing amount of literature that addresses issues associated with intersectionality (Berger & Guidroz 2009; Collins 2000; Crenshaw 1989; de Vries 2015; Hancock 2007; Lutz et al. 2011; McGuire 2010; Meekosha & Shuttleworth 2009; Smith 2000; Taylor et al. 2011; Walby et al. 2012). In general, this literature has aimed to reveal the experiences of further disadvantaged women while also making privilege visible. This is particularly important in light of research that has shown that the “experience of race-and-gender discrimination is qualitatively different from race discrimination or gender discrimination” (HREOC, 2001). Indeed, women's experience of racism can be further compounded by other aspects of their identity such as being “single heads of households, living with disabilities, girl children, lesbian women, young mothers, or older women” (HREOC, 2001). The current research aims to employ the analytical lens of intersectionality in order to articulate the specific ways in which anatomical visual discourse has defined, marginalised and disempowered women who are further marginalised by structures such as ethnicity and disability. As this research is focused on the content of anatomical textbooks rather than interpersonal experiences, it will focus on the issue of making visible privileged identities, such as being male and/or White, and marginalised identities, such as being Black and/or intersex.

2.6.2 Sex, gender and social constructionism

Since the 17th and 18th centuries, Western scientific and medical discourses have played a major role in the establishment of the ontological conditions of sex and the body. As Thomas Laqueur (1990, p.viii) documented in *Making Sex*, during this time society saw a shift from the one-sex model, where female bodies were understood as an imperfect variation of the male body, to a two-sex model, where the female body was distinguished as the “incommensurable opposite” of the male. As a result, male and female identities were constructed as a binary opposition and men and women

were accordingly assigned to ‘separate spheres’ (Connell 2002). Laqueur (1990) continued to show that this dichotomous and unequal difference resulted, not from actual scientific discovery, but from social, cultural and political influences. The implications of this binary have been at the heart of feminist theory. Indeed, one of the core issues that has united feminist scholars is the concern with highlighting and questioning the social meaning of biological difference. As Barbara Marshall (2008, p.688) has stated, a major objective of feminist social theory has been to “identify the many ways in which gender difference – usually manifested as inequality – is produced, experienced, regulated and resisted and suggest how prevailing modes of gender organization might be transformed”.

Feminists employed the term ‘gender’ during the second wave of feminism as a concept for classifying social and cultural interpretations of biological sex (Haraway 1991). Specifically, feminists were concerned with the belief that differences in male and female biology dictated what roles and attributes were socially appropriate for either sex (Unger 1979). Initial attempts to challenge this biologically deterministic view were made by appropriating the term gender and separating it from the concept of sex (Flax 1987). Ann Oakley (1972, p.158) aimed to draw attention to the socially constructed features of gender relations by doing just this:

‘Sex’ is a biological term: ‘gender’ is a psychological and cultural one. Common sense suggests that they are merely two ways of looking at the same division and that someone who belongs to, say, the female sex will automatically belong to the corresponding (feminine) gender. In reality this is not so. To be a man or a woman, a boy or a girl, is as much a function of dress, gesture, occupation, social network and personality, as it is of possessing a particular set of genitals.

The biologically deterministic underpinning of what it meant to be or become male or female were revised as a form of socialisation. Illustrative of this change in thinking, Simon de Beauvoir (1949, p.295) famously wrote: “One is not born, but rather becomes, a woman”. By clearly differentiating sex and gender, second wave feminists were able to draw attention to normative structures within society and

argue that the behavioural and psychological differences between women and men were socially learned and preformed and therefore alterable (Marshall 2000). One of the aims of second wave feminism was to therefore create a “genderless (though not sexless) society, in which one’s sexual anatomy is irrelevant to who one is, what one does, and with whom one makes love” (Rubin 1975, p.204).

The feminist sex/gender distinction was useful for countering essentialist politics that used biologically reductionist arguments to restrict social agency. However, the emerging feminist theory that gender was socially rather than biologically determined did not automatically repudiate the idea that the biological body was the site upon which gender was constructed (Nicholson 1994). From within this framework, sex is a fixed site upon which the cultural constructions of masculinity and femininity are superimposed and is therefore not actually separate from gender but is instead subsumed under gender (Nicholson 1994). Using biological knowledge to provide the foundations for the construction of gender is problematic as this knowledge is almost exclusively based on the normative and restrictive male/female sex binary (Scott 1988). Further, our understanding of biological sex is preceded by and developed based on the concept of gender (Delphy 1993; Butler 1990). Indeed, Professor of Psychology Suzanne Kessler (1998, p.90) has argued, “There is no sex, only gender, and what has primacy in everyday life is the gender that is performed, regardless of the flesh’s configuration under the clothes”. Dr Anne Fausto-Sterling (2000), an expert on the biology of gender, has pointed out that the continued assignment of intersex babies to a male or female gender is a social rather than health-based decision – one that has profound medical and psychological implications for these individuals. This and the fact that intersex people, a group who comprise up to 4% of the population, are rarely recognised or represented in society, reflects the social dominance of the male/female sex binary (OII Australia, 2013). The proposal by second wave feminists to degender society was therefore inherently flawed as it reduced sexual politics to gender differences that relied on the inaccurate belief that definitions of sex and biology are objective facts and not also culturally produced (Gatens 1983). More recently, the claim that sex is biological while only gender is social has begun to be replaced within feminist discourse by the view that biological meanings in general, and sex as a biological phenomenon, are not stable

and fixed but are also social constructions (Butler 1990; Crawley & Broad 2008; Fausto-Sterling 1993; 2000; Ferree et al. 2000; Mann 2012; Marshall 2008).

The development of theory based on the sex/gender distinction has also been criticised for the ways in which gender is assumed to be a uniform concept or to have unifying features that clearly identify how all women differ from all men (Butler 1990; Spelman 1988). Specifically, the aim to discern a unitary concept of gender failed to take into account the differences between women and did not acknowledge “the multiplicity of cultural, social, and political intersections in which the concrete array of ‘women’ are constructed” (Butler 1990, p.14). Of particular concern is the view that explanations of, and discussions surrounding, the concept of gender are unconnected to intersections such as race and class. Elizabeth Spelman (1988, p.159; p.3) has asserted that such omissions within gender theory create a “white solipsism” that conflates “the condition of one group of women with the condition of all”. Judith Butler (1995, p.50) has also argued that existing identity categories, such as the category of woman, “are never merely descriptive, but always normative, and as such, exclusionary”. Such concerns highlight the need for the incorporation of intersectional theory into a feminist framework that encompasses all the complex interconnections and differences experienced by individuals. Further, this should include not only the intersections of more visible oppressive systems such as class and race but also alternate sex designations, such as intersex, and gender identities, such as those who identify as androgynous or transgender.

Due to the criticisms levelled at the sex/gender distinction, many theorists have questioned its usefulness (Lloyd 1993; Mikkola 2011; Moi 1999). Some feminist scholars moved away from the conceptualisation of gender as a dichotomous and essentialist characteristic of individuals that causes them to act in certain ways by instead viewing the practices of gender as constructing and constituting the subject and identity (Ferree et al. 2000). In this way the concept of gender maintains its position as a social construction while also encompassing both agency and structure and merging with other structures of inequality. Importantly, despite the feminist success in disputing biologically determinist perspectives, the belief that behavioural and psychological differences between women and men are biological still persists today. For example,

psychologist Cordelia Fine (2010) has identified and criticised neurological and biological theories that male and female brains are intrinsically different, claiming that scientific evidence can be inaccurately used to support sex-based discrimination. Feminist theoretician Mary Evans (2009, p.236) has also recognised the continued effect that biologically determinist perspectives have on society, such as the ongoing “assumption that women should occupy the private world of the household whilst men should direct and determine the public world”. Within anatomical textbooks the influence of this thinking can also be seen in the predominant representation of women in reproductive content which, perhaps unintentionally, reflects the view that female identity is inextricably linked to reproductive abilities and roles (Braun & Wilkinson 2001; Doyle 2006; Lawrence & Bendixen 1992). The prevalence of such thinking means that theories of sex and gender are still useful for revealing the falsity behind biologically deterministic thinking (Moi 1999). Further, the social construction of gender plays a crucial role in moulding physical bodies to conform to masculine and feminine ideals (Lorber & Farrell 1991). This is particularly important when examining the ways in which medical discourse constructs gendered bodies.

The fact that gender continues to be an inescapable apparatus of power has meant that it remains a target for feminist analysis and deconstruction. Historian Ludmilla Jordanova (1989, p.4) explained that the significance of gender is seen in its inclusion of “femininity and masculinity along with the norms that determine who meets the criteria of womanhood and manhood at any particular time and place for a specific social group”. Gender therefore embodies the cultural and time specific characteristics, social roles, positions, behaviours, practices and identities that fit within the categories of feminine and masculine. As an inevitable structure within most discourse, gender is also understood as socially learnt, internalised and performed (Millett 1971). More specifically, the social symbols of idealised feminine and masculine norms created within dominant discourses and the internalisation of these norms by individuals are what determine gender roles and the social relations of gender (Haslanger 2000). These gender roles and norms act as tools of power to control and constitute the individual within society. This is particularly problematic as traditional and stereotypical gender structures often reinforce female subordination by socialising women into subordinate social roles, and ostracise or classify as

deviant those who do not conform to social norms. Further, it dismisses other gender identities that don't conform to the male/female binary. As such, how women, men and sex/gender variant individuals are represented, or not represented, in medical textbooks can be seen to play a role in establishing and maintaining a normative discourse. Medical textbooks frequently contain social symbols of gender that reflect the normative bodies and gendered social roles of medical discourse (Martin 1991). This becomes an issue when the gendered knowledge within medical discourse constructs and represents gender in stereotypically negative ways.

Contemporary feminist theory aims to subvert the normative boundaries of mainstream gender. The emergence of a constructionist feminist theory has been significant in increasing our understanding of how the process of gendering occurs and what the impact and consequences of gendering are for the individual, institution and society at large. Through debates about the nature of sex and gender difference, feminist theorists have undermined rigid and androcentric theories about the body by showing how women's bodies have been, and continue to be, subject to social inequality, domination and oppression (Bartky 1990; Doyle 2006; Fausto-Sterling 2000; Jordanova 1989). By critically analysing gender and the ways in which gender differences are learned and reinforced through social institutions and discourse, not only can the history and representation of the female body be deconstructed but gender roles themselves can also be transformed through social and political change (Lloyd 2005; Mann 2006). This thesis utilises feminist and constructionist theories about gender but it does so with the understanding that gender is not an easily changed construct and nor is it completely distinct from the concept of sex. Instead, the social construction of gender, as visually represented in medical textbooks, can be put forward as evidence of the gender-biased power relations that exist within medical discourse.

2.7 Conclusion

By integrating Foucauldian and feminist perspectives, the constructs of gender and sex can be understood as tools of disciplinary power that produce and control the body and identity. Considering the power of hegemonic discourses in constructing what is 'normal' and 'real' in our society, and the fact that these knowledges are

fallible and plural, it is clearly important for social justice research to analyse, deconstruct and challenge these structures when they negatively impact marginalised and minority groups. From a feminist perspective, the role that dominant discourses play in constructing gender bias as normative is of particular importance. The authoritative position of medical discourse and its direct influence on the construction of normative bodies, especially visually, makes it an important arena for this kind of investigation. This thesis is comprised of three studies that are based on the understanding that, not only is gender a social construct, but also that the gender ideologies produced and maintained in medical illustrations can be part of a hegemony that naturalises and promotes certain power relations. Influenced by Foucauldian and feminist understandings of power and knowledge, this research analyses the ways in which gender has been socially constructed and normalised within the visual culture of medicine. It also examines the influence that visual representations have on constructing normative attitudes towards gender. By utilising validated scientific methods, this thesis hopes to interrupt existing normative knowledges about gender and, in doing so, challenge existing power relations. The following review of the literature provides a historical and cultural context for the exploration of gender in contemporary anatomical textbooks.

3 LITERATURE REVIEW

Abstract

This chapter is divided into two parts. Part 1 presents a review of gender bias in healthcare and the ways in which it has manifested in both historical and contemporary contexts. Despite the progress made in addressing gender inequality within medicine, research shows that gender bias continues to be present in medical discourse. This is particularly the case when gender is considered in relation to other minority or marginalised identities. Gender bias in healthcare is demonstrated through gender exclusion, ‘othering’ and stereotyping and has a significant impact on patients, healthcare professionals and society in general. An overview of the intersections of gender and bias within medical discourse and the way in which a binary system of gender is naturalised and used to regulate the body is also provided. Part 2 of this chapter examines the significant role that visual culture plays in propagating and producing meaning within society. Visual representations of gender can either perpetuate or resist normative stereotypes. The role of visual culture in scientific and medical discourse is considered including their authoritative and influential position within Western society. A framework for examining the meaning in images is outlined.

Part 1: Gender Bias in Medical Discourse

3.1 Introduction

Gender has been identified as a significant determinant of health and, as such, has received increasing attention within the medical sphere over the last four decades (Doyal 2001; Phillips 2005; Risberg et al. 2011; Scully & Bart 1973). Despite these initiatives, research continues to show that gender bias not only persists in medicine but that it also has negative health outcomes for patients (Baggio et al. 2013; Bierman 2007; Colella et al. 2015; Hamberg & Larsson 2009; Kent et al. 2012). Gender bias has manifested within medicine through gender exclusion, through the ‘othering’ of women and marginalised/minority groups and through the construction and promotion of restrictive gender stereotypes (Riseberg et al. 2011; Zelek et al. 1997). Gender exclusion is seen in the lack of representation of a particular sex or gender in medical practice, research or education, and in the limited attention provided to the role of gender as a determinant of health. Gender exclusion has a number of negative outcomes for healthcare. For example, the underrepresentation of women in medical research has resulted in limited and/or inaccurate knowledge about female health while inadequate attention towards gender issues in medical discourse has resulted in ignorance or dismissal of the significance of sex and gender to health (Hamberg 2008). The current research also views inattention towards intersectional issues in medicine as part of gender exclusion. Ignoring how dimensions of difference such as race and disability intersect with gender has resulted in a limited understanding of all the factors contributing to health in medical practice, research and education (Hankivsky 2012; McCall 2005). Indeed, the effects of gender bias are shown to increase when intersectional determinants of health such as class, ethnicity and sexuality are taken into account (Hankivsky 2005). The ‘othering’ of women and minority/marginalised groups is also significant as it acts to produce and reproduce positions of power and subordination and can result in discrimination (Fine 1994). This has significant implications in a healthcare setting (Johnson et al. 2004). Bias through the production and maintenance of gender stereotypes has been shown to not only promote an androcentric model within medicine but to also affect the medical diagnosis, treatment and management of patients (Balsa & McGuire 2003; Martin & Suls 2003). The following review of the literature will examine the existence and implications of bias through gender

exclusion, othering and stereotyping in medicine, providing a broad context for understanding the reasons behind, and implications of, bias in visual representations of gender.

3.2 Gender Exclusion

The exclusion and underrepresentation of women and sex/gender variant individuals in medicine has been one of the major ways in which gender bias has persisted in the medical arena. Ideologically biased views about women's bodies exist not just within representations but also within the absence of such representations. As Judith Butler (2011, p.xxiv) has argued:

... it will be as important to think about how and to what end bodies are constructed as it will be to think about how and to what end bodies are *not* constructed and, further, to ask after how bodies which fail to materialize provide the necessary "outside", if not the necessary support, for the bodies which, in materializing the norm, qualify as bodies that matter.

The historical neglect of the female body in medical areas other than reproductive health has resulted in not only an ignorance of the role that sex and gender play in diagnosis and treatment, but has also standardised the attitude that the male body is the norm in medical discourse (Lawrence & Bendixen 1992; Verdonk et al. 2009; Zimmerman 2000). There have been some steps towards improvements in contemporary clinical medicine with, for example, the World Health Organization (WHO) promoting the mainstreaming of gender in healthcare, and the National Institutes of Health (NHI) and the Institute of Medicine recognising gender identity and sexual orientation as significant determinants of health (Cahill & Makadon 2014; WHO 2001). Nevertheless, women and sex/gender variant people remain understudied, underdiagnosed, undertreated and undermanaged (Wenger & Collins 2005; Hamberg 2008).

3.2.1 The historical context of female exclusion from medicine

The underrepresentation of the female body in medical discourse has developed out of a long history of exclusion and of women being viewed as inferior to the universal male norm (Verdonk et al. 2009; Zimmerman 2000). From the era of the Ancient Greeks until the 17th century, the female body was not only largely ignored in medicine, but it was also viewed as merely an imperfect variation of the male body (Lawrence & Bendixen 1992). During this time medical ideas about women's bodies were based on what Thomas Laqueur (1990) called the one-sex model. This model was founded on the belief that female reproductive organs were homologous but inferior to male parts: "Turn outward the woman's, turn inward, so to speak, and fold double the man's, and you will find the same in both in every respect" (Galen cited in Laqueur 1990, p.25). Vesalius' illustration of the vagina as an internalised penis (Figure 2) epitomised the belief that female bodies were basically the same as, but inferior to, males. For centuries, images and texts "sustained the male body as the canonical human form", and the few representations of female anatomy also reflected this (Laqueur 1990, p.96). The tradition of maintaining men and their bodies as the universal norm, negating the inclusion of women and implying their inferiority, has been influential and difficult to counteract in medical discourse (Petersen 1998).

During the Enlightenment period, a growing belief that all people should be viewed as equal signified that "an appeal to natural rights could be countered only by proof of natural inequalities" (Schiebinger 1999, p.21). As a result, women's bodies were no longer seen as just an underdeveloped version of the male but were constructed as a completely different or 'other' sex (Laqueur 1990; Lawrence & Bendixen 1992; Stolberg 2003). From this point on, Laqueur (1990) argues, the two-sex model became the dominant view in medical practice. This idea appeared to be an improvement on the one-sex model. However, the new female sex not only continued to be viewed as inferior to the male norm but was also used to promote the idea that women were only physically suitable for the domestic roles of housewife and mother (Lawrence & Bendixen 1992; Stolberg 2003). The two-sex model was increasingly normalised within society and yet the male body was still the "standard against which female structures are compared" (Lawrence & Bendixen 1992, p.925).

Anatomical representations continued to primarily focus on male anatomy but now also focused on how it differed from female anatomy while concomitantly disregarding female-specific parts. For example, anatomy texts provided more detailed portrayals of the penis while simultaneously omitting or providing only simplified representations of the clitoris (Tuana 2004).

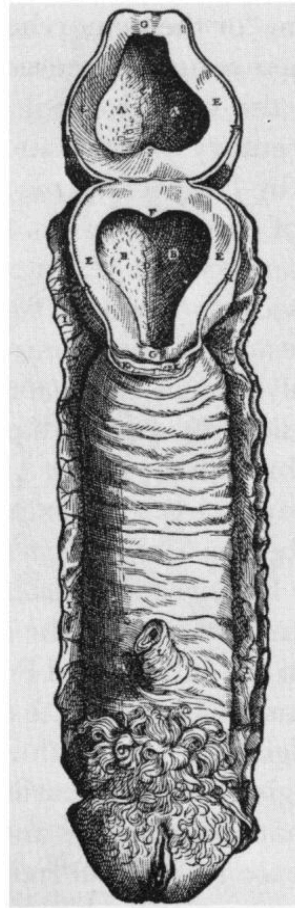


Figure 2. A representation of female genitalia, 1543, from Andreas Vesalius' *De Humani Corporis Fabrica* (Saunders & O'Malley 1982, p.171).

3.2.2 Gender exclusion in contemporary medicine

Gender bias exists in contemporary medical practice, research and education through the underrepresentation and marginalisation of women and sex/gender variant people and through the omission of sex and gender differences (Beery & Zucker 2011; Kim et al. 2008; Morgan et al. 2014; Sen et al. 2007; Trix & Psenka 2003). Further, women from marginalised or minority groups are even more underrepresented

(Banks & Kaschak 2003; Braithwaite et al. 2008; Gross et al. 2005; Hammarström et al. 2014; Killien et al. 2000; Wong et al. 2001b). Minority and marginalised status is defined by social attributes such as race, disability and weight, as well as by sex variant categories such as intersex and gender variant categories such as transgender, transsexual or transitioned (hereafter collectively referred to as trans). The lack of female and sex/gender variant equality and representation in medicine has serious health consequences for the medical diagnosis, treatment and management of patients. The following section reviews literature related to the exclusion of women from prestigious medical career positions, medical research and medical education.

The exclusion of women from healthcare occupations. Exclusionary gender bias can be seen in the hiring, promotion and retention practices within medical occupations (Trix & Psenka 2003). Recently, there has been growth in the number of women taking up careers in healthcare (Magrane et al. 2005; Riska 2001). There has also been a considerable increase in women entering into medical education with, for example, half of the students enrolling in Australian medical schools in 2015 being female (Medical Deans 2015). However, women predominantly occupy lower-status healthcare roles and gender disparity exists at the leadership and managerial levels (Australian Institute of Health and Welfare 2014; Bickel et al. 2002; Bismark et al. 2015; Nonnemaker 2000; Wehner et al. 2015). Further, women in healthcare occupations are consistently paid less for the same work and are also less likely to receive promotions (Ash et al. 2004; Tesch et al. 1995; Wallace & Weeks 2002; Wise et al. 2004). The majority of female physicians are employed in primary care and obstetrics/gynaecology and yet, even in these areas, they are less likely than men to work full-time or be promoted (McMurray et al. 2002; Wise et al. 2004). Further, female representation in academic medicine is not only low but also gets increasingly worse as rank position improves (Carr et al. 2015). A recent report by the Association of American Medical Colleges (2014) revealed that, in medical academia, only 38% of full-time faculty members, 21% of professors and 16% of Deans were women.

Specialist fields in medicine such as surgery are particularly male dominated. Indeed, the general culture of bias that permeates these areas has resulted in multiple

obstacles for gender parity including gender-based discrimination, a lack of mentoring and role models for women and a lack of consideration and support for family-based lifestyles (Babaria et al. 2012; Baxter et al. 1996; Bruce et al. 2015; Gordin et al. 1991; Kaderli et al. 2011; Lillemoe et al. 1994; Mayer et al. 2001; Park et al. 2005; Pearlman et al. 2004; Richardson and Redfern 2000; Sambunjak et al. 2006; Viola et al. 2001). For these reasons, few women pursue or maintain careers in surgery and, as a result, only 10%-15% of surgeons are female (Bruce et al. 2015; Royal Australasian College of Surgeons 2014; Royal College of Surgeons of England 2011). Widespread reports of sexism and bullying and the harmful influence this has on the careers of female surgeons is one major reason why many women step down from or do not take up careers in this field (Anonymous 2015; Matthews 2015; Scott & Matthews 2015; Taylor 2015). A study by Stratton and colleagues (2005) found that incidences of gender discrimination were likely to influence female students' choice of specialty. Research has also shown that, during medical education, women are more likely than men to be discouraged from entering specialties such as surgery due to a lack of support and/or to experiences of discrimination (Baxter et al. 1996; Gargiulo et al. 2006; Hill & Vaughan 2013; Stratton et al. 2005). A survey by Bruce and colleagues (2015) found that 87% of women studying to become surgeons experienced gender-based discrimination during medical training, and this led 24% to leave the program. Even when women continue to train in these areas, discrimination and the absence of support often cause them to drop out (Noviellei et al. 2001; Yeo et al. 2009). A report by the Royal Australasian College of Surgeons (2015) found that women were more than twice as likely as men to drop out of surgical training programs due to a lack of support and a range of discriminatory practices.

An unequal representation of women employed within the medical system has a variety of consequences for the health and treatment of patients. Increasing the gender diversity in medical occupations not only provides broader access to intelligent and talented individuals but also allows for the influence of experiences and perspectives other than that of males (LaPierre et al. 2016). Having a more diverse population of medical practitioners and educators also increases the potential for a more nuanced understanding of the healthcare needs and disadvantages of

minority and marginalised groups and provides inspiration and support for future medical students (Singer 2011). Levinson and Lurie (2004) have argued that an increase in female medical practitioners will also have an impact on areas such as the physician/patient relationship and delivery of care. Indeed, research has shown that female physicians are more likely than male physicians to engage with, encourage, reassure and offer emotional support to their patients (Roter et al. 2002). Such patient-centred healthcare has been shown to have a positive effect on outcomes of care (Greenfield et al. 1985; Kaplan et al. 1989; Stewart 1995). Women are also more likely to adopt democratic styles of communication and, in leadership roles, are more likely to support and empower the development of colleagues and staff (Eagly & Johnson 1990; Eagly et al. 2003). The numerous benefits that a more diverse workforce provides to healthcare make the advancement of egalitarian hiring, promotion and retention practices a necessity.

Gender exclusion in medical research. Gender exclusion also occurs through unequal representation of gender or the dismissal of sex and gender-related differences in medical research (Holdcroft 2007). In 1994, Sue Rosser (p.vii) identified that the “selection and definition of problems for study, the choice of experimental subjects, and conclusions drawn from the data in clinical trials often fail to include women or women’s changing needs throughout the life cycle”. Efforts have been made since then to increase the involvement of women in biomedical research. However, female representation continues to be disproportionate (Geller et al. 2006; Harris & Douglas 2000; Kim, et al. 2008; Tsang et al. 2012). The repercussions of male dominated medical research are that the outcomes and any consequent guidelines are often generalised and indiscriminately applied to males, females and sex/gender variant individuals (Holdcroft 2007). This is concerning as, despite some similarities between the sexes, there are still significant biological and behavioural differences that affect health (Hamberg 2008; Kim et al. 2010). Hamberg (2008, p.237) has noted that female and male bodies have “different biological processes, anatomies, conditions in daily life, environmental experiences, risk behaviors and responses to stressful events, [which] may all contribute to variation in health and disease in men and women”. These differences can affect the manifestation, epidemiology, pathology and physiology of diseases, as well as the

approach and response to healthcare (Regitz-Zagrosek 2012). The failure of medical research to be more inclusive of sex and gender differences has meant that its foundational evidence is fundamentally flawed (Holdcroft 2007). Inadequate research on sex and gender-specific health factors is dangerous as it reduces the accuracy with which physicians can identify and predict sex or gender differences in cause, prevention, incidence, prevalence, treatment and survivability of various illnesses and diseases (Council on Ethical and Judicial Affairs 1991; Vlassoff 2007).

The exclusion of women and the disregard for sex and gender difference in medical research has been identified in numerous medical areas including Alzheimer's disease (Carter et al. 2012; Weinberger et al. 2010), cardiovascular disease (Melloni et al. 2010; Wenger & Collins 2005) and lung cancer (Donington & Colson 2011; Gorlova et al. 2006). Female exclusion has also grown steadily worse in animal-based research, which provides important knowledge on how to treat a range of diseases such as cancer, cardiovascular disease and diabetes (Beery & Zucker 2011). The underrepresentation of non-human female participants in research has meant that that the influences of female specific biological issues, such as the estrous or menstrual cycle, are often unknown (Beery & Zucker 2011). Women are frequently underrepresented in clinical trials with several reports indicating that only one-third of cardiovascular clinical trial participants are female (Geller et al. 2006; Heiat et al. 2002; Kim et al. 2008; Melloni et al. 2010). This is often in spite of federal mandates calling for more inclusive research (Geller et al. 2006; Kim et al. 2008). Even when studies include female participants, they often ignore the impact of sex and gender difference (Blauwet et al. 2007; Dolor et al. 2012; Merz 2013; Wald & Wu 2010). For example, Melloni and colleagues (2010) identified that only 31% of female inclusive cardiovascular clinical trials reported outcomes by sex. The risks associated with ignoring the role that sex-based difference play are illustrated in the fact that dosage recommendations for certain drugs are not sex-specific despite proven differences in the way that men and women absorb, distribute, metabolise and excrete substances (Anderson 2005). Significantly, the exclusion of women from research is even worse for those from marginalised or minority groups (Bartlett et al. 2005; Murthy et al. 2004; Taylor 2009).

A study by Söderström (2001) sought out the reasons behind gender disparity in research and found that researchers excluded women due to scientific (the exclusion of women of childbearing age due to the potential for pregnancy and harm to the foetus), historical (the need for population consistency in repeat studies that were formerly comprised of male participants) or economic reasons (budgets restrictions). The concern that women of childbearing age could be harmed through research has a historical background that makes it difficult to counteract. The discovery of birth defects in the 1950s resulting from exposure to drugs like thalidomide strongly contributed to social concern with including women in medical trials (Junod 2014). As a result, the US Food and Drug Administration (1977, p.10; FDA) introduced regulations in 1977 that excluded any “premenopausal female capable of becoming pregnant” from clinical trials. This policy was upheld until 1993 when it was criticised for the negative impact it had on knowledge about women’s health and for the “lack of respect for their autonomy and decision-making capacity” that these restrictions implied (Merkatz et al. 1993, p.295). However, the effects of this policy have been long lasting as women not only remain underrepresented in clinical research but female participants are also often only accepted if they are sterile or using contraceptives (Cain et al. 2000). Further, the routine exclusion of pregnant women from clinical trials has led to knowledge gaps that have severe health consequences for a vulnerable part of the population (ORWH 2011). Indeed, many pregnant women require medications (for both pre-existing and new conditions) that have not been tested or proven safe for use during pregnancy (Adam et al. 2011; Sharma et al. 2008). This lack of knowledge about the risks and benefits of pregnant women using medications can result in foetal birth defects, termination of the pregnancy or maternal and/or foetal harm due to the discontinued use of the medication (Doering et al. 2002; Pace & Schwarz 2012). It is clear that there are a large number of clinical areas in which men receive a higher level of research attention and treatment than women. The following section focuses on the area of cardiovascular disease to illustrate how bias through the exclusion of women has harmful outcomes for female health.

The case of cardiovascular disease. One area of medical research in which gender exclusion has had a particularly negative impact is in the area of cardiovascular

disease (CVD). For almost 30 years innumerable studies have found evidence of the differential treatment and diagnosis of men and women for CVD (Anand et al. 2005; Bertakis et al. 2001; Kim et al. 2010; Pelletier et al. 2014). Despite the attention that this issue has received within the medical community, and the technological and medical developments that have consequently been made, female-specific research continues to be underrepresented and underfunded (Holdcroft 2007; Wenger & Collins 2005). As a result, women with CVD have been underdiagnosed, undermanaged and undertreated (Lichtman et al. 2010).

The exclusion of women from medical research and the normalisation of CVD as a male disease is one of the central reasons why gender disparity persists in this area. Research on CVD has typically been male dominated, evidenced in the fact that “Women are excluded from many clinical trials regardless of age or cardiac history, simply because most trials are aimed at male patients” (Wenger & Collins 2005). In the UK, funding for coronary artery disease research is greater for men than for women and this has resulted in a lack of knowledge about the gender differences in CVD symptoms and experiences (Holdcroft 2007). Healthcare practitioners have also been shown to hold the belief that coronary heart disease (CHD) is more severe for men (Ayanian & Epstein 1991). The Framingham Heart Study, a longitudinal cohort study on the risk and incidences of CHD that has been running since 1948, found that in individuals under the age of 75, men were more likely to suffer CHD than women (Thom et al. 2006). However, the gap between men and women narrows with age and women experience comparable rates of CHD 7-10 years later in life (Maas & Appelman 2010). Further, and even more significantly, women with CHD have a higher mortality rate than men (Lerner & Kannel 1986; Mozaffarian et al. 2015). Indeed, studies have found that women who experience a heart attack are twice as likely to die as men and that cardiovascular events are 10 times more likely for women than death from breast cancer (Lee & Foody 2011; Lichtman et al. 2015; Lichtman et al. 2010). Despite this, one study found that only 8% of family doctors were even aware that more women die from cardiac-related causes than men (Mosca et al. 2005). As such, the prognosis of CHD is likely to be just as severe for women as it is for men (Ayanian & Epstein 1991). Further, Black women are more likely than White women to experience CVD (Mosca et al. 2011).

The exclusion of women from CVD research and the persistence of the belief that it is typically a male disease have had harmful consequences for the diagnosis and treatment of women. Research by Ayanian and Epstein (1991) revealed that men were 15-45% more likely to receive diagnosis and treatment than women. Women, particularly in high-stress situations, are more likely to have their cardiac symptoms misinterpreted or even discounted by physicians (Martin 1998; Martin 2003). Multiple studies have shown that women undergo far fewer CVD-related diagnostic procedures than men (O'Farrel et al. 2000; Shaw et al. 1994; Steingart et al. 1991; Wong et al. 2001a). Shaw and colleagues (1994, p.559) found that, despite "incidence of typical angina, cardiac risk factors, and initial diagnostic test positivity rates" being similar in men and women, women received diagnostic testing far less frequently. Women have also been shown to receive a lower quality of preventive care for CVD than men (Centers for Disease Control and Prevention 1998; Jha et al. 2003; Kim et al. 2003; Mosca et al. 1997). In a recent systematic review of studies reporting rates of referral to cardiac rehabilitation programs, Colella and colleagues (2015) found that women were significantly less likely to be referred to such programs. Evidence has also been found that this bias exists at an educational level. A randomised vignette experiment exploring the bias of medical students and residents towards gender and the diagnosis of CHD found that, when stress was included as a symptom, women were significantly less likely to receive a CHD diagnosis (Chiaromonte & Friend 2006). The symptoms of female patients were instead more likely to be perceived as originating from psychological rather than organic causes (Chiaromonte & Friend 2006). This marginalisation of knowledge about gender differences in medical discourse unfortunately also extends to social understandings of CVD. Limited research on gender differences in CVD has meant that knowledge about issues such as how cardiac-related symptoms are not the same for women as they are for men has not been publicly mainstreamed (Lichtman et al. 2010). As a result, women are less likely to interpret their symptoms as severe and are therefore more likely to delay medical treatment (McSweeney et al. 2003; Ruston & Clayton 2007; Wenger & Collins 2005). Although some knowledge about the gender difference in CVD exists, a long history of excluding women from research has normalised it as a man's disease and obstructed attempts to make this knowledge mainstream. These issues with CVD research, diagnosis, treatment and management

indicate the dangers of gender exclusion and of the dismissal of sex and gender related factors.

Gender exclusion in medical education. Gender exclusion occurs in medical education not only through the lower numbers of female faculty (as discussed above) but also through the underrepresentation of women and sex/gender-related issues in the materials and content within educational curricula. Medical education plays a significant role in influencing and cementing future healthcare professionals' knowledge and gender biases (Dielissen et al. 2012; Lagro-Janssen 2010; Lent & Bishop 1998; Miller et al. 2013; Verdonk et al. 2009). Indeed, multiple researchers have identified the crucial need to address gender-related issues at the educational level in order to equip future healthcare providers with more comprehensive knowledge and to also positively influence their gender sensitive attitudes and behaviours (Bickel 2001; Hamberg & Johansson 2006; Henrich 2004; Jacobs et al. 2000; Lagro-Janssen 2007; Lent & Bishop 1998; Metz et al. 2001; Risberg et al. 2009; Verdonk et al. 2009). This was highlighted by an Australian study, which demonstrated that the more medical students learnt about and discussed gender in health, the more positive their attitudes became towards such issues (Wainer 2003).

Over the years, a number of academic institutions have shown the positive effects that integrating women's health and gender issues into the educational curricula has had on both teaching and learning (Heinrich et al. 2003; Magrane et al. 2000; Philips et al. 2003; Rogers et al. 2007; Verdonk et al. 2005; Weiss & Levison 2000). However, gender has not been systematically mainstreamed in medical education as many institutions either do not address issues related to gender at all or do so in ineffective ways (Celik et al. 2009; Henrick & Viscoli 2006; Hochleitner et al. 2013; Verdonk et al. 2006). A study by Henrich and Viscoli (2006) found that very few medical schools in the United States offered courses or subjects on women's health and/or gender and that existing curricula offered limited information on gender issues. Similar patterns of gender exclusion have been identified in Dutch (Verdonk et al. 2006) and Swedish (Hamberg 2003) medical school curricula. Indeed, a number of studies have shown that the influence of gender on health is frequently a low priority area within medical

education (Bickel 2001; Verdonk et al. 2006; Weisman 2000). These findings are significant as research has shown that many healthcare providers not only lack knowledge about how to recognise and treat gender-related health issues but also do not view gender as an important contributor to health (Risberg et al. 2003a; Vlassoff 2007). In one study, physicians who reported that gender sensitivity training was not a part of their medical education also found it difficult to discuss or prioritise gender issues in their practice (Celik et al. 2009).

Issues related to gender are also underrepresented in materials used in medical education (Dijkstra et al. 2008). A number of studies on educational medical texts have demonstrated the exclusion of women through a lower ratio of female to male representation (Alexanderson et al. 1998; Giacomini et al. 1986; Lawrence & Bendixen 1992; Mendelsohn et al. 1994). Hamberg and Larsson (2009) found that educational case studies used in Swedish medical schools, mostly written by male educators, included insufficient information about gender-related health issues. Educational materials have also shown a lack of accurate or detailed information about female-specific anatomy (Braun & Kitzinger 2001; Metoyer & Rust 2011; Moore & Clarke 1995; O'Connell et al. 2005; Tuana 2004). This is in spite of the fact that female representation in reproductive content is consistently higher than male representation (Alexanderson et al. 1998; Metoyer & Rust 2011; Moore & Clarke 1995). Tuana (2004, p.209) identified the portrayal of female genitalia in medical texts as simplistic in comparison to male genitalia:

... contemporary anatomy textbooks include detailed renditions of the structures of the penis, with the *corpus cavernosum* and the *corpus spongiosum*, important sites of male engorgement, carefully drawn and labelled, while offering only the merest bit of a nub as a sufficient representation of the clitoris.

O'Connell and colleagues (1998) performed a study on the anatomical representation of the clitoris and found that depictions in anatomical texts were frequently inaccurate. Julie Doyle (2006, p.311) has pointed out that “the reduction or loss of sexual pleasure for women who have undergone pelvic surgery has been a direct

result of such oversights in medical knowledge of female anatomy”. A lack of knowledge about female’s non-reproductive organs such as the clitoris is not only evidence of the exclusion of women from medical research but also constructs the female body as essentially reproductive and dismisses female sexual pleasure.

The lack of gender education in medical curricula can also be attributed to findings that medical educators themselves have inadequate knowledge about gender in healthcare and have even displayed resistance toward integrating gender-related issues into the medical curriculum (Jacobs et al. 2000; Phillips 1997; Risberg et al. 2003a; Risberg et al. 2008; Verdonk 2009; Westerståhl et al. 2003). It was reported in one study that medical educators believed gender issues should not be directly addressed in the curriculum but instead learnt through observing teachers behaviour (Lawless et al. 2005). Male educators in particular have been shown to view health-related gender issues as less essential in medical education and to be less accepting of the integration of gender into medical curricula (Risberg et al. 2003a; Risberg et al. 2011; Verdonk et al. 2008a). The negative attitudes of male faculty members is concerning considering that they are more likely to occupy influential positions in medical education than females (American Medical Colleges 2014; Carr et al. 2015; Riska 2001). Indeed, one study identified that the presence of a female Dean increased the inclusion of gender issues in medical schools, thus confirming the importance of female leadership in academic medicine (Henrich & Viscoli 2006). Medical education has the ability to play a key role in increasing gender awareness and reducing gender bias in future healthcare providers. However, resistance towards a healthcare curriculum that integrates gender issues indicates that such a process is not straightforward (Norstedt & Davies 2003; Verdonk 2006; Westerståhl et al. 2003). As such, it is critical that, during the process of developing educational programs, the most effective ways to make gender issues mainstream in the curriculum should be identified and the attitudes of faculty members should be addressed (Lagro-Janssen 2012). Importantly, the issue of gender exclusion within medical education is noticeably magnified when issues of intersectionality are considered. Intersectional aspects, such as race, disability and sexuality, should also be address in relation to gender education in order to provide a realistic

understanding of how diverse bodies and identities add to the complexity of individual difference in healthcare (Hankivsky 2005).

The exclusion of intersectional groups. The issue of intersectionality has become increasingly central to feminist theory and research but its incorporation into methodology, policy and practice has lagged behind (Shield 2008). Adopting intersectional theory allows medical research “to study health and disease at different intersections of identity, social position, processes of oppression or privilege, and policies or institutional practices” and, by doing so, provides “greater attention to both heterogeneity of effects and causal processes producing health inequalities” (Bauer 2014, p.10). Research in the field of gender in healthcare has begun to recognise and employ theories of intersectionality (Bauer 2014; Bowleg 2008; Bowleg 2012; Iyer et al. 2008; Kelly 2009; Schulz & Mullings 2006; Sen et al. 2009; Springer et al. 2012; Weber 2006). However, challenges still exist for intersectional research, and the degree to which healthcare policies and practices have applied the principles of intersectionality is limited (Hankivsky 2012; McCall 2005). Research and literature that is inclusive of minority women is inadequate (Zimmerman 2000). Those studies that do take an intersectional approach often focus on the categories of gender and race but ignore the intersections of less visible marginalised and minority groups such as trans and intersex people (Hankivsky 2011). Further, little attention has been paid to interrogating privilege (such as whiteness) in order to provide a more comprehensive understanding of inequality (Howard & Renfrow 2014; Levine-Rasky 2011). The lack of heterogeneous samples in research produces flawed information that does not allow for the outcomes of unique social situations (Bredström 2006; Lorber 2006). The underrepresentation of women from marginalised and minority groups can therefore have significant health outcomes.

The exclusion of intersex and trans individuals. Discussions surrounding the issue of gender bias are inadequate unless the complexities of sex and gender variant individuals are also taken into account. Indeed, gender bias not only occurs within medicine through the exclusion of those who are sex/gender variant but also through the normalisation of the gender binary system. At the core of social rules that aim to discipline and regulate the human body is the existence of and distinction between

the sex and gender binary (Hird & Germon 2001). It has been established that sex and gender are different: sex is determined by biological differences, while gender is determined by sociological differences (Miller et al. 2013). However, the link between sex and gender and their restriction to a binary has remained difficult to resist in contemporary culture. Historically, the only available categories of both sex and gender have been male and female. Indeed, “modern discourses produce specific discourses about what is *natural* about gender. That is, gender consists of two mutually exclusive typologies: female and male” (Hird & Germon 2001, p.171). Further, this belief “is maintained and perpetuated by the medical community in the face of overwhelming physical evidence that this taxonomy is not mandated by biology” (Hausman 1995, p.25). However, the gender binary does not actually define the nature and production of biological sex or cultural gender (Hird 2000). The hegemonic gender binary restricts individuals into a socially constructed and systemically enforced female/male sex and feminine/masculine gender (Marinucci 2010). In a medical context this has meant that intersex and trans individuals have not only been neglected in medical research, literature and education but that they have also been misunderstood, marginalised and discriminated against within the medical institution (Eliason et al. 2011; Morgan & Stevens 2012). Further, medical practice has used the gender binary to provide them with the authority to theorise the experience of intersex and trans people and decide what their sex should be (Hausman 1995). Medical research, literature and education primarily use the gender binary to categorise anatomy, disease and patient identity and, in doing so, ignore and exclude the reality of intersex and trans people and the influence this has on their health (Hird 2000; Jordanova 1989; Wall 2009). The continued absence of sex and gender variant people from medical education has severe consequences.

Intersex people. Intersex individuals are those whose biological makeup, including their sexual and reproductive anatomy, does not fit within the male/female binary (Agius & Tobler 2012). Intersex issues remain relatively invisible in our society, which, as a result, makes them vulnerable to not only discrimination and prejudice but also to unnecessary medicalisation (Ghattas 2013). A study by Georgiann Davis (2011, p.155) found that healthcare providers “rely on essentialist understandings of gender to justify the medicalization of intersexuality”. Existing medical research has

shown that medical interventions performed on intersex infants often result in adverse psychological and physical effects (Ghattas 2013). However, there is a lack of long-term and follow-up research on the effects of medical interventions on intersex people (Creighton 2001; Creighton & Minto 2001). The limited knowledge about the long-term outcomes of intersex surgery means decisions regarding medical interventions are unsubstantiated and ethically questionable (Dreger 1998). There is also a lack of medical policy on the treatment of intersex infants and therefore little consensus on what protocols to implement in these cases (Karkazis 2008). The lack of evidence on if or how to treat intersex individuals in a medical context makes physicians' reliance on the gender binary potentially dangerous.

Trans people. Trans individuals are those whose gender identity differs from the anatomical sex they were identified with at birth (Forcier & Haddad 2013). Trans people suffer from severe health disparities and face extensive stigma in both a social and medical context (The Institute of Medicine 2011). One reason the disparity exists is due to the lack of knowledge and information about trans health issues (Corliss et al. 2007; Roberts & Fantz 2014; Snelglove et al. 2016). A 2012 Australian study revealed that healthcare providers not only lacked the necessary knowledge to treat trans patients, but also displayed phobic attitudes towards these individuals (Chapman et al. 2012). Healthcare providers' lack of knowledge about and sensitivity towards trans individuals largely exists due to insufficient education, training and research on trans health (Snelglove et al. 2016). Indeed, several studies have shown that trans health is limited if not absent from medical education (Obedin-Maliver et al. 2011; Poteat et al. 2013). For example, a recent study on the representation of transgender individuals in the curricula of 176 Canadian and US medical schools found that there was little to no content on transgender health (Obedin-Maliver et al. 2011). The lack of medical training on trans-related health has left healthcare professionals unprepared for treating trans individuals both physically and emotionally (Institute of Medicine 2011; Meyer 2001). However, the development of a medical curriculum that is inclusive of trans healthcare issues is further compounded by the limited, especially on a large-scale, research on trans health (Vanderleest & Galper 2009).

The paucity of information on trans health is reflected in the erasure of trans people at the institutional level in medicine (Bauer et al. 2009). Medical policies that recognise and accommodate for the needs of trans patients have been largely absent (Melendez & Pinto 2009; Snelglove et al. 2016). Healthcare services for trans people are often either inadequate or difficult to access (Sperber 2005). For example, despite the fact that trans individuals are at a high risk for acquiring HIV, prevention services are often only aimed at cisgender people (Bauer et al. 2009). One of the biggest barriers to obtaining healthcare services has been economic. At the broad level, funding for programs that specifically target trans people has been limited, while at the individual level, health insurance that covers issues related to trans specific health is difficult to obtain (Roberts & Fantz 2014). Indeed, the policies of health insurance companies predominantly align with the gender binary by not only excluding trans related health services, but also by frequently denying trans people any coverage (Marksamer & Dylan 2013; Roberts & Fantz 2014). These negative experiences have meant that many trans people distrust or even fear using the healthcare system (Sperber 2005). The barriers created by the erasure of trans people in existing medical information, as well as within the broader institution of medicine, need to be eradicated in order to provide trans people with adequate healthcare.

Conclusion. A tradition of exclusion has been dominant in medical discourse. Despite an increase in gender equality, evidence remains of the exclusion of women and sex/gender variant people from healthcare occupations, research and education. A repeated theme within all aspects of exclusion was the defining role that medical education played in both establishing and perpetuating bias through gender exclusion. The following section will examine how these processes of exclusion, as well as other factors contribute to the ‘othering’ of women and marginalised/minority groups.

3.3 Gender Othering

Within social and medical discourse the female body has consistently been positioned as secondary, or ‘other’, to the male body. This concept is closely linked to the previous discussion on exclusion as othering can occur through processes of exclusion (Canales 2000). However, othering is addressed here separately as it can also occur through practices of inclusion. Inclusive othering occurs when those in

positions of power include marginalised or minority groups as a practice of tolerance and/or in a way that emphasises their own superiority (Ang 1996). Indeed, Lisa Cartwright (1998, p.23) contends that making women visible “does not in itself address the complex question of how gender difference is constructed and given value in medicine”. The incorporation of information about women or gender issues into medical literature may be more inclusive, but it can actually be used to indicate inferiority, especially if the information is stereotypical, inadequate or prejudiced (Bekker 2003). For example, the high representation of women in advertisements for antidepressants reflects and promotes the gendered stereotype that depression is a female-specific ailment and that women are likely to suffer from psychological disorders in general (Curry & O’Brien 2006). The process of othering is of particular concern when additional minority and marginalised identities are considered. The following section examines the way in which medical discourse others women and explores how this can occur through the pathologisation of differences. This issue is further investigated by addressing the way in which minority and marginalised identities are also othered in medical discourse and how this can be particularly detrimental when combined with the othering of women. Finally, incidences of othering that occur beyond the male/female gender binary are investigated.

In 1949, the feminist Simone de Beauvoir (1949, pp.5-6) described women’s status within Western European society, stating:

Humanity is male, and man defines woman, not in herself, but in relation to himself; she is not considered an autonomous being ... She determines and differentiates herself in relation to man, and he does not in relation to her; she is the inessential in front of the essential. He is the Subject, he is the Absolute. She is the Other.

The sense of alterity, or feeling of ‘otherness’, that is felt by women and marginalised/minority groups is heavily influenced by, if not entirely created through, social constructions of a rigid binary opposition of normal versus other (Bauman 1991). In dominant discourses, bodies are constructed through representations that reflect this ideological binary (Howson 2003). In our society, the

other is “constituted as inferior, lacking, deviant or deficient in some way” while the normal “is that which passes as common sense and natural, usually remaining unquestioned, invisible, silenced and unremarked” (Blackman 2008, p.71). As a result, the category of normal comprises a narrowly defined but clearly demarcated body type, and physical attributes, such as gender, race, disability and weight, create connotations of value depending on where they sit within this binary (Haslanger 2000). Because society places such great value on physical attributes, they become markers of our social identity (Rice 2014). Further, the experiences of each individual are never the same and can often be compounded by the existence of more than one such identity marker (Barvosa-Carter 2001). Those with bodies or identities that have been socially categorised as other suffer not only from social marginalisation, ostracism and oppression but also from unequal healthcare treatment and outcomes (Johnson et al. 2004).

The status of women as other is reinforced through society, as well as via medical discourse and practice. Susan Phillips (1997, p.497) has argued, “one of the fundamental components of both society’s and therefore medicine’s stereotypes about women is their position as ‘other’”. The discriminatory othering of women has been linked to a range of negative health consequences including lower life expectancy and a higher rate of infant mortality (Clark 2003; Collins et al. 2004; Everson-Rose & Lewis 2005; Guyll et al. 2001; Harrell et al. 2003; Krieger 1990; Krieger & Sidney 1996; Potter 1991). Experiences of othering also construct barriers to healthcare access because those who have had a negative or unwelcoming experience in a healthcare setting are less likely to seek these services in the future (Kosenko et al. 2013; Pattyn et al. 2014; Poteat et al. 2013; Sambisa et al. 2010; Wen et al. 2007). Medical discourse has played an active role in constructing the other via the propensity to establish a narrow and essentialist guide for what is considered normative and to either exclude or present diverse bodies as inferior (Johnson et al. 2004). Newbould (2013, pp.161-162) has argued that, within medicine, “Decisions regarding what is normal are treated as if they were biological facts, but any cut-off point that separates the normal from the abnormal must be defined arbitrarily and frequently relies on social norms regarding appearance”. It is therefore important to not only examine how the female body is othered in a medical context but also to

investigate how the complexities of intersecting identities contribute to this process and to question the hegemonic ideologies that discriminate against diverse bodies (Siebers 2001).

Women have been represented as other within medical literature as a result of being excluded and/or presented as an inferior comparison to men (Alexanderson et al. 1998; Phillips & Ferguson 1999; Zimmerman 2000). Men and women have biological similarities and differences and an in-depth understanding of these differences is necessary for optimal healthcare (Hamberg 2008; Shaw et al. 1994). However, dominant hegemonic notions of gender construct non-male (i.e. female, intersex and trans) difference as something other and subordinate to the male norm (Connell 2005). Medical discourse has had a long history of constructing perceived gender differences that legitimatise social division and support a patriarchal power system rather than providing a truthful account of the biological differences between men and women (Newbould 2013). This has been seen, for example, in the medical construction of the one-sex and two-sex models, where “femaleness is defined as whatever maleness is not: maleness is defined via the presence of some defining feature or other, while femaleness is its absence” (Gilbert 2001, p.296). Medical discourse has even further othered women by pathologising this difference.

The construction of the female other through the pathologisation of difference.

The process of othering can occur through the pathologisation of female difference. The pathologisation and denigration of sex and gender differences within medicine has had a lasting impact on not only the health of women but also on social attitudes towards women’s bodies, minds and behaviours (Doane 1985; Phillips & Ferguson 1999; Ussher 2013). The need to understand how the biological sex differences between men and women have an impact on health is a necessary, albeit often neglected, area of medical research. However, when such a focus has occurred within medicine it has historically been “prone to pathologizing artifacts of sexual difference” in women (Hanson 2000, p.57). Further, the pathologisation of women’s bodies has acted to produce pejorative views of female reproductive features and processes within both medical and social contexts (Ussher 2006).

Throughout history the female body, particularly as regards its reproductive abilities and processes, has produced intense social reactions. Women and their bodies have been historically associated with monstrous beasts as connections were made between female reproductive parts and animals. Plato saw the uterus as a destructive animal that wandered through the female body causing disease and harm (Maclean 1980). Influential scientists such as Galen and Vesalius made claims that the uterus had horns (Schiebinger 1989; 1993). Other authoritative scientists and scientific artists, such as Aristotle and Linnaeus, linked women's ability to produce milk and the act of suckling with the same abilities and acts in animals (Cadden 1993). History has also shown that social attitudes towards the process of menstruation in particular have been problematic. The historian and philosopher Pliny the Elder (1942, p.549) wrote in 77AD that menstrual blood:

... turns new wine sour, crops touched by it become barren, grafts die, seed in gardens are dried up, the fruit of trees fall off, the edge of steel and the gleam of ivory are dulled, hives of bees die, even bronze and iron are at once seized by rust, and a horrible smell fills the air; to taste it drives dogs mad and infects their bites with an incurable poison

Judeo-Christian beliefs have linked the pain of menstruation and childbirth to being cursed and unclean (Delaney et al. 1988; Turner 2006). During the Middle Ages, the female capacity to conceive and give birth was revered as a miraculous and sacred process (Fissel 2004). However, medical and religious discourse during this period also revealed a growing fear of diseased and contaminated blood, with which menstrual blood became associated (Zimmerman 2008). In an attempt to quell rising unease about a 'cannibalistic' Eucharist, Christian factions became especially obsessed with the idea of differentiating between pure and contaminated blood (Zimmerman 2008). This attitude towards contaminated blood contributed to the belief that menstrual blood was a source of disease and incited "discursive attacks on malevolent women accused of deliberately transmitting leprosy to lovers and infants" (Zimmerman 2008, p.410). Perceptions about female reproductive processes were dramatically transformed as the womb was declared a source of disease and weakness rather than a producer of life (Fissel 2004). The religious and social

attitudes of the sixteenth and seventeenth centuries also framed women's bodies as corrupt and defiled (Ussher 2006). John Wiltbank wrote in 1854:

Women's reproductive organs exercise a controlling influence upon her entire system, and entail upon her many painful and dangerous diseases. They are the source of her peculiarities, the centre of her sympathies, and the seat of her diseases (cited in Smith-Rosenberg 1986, pp.183-184).

Feminist critics have argued that the historical treatment of women's reproductive parts and processes as abnormal contributed to the unwarranted medicalisation and pathologisation of women's bodies (Boston Women's Health Book Collective 2005; Britt 2014; Martin 2001). Indeed, despite increased knowledge about female reproductive anatomy and processes in contemporary medicine, their pathologisation within society is a prevailing theme (Stotland 2004). Normal phases of the female reproductive cycle such as menstruation and menopause continue to be constructed in contemporary society as diseases or conditions that require medical intervention (Inhorn 2007). Examples of this pathologisation exist in the diagnosis of Premenstrual Dysphoric Disorder (PMDD). PMDD has been heavily opposed by feminist critics on the basis that it has invalidly been defined as a mental illness (Ussher 2013). Women's health psychologist Jane Ussher (2011, p.154) has argued, "premenstrual change is a normal part of women's experience, which is only positioned as 'PMDD' because of Western cultural constructions of the premenstrual phase of the cycle as a time of psychological disturbance and debilitation". Contemporary culture has also constructed female bodies as "dirty, mysterious, oozing strange fluids – different from men's, therefore wrong" (Braun & Wilkinson 2001, p.22). This denigration has created anxiety and shame in women that their genitalia are disgusting, odorous and undesirable (Shaw 1995). These viewpoints have been manifest within medical texts through descriptions of menstruation as wasteful, destructive and chaotic (Martin 1991; 2001).

The othering of women from marginalised and minority groups. The positioning of women as other is further compounded when female bodies do not conform to the socially accept standards of what they should look and act like. In particular,

contemporary Western society positions the White, young, thin, able-bodied and cisgendered body as the norm for women while other body types are both subtly and overtly labelled as inferior or unhealthy.

Ethnic bodies. The female body represented as normative within Western discourse has been overwhelmingly White (Bordo 2003; Collins 2004; Deliovsky 2008; Dyer 1997). The othering of non-White ethnicities has had a strong and intractable influence on medical discourse. Similar to sex and gender, ethnic and racial differences are also determinants of health (Hernandez & Blazer 2006). However, some beliefs about the biological differences between races are based on false stereotypes that have been constructed and used to justify the othering of non-White people through a process of marginalisation and even dehumanisation. There has been a long history of medical discourse marking the bodies of racial/ethnic minorities as other by claiming physical and psychological deficiencies. Jean Camaroff (1993) has pointed out that, during the 19th century colonisation of Africa, medicine was increasingly used to justify the regulation and control of the Black body. As a result, “the black body became ever more specifically associated with degradation, disease, and contagion” (Camaroff 1993, p.306). While such racist attitudes and beliefs have significantly improved over time, there is evidence of their continued influence in the unequal medical treatment and care of non-White racial and ethnic groups (Balsa & McGuire 2003; Fiscella et al. 2000; Institute of Medicine 2002).

The othering of people of colour is illustrated by the racial disparities found in the medical diagnosis and treatment of pain. For example, multiple studies have identified that healthcare providers hold negative stereotypes about how racial/ethnic minorities experience pain (Burgess et al. 2008; Dovidio & Fiske 2012; Staton et al. 2007). Indeed, research has shown that people of colour are undertreated for pain (Drwecki et al. 2011; Green et al. 2003; Ng et al. 1996; Tait & Chibnall 2014). A recent study by Hoffman and colleagues (2016) demonstrated that medical students held stereotypical beliefs that Black people experienced less pain than White people and that this led to racial bias in the diagnosis and treatment of pain. Trawalter and Hoffman (2015) identified the historical roots of this belief in claims that medical

professionals from the 18-19th Century made that Black slaves felt less pain as a means to excuse inhumane treatment. Although contemporary medical research has shown that Black people actually report experiencing higher levels of pain than White people, this stereotype persists (Campbell & Edwards 2012; Castel et al. 2008; Edwards et al. 2001; Eversley et al. 2005; Green et al. 2003). Even more troubling is that, for women of colour, this stereotype is compound by the fact that physicians are also less likely to take women's pain seriously (Hoffmann & Tarzian 2001). Indeed, research has shown that not only are women more likely than men to be undertreated for pain (discussed below), but non-White women are also more likely to be undertreated for pain than White women (Payne et al. 2003; Rust et al. 2004). Significantly, most medical literature ignores Black women's experiences of chronic pain and disability (Feldman & Tegart 2003).

The fat body. The fat body is one that is frequently labelled as abject within contemporary Western culture. The 'obesity epidemic' has become an obsession in our society that has visibly marked the fat body as non-normative. Medical discourse in particular has played a role in 'othering' the fat body by marking it as monstrous or pathological, the product of a weak or unintelligent mind (Murray 2008). In 1924, the *Journal of the American Medical Association* published an article by Dr James McLester (quoted in Kersh & Morone 2002, p.166) who wrote that:

Overweight is a mar to beauty ... An excess of fat destroys grace and delicacy. A fat face has a monstrous uniformity. No theatrical producer would hire a plump actress to mirror the real depths of the human soul.

These seemingly archaic ideas could be written-off as a product of the inaccurate medical knowledge and attitudes of the early twentieth century if not for their persistence in contemporary medical culture. In 1974, Stanley Schachter and Judith Rodin (p.1) published a book that framed fat bodies as inherently weak and perverse, labelling their behaviour as pathological:

Of all human frailties, obesity is, perhaps, the most perverse. The penalties are so severe, the gratification so limited, and the remedy so simple that obesity

should be the most trivial of aberrations to correct. Yet, it is among the most recalcitrant. Almost any fat person can lose weight; few can keep it off.

Sociologist Helen Keane (2002) has criticised the belief found in both social and medical discourse that those who are categorised as obese do not eat sensibly and cannot, therefore, be sensible.

In more recent years, medical discourse has begun to move away from framing fat bodies as a result of a weak or foolish mind and has instead positioned them as pathological (McHugh & Kasardo 2012). In 2000, a World Health Organization report positioned obesity within the medical narrative as a “chronic disease” that had become more of a threat to society’s health than “more traditional public health concerns, including undernutrition and infectious disease” (WHO 2000a, pp.1-2). In 2013, the American Medical Association (AMA) also officially labelled obesity a disease despite widespread criticism that fatness does not necessarily lead to health problems (Stoner & Cornwall 2014). A study by Hoyt and colleagues (2014) found that the message that ‘obesity is a disease’ actually had the effect of reducing the concerns of overweight people to eat well and resulted in unhealthy food choices. Further, research has shown that the pathologisation of fatness has resulted in social and medical discrimination (McHugh & Kasardo 2012). Indeed, healthcare providers have been shown to have antifat biases and to hold implicitly stereotypical attitudes that fat people are lazy, stupid and worthless (Foster et al. 2003; Sabin et al. 2012; Schwartz et al. 2012; Teachman & Brownell 2001). Concerningly, such attitudes have also been shown to exist in the implicit attitudes of healthcare professionals that specialise in obesity (Schwartz et al. 2012). A study by Sansone and colleagues (1998) revealed that increases in a patient’s Body Mass Index (BMI) predicted an increase in the rate at which patients changed physicians. It was suggested that obese patients, especially women, were likely to seek out new physicians due to the embarrassment and discrimination they experienced from healthcare providers (Sansone et al. 1998). Sexist, racist and classist attitudes further compound the negative experiences that fat people have with healthcare professionals (McHugh & Kasardo 2012).

The intense social stigma and discrimination that fat people experience has been shown to be particularly bad for women (Puhl et al. 2008). The normative female body is expected to be thin and the social and psychological penalties for fat women are severe (Fikkan & Rothblum 2011; Wooley et al. 1979). For example, numerous studies have found that fat women experience higher levels of discrimination than thin women or fat men at all levels of employment including hiring, promotion, performance evaluations and wages (Baum & Ford 2004; Bellizzi et al. 1989; Conley & Glauber 2007; Han et al. 2009; Miller & Lundgren 2010; Pingitore et al. 1994). Not even pregnant bodies are exempt from the intense social demands for women to conform to a normative female body size (Nash 2012; Wiles 1998). Lisa O'Malley's (2006) exploration of how the pregnant body has been visually represented has revealed that pregnant women are also expected to maintain a certain weight. Fox and Yamaguchi (1997) found that the weight gained by women during pregnancy caused them to develop a more negative body image. Research by Oliver (2012) has shown that not only has there been an increase in representations of the pregnant body in the media, but that these provide unrealistic and idealised portrayals of the average pregnant body. This has intensified the pressure women experience to maintain a perfect body even while pregnant (Husbands 2008).

The negative social attitudes towards fat women have been mirrored in medical discourse where the fat female body has been represented as deviant, inferior and unhealthy (Murray 2008). The weight bias that exists within medicine makes it especially hard for fat women to access satisfactory healthcare (Fikkan & Rothblum 2011). The antifat attitudes held by physicians often result in them shaming and blaming their female patients (Fikkan & Rothblum 2011; Olson et al. 1994). Despite the increased pathologisation of fat bodies and the subsequent increase in diagnosis and treatment, multiple studies have shown that fat women are less likely to receive important preventative healthcare services (Adams et al. 1993; Fontaine et al. 1998). Fontaine and colleagues (1998) found that, in spite of the fact that fat women visit their physicians at a higher rate than thinner women, they are less likely to obtain preventative services such as Papanicolaou tests and breast examinations. Adams and colleagues (1993) found that as a female patient's weight increased, physicians' negative attitudes and their reluctance to perform pelvic examinations also increased.

These experiences of discrimination have made fat women more likely to avoid accessing necessary and routine preventative healthcare services (Sabin et al. 2012). The authoritative role that medical discourse plays in promoting social panic about the ‘obesity crisis’ and constructing the fat body as unhealthy has meant that such views have been particularly difficult to combat.

The disabled body. The medical model of disability has traditionally viewed disability as an impairment that limits the functionality of an individual (Lutz & Bowers 2003; Oliver 1993; Wendell 2001). This functionality has specifically been described as the ability to conform to socially normative roles and behaviours (Brandt & Pope 1997; Gignac et al. 2000; Lutz & Bowers 2003; Wendell 2001). The disabled body has in this way been represented as ‘other’ to the socially normative body (Gignac et al. 2000; Kitchin 2000; Michalko 2002). Indeed, as Cindy LaCom (1997, p.189) has argued, “disability has historically been used as a signifier to construct cultural standards of “normalcy” in everything from human sexuality to criminal behaviour”. In recent years, the medical model has been criticised for the way in which it discriminates and oppresses those with a disability and calls have been made to replace it with the social model of disability (Gill 2001; Goodley 2004; Kitchin 2000; Michalko 2002; Morris 2001; Wendell 2001). In the social model, the obstacles that disable those with a physical or mental impairment are viewed as socially constructed (Barnes & Mercer 1997; Oliver 1998). From this perspective, disability is therefore understood as socially constructed rather than pathological. However, in their review of the literature on disability, Boyles and colleagues (2008) found that the term disability continues to be othered and associated with negative connotations. This supports a number of studies that have identified the way in which disability is represented in social and medical discourse as different or abnormal (Abberley 1993; Gordon et al. 1998; Michalko 2002; Morris 1992).

Beyond the positioning of disability as abnormal, medical literature and education have also failed to adequately represent disability (McNeal et al. 2002; Shakespeare 2009). Research has shown that healthcare providers are often unaware of the full impact of a patient’s disability on their lives and that they rarely assess or treat the full extent of their patient’s needs, particularly if the patient is a woman (Denham &

Gillespie 1994; Masuda 1999; Morrow 2000; Odette 1993). Not only have physicians been shown to possess very little knowledge about the lives of those with a disability but they also lack training on how to relate to people with a disability (Frazee et al. 2006; McNeal et al. 2002; Shakespeare 2009; Veltman et al. 2001). This lack of training has meant that physicians often collect insufficient information about the conditions of a person's disability and/or attribute everything to the conditions of the disability (Veltman 2001). The perception that disability is abnormal combined with a lack of knowledge about the physiological and emotional realities of disability has meant that people with a disability frequently receive substandard healthcare (Ali et al. 2013).

Women with a disability have been shown to be particularly disadvantaged when it comes to healthcare. As Banks and Kaschak (2003) have pointed out, women with a disability suffer more severe health outcomes while also receiving less economic support than men with a disability. Further, these disadvantages are worse for women of colour (Banks & Kaschak 2003). The existing attention given to disability within medical literature has been androcentric and female dominated disabilities such as chronic fatigue or fibromyalgia "have been defined as hysterical, treated as mental dysfunction, trivialized, and viewed as self-inflicted" (Chin 2003, p.xx). One of the ways in which women with disabilities have been particularly marginalised is through the lack of support they receive for non-visible impairments (Banks & Kaschak 2003). This is significant as women are much more likely than men to suffer from non-visible disabilities such as chronic illness (Masuda 1999; Trypuc 1994; Wendell 2001). People with a visible disability are more instantly classified as different and therefore other. However, those with an invisible disability are often required to undertake the difficult and stressful task of convincing others that they truly are disabled (Davis 2005). For women, this process can be even more traumatic as physicians are much less likely to take them seriously (Caplan 2001).

The aging body. Contemporary society's preoccupation with maintaining a young body has resulted in prevalent age discrimination. Negative attitudes towards the aging body are magnified for elderly women in particular who are devalued in contemporary Western society (Garner 1999; Mercer & Garner 2001). This is because

female social value predominantly comes from their physical beauty, which is normalised as youthful, and from the capacity to reproduce, which stops once women experience menopause (Clarke 2011; Markson 2001). As Jane Ussher (2006) has argued, the fecund female body is normalised in society and thus the very definition of 'woman' revolves around her reproductive abilities. It is therefore unsurprising that, despite the fact that menopause is a natural part of the female reproductive cycle, popular culture constructs the experience of menopause and the postmenopausal body in a negative way (Colombo et al. 2010; Gannon & Stevens 1998; Hust & Andsager 2003; Lyons & Griffin 2003; Rosewarne 2007; Ussher 2006).

The predominance of ageism in society is reflected in the persistent age discrimination that exists within healthcare (Arber et al. 2004; Austin et al. 2013; Bartlett et al. 2005; Bowling 2007; Harris et al. 2007; Madan et al. 2001; Madan et al. 2006; Morris et al. 2005). Within a healthcare setting the aging body is neglected in clinical research, receives a lower quality of care and is viewed as less important (Heiat et al. 2002; Herrera et al. 2010; Minichello et al. 2000; Shenoy & Harugeri 2015). Significantly, research has shown that this ageism in healthcare is often worse for women (Cameron et al. 2010; Chrisler et al. 2016). Despite the fact that women live longer and make up a much larger percentage of the elderly population (Pirkl 2009), elderly women are underrepresented in medical research (Bird 1999; Morse et al. 2004). Sharpe (1995) also found that older women's concerns were more likely to be minimised by healthcare professionals. Correa-de-Araujo (2004) reported that older (46-60 years) women were only half as likely as older men to receive a kidney transplant. Al-Eassa and colleagues (2012) found that, despite the fact that primary care physicians held inadequate knowledge about menopausal and postmenopausal conditions and medical treatments, they referred nearly half of their patients for hormonal replacement therapy (HRT). The medical community has long framed menopause as a disease that requires management and treatment by a physicians (Foxcroft 2011). Indeed, despite a lack of evidence that menopause requires medical intervention, contemporary medical discourse continues to medicalise and portray it as a disease (Coupland & Williams 2002; Derry 2002; Hvas & Gannik 2008; Niland & Lyons 2011; Murtagh & Hepworth 2003; Ussher 2006). Further, research on HRT has found evidence that its use is associated with serious health risks including an

increase in incidences of cancer and heart disease (Chlebowski et al. 2003; Collaborative Group on Hormonal Factors in Breast Cancer 1997; Manson et al. 2003; Women's Health Initiative 2002). However, the healthcare community continues to promote HRT as a necessary treatment of menopause (Fugh-Berman & Scialli 2006; National Institute for Health & Care Excellence 2015). Thus, as Ussher (2006, p.126) has argued, medical discourse prioritises the reduction of menopausal symptoms such as “the hot flushes which most strongly signify feminine excess, and the ‘vaginal atrophy’ which signifies a sexual body no longer serviceable” over women's actual lives. Importantly, the way in which medical discourse constructs menopause influences women's experiences of it (Hyde et al. 2010; Nosek et al. 2010). Indeed, the ways in which medical discourse has represented the aging female body has had a strong impact on social attitudes.

Intersex bodies. Beyond exclusion from medical discourse, the pathologisation of intersex individuals has also constructed them as other. The medical establishment has been complicit in maintaining and normalising a binary classification of sex and gender. Indeed, the arbitrary nature of what is considered ‘normal’ or ‘abnormal’ has meant that medicine has depended on social norms to define what these terms mean (Newbould 2013). The social normalisation of the male/female binary has therefore influenced the medicalisation and pathologisation of intersex people in medical discourse. Instead of identifying new ways of understanding the social and physiological condition of intersexuality, the knowledge produced by the medical community has acted to authorise healthcare practitioners “to maintain a mythology of the normal by changing the intersexual body to fit, as nearly as possible, into one or the other cubbyhole” (Fausto-Sterling 2000, p.8). The increased division between male and female bodies has been further encouraged by social discourse due to the fact that “such a division suits the economic needs of heterosexuality, and lends a naturalistic gloss to the institution of heterosexuality” (Butler 1999, p.143).

Intersexuality has long been a topic of interest within medical and psychological discourse (Hird 2004). Intersexuality first became medicalised in the 16th century when Ambroise Parel claimed in 1573 that physicians had the right to determine the

(binary) gender of intersex people (Epstein 1990; Foucault 1980b; Hausman 1995; Hird 2004). Intersex individuals were not socially affected by this medicalisation:

... until the availability of surgical and pharmacological interventions could control or create a public sexual identity for these individuals. In mandating binary sex differentiation for legal purposes, medical jurisprudence has, then, imposed a clearcut distinction even though in biomedical terms such a distinction has long been known not to exist (Epstein 1990, p.106).

The persistence of these attitudes towards intersexuality within the medical community is reflected in the view that “Genital ambiguity in a baby [is] almost as devastating in the delivery room as a perinatal death” (Hutson 2012, p.103). Medical literature has further cautioned, “against failing to acknowledge and treat the potential psychological consequences of not adhering to standardised societal notions of male and female” (Community Affairs References Committee 2013, p.36). Such attitudes towards intersex difference have had a strong influence on physician and parental decisions to use medicine to conform to a normative gender binary (Community Affairs References Committee 2013). Indeed, in Australian and other parts of the Western world, the prevalence of the sex and gender binary has translated into a need to permanently and irreversibly alter individuals’ sex through surgery:

... the medical norms of so-called female and male bodies have allowed for the establishment of routine medical and surgical interventions on intersex people, even when such interventions are cosmetic rather than medically necessary, or when those concerned have not been adequately consulted or informed prior to these procedures. Secrecy and shame around intersex bodies have permitted the perpetuation of these practices for decades, while the human rights issues at stake have remained for the most part unaddressed (Agius 2015, p.7)

The European Union Agency for Fundamental Rights (2015, p.8) has argued, “Intersex people will remain vulnerable to discrimination ... as long as they are medically diagnosed as men or women with a health disorder”. A report by the Australian Senate on *Involuntary or coerced sterilisation of intersex people in*

Australia stated that the medical establishment used surgery to erase and stigmatise intersex difference despite the fact that “little research exists regarding ‘adequate’ or ‘normal’ genitals, particularly for women” (Community Affairs References Committee 2013, p.65). Despite the findings of such reports, Australian and other governments are slow to implement the changes necessary to depathologise intersex diversity (Morgan 2015).

Conclusion. The othering of women has a clear impact on their health. When women’s bodies do not fit within normative ideals (i.e. White, young, thin, able-bodied and cisgendered) they are further othered. Those who exist outside the sex binary also suffer intense pressure from the medical community to adhere to the binary. Again, medical education has a critical role to play in either advancing or disrupting these views. Beyond how the gendered body should physically conform, societal norms also play a role in constructing how it should perform (Butler 1990). Within medical discourse, narratives exist that perpetuate social gender roles, contributing to the creation and maintenance of unequal expectations and treatment of both male and female bodies.

3.4 Gender Stereotyping

Stereotypical preconceptions about gender have been recognised as one of the key causes of gender bias in healthcare (Andersson et al. 2013; Hamberg 2008). Socially constructed gender stereotypes define the social organisation of gender including the physical, occupational and emotional roles that men and women are expected to inhabit. Stereotypes are drawn from the norms, values and cultural preferences of society and produced by and exist within society’s most dominant discourses (Schneider 2004). Stereotyping simplifies and legitimises socially dominant systems and has the ability to affect our perceptions and treatment of social groups (Banaji 2002). This can lead to inequality and discrimination (Agerström & Rooth 2011; Davison & Burke 2000; Fiske & Lee 2008; Rudman & Glick 2001; Tilcsik 2011). The validity of dichotomous gender stereotypes in medicine additionally ostracises those who are sex/gender variant and further disadvantages women from marginalised/minority groups (Committee on LGBT Health Issues and Research Gaps and Opportunities 2011; Findlay 1995).

Within medical discourse the gendered body is often exhibited in ways that reflect and also contribute to the construction of stereotypical gendered attitudes (Spelman 1982). The potential outcomes of gender stereotype biases are not only damaging to the cultural construction of bodies but can also cause negative health outcomes (Hamberg 2008; Verdonk et al. 2009). Due to issues such as the exclusion of women and intersex/trans individuals in medical research and literature, physicians often either generalise knowledge based on male dominated research to all genders or depend on gender stereotypes to diagnose and treat these groups (Bertakis & Azari 2007; Chakkalakal et al. 2013; Loikas et al. 2015). Such decisions can lead to misdiagnoses and errors in treatment (Loikas et al. 2015). Significantly, Loikas and colleagues (2015) found that, although general practitioners had limited or no knowledge about the sex and gender differences for drug treatments, they nevertheless used patients' sex to guide their treatment. The persistence of traditional gender role stereotypes (including occupational, mental and emotional stereotypes) in medicine has a number of consequences for the health of women (Hamberg 2008; Risberg et al. 2009). For example, because of the stereotypical links made between the female body, health and reproductive condition, women are often reduced to their reproductive parts in a medical context (Braun & Wilkinson 2001; Doyle 2006; Lawrence & Bendixen 1992). The social conventions of femininity and masculinity act to restrict how the body should look and act and those that deviate from the rules can often be discriminated against or, in some cases, labelled as mentally unstable (Poulin & Gouliquer 2003). Even when male and female patients conform to these gender roles, these can still inhibit the way they act and communicate with their healthcare providers (Zepek et al. 1997). An examination of both historical and contemporary treatments and representations of gendered bodies, especially within dominant medical paradigms, is important for understanding the emergence of 'truths' and practices that define, control and affect patients. The following section will examine the effects of stereotypical gender roles on healthcare outcomes by looking at the gendered division of labour, female reproductive stereotypes and specific feminine and masculine stereotypes in a medical setting.

3.4.1 The medical naturalisation of stereotypical gender roles

Medical discourse has played a central role in reflecting and naturalising traditional gender roles. In the 18th century, the belief that men and women should occupy separate spheres became the hegemonic ideology on which the social organisation of gender in modern society was based (Laslett & Brenner 1989). The gendered division of labour within society assigned women to domestic roles, such as rearing children and caring for the household, and men to public roles that were central to contemporary social institutions, such as those related to economics and politics (Chafetz 1988). This division has been one of the main contributors to power inequalities between the genders as it assumes men will occupy positions of authority and situates women in less powerful and less socially valued roles (Chafetz 1988; Cohen & Bianchi 1999). As scientific and medical discourses became increasingly central to modern society, they played a significant role in creating, maintaining and naturalising the polarity between socially gendered spheres (Smith-Rosenberg & Rosenberg 1973). Emerging questions about whether or not women were equal to men threatened the hegemonic power system by, for example, opening up positions of political power to women. There was, therefore, a demand for scientific and medical efforts to find ‘natural’ foundations to justify social inequality through biological categorisation and hierarchy (Schiebinger 1999; Urla & Terry 1995). As Thomas Lacquer (1990 p.10) has argued, “no one was much interested in looking for evidence of two distinct sexes ... until such difference became politically important”. This resulted in purposefully misconstrued and biologically reductionist views of the female body (Lawrence & Bendixen 1992; Schiebinger 1986). There was a growing obsession with cultural definitions of gender as the terms ‘male’ and ‘female’ were redefined based on biological ‘truths’ rather than on “divinely ordained hierarchies or immemorial custom as the basis for the creation and distribution of power in relations between men and women” (Laqueur 1990, p.193). With the introduction of the two-sex model, medical discourse no longer viewed women as just a variant of the male norm but as their physical, mental and moral opposites (Laqueur 1990; Lawrence & Bendixen 1992). This belief was epitomised in the writing of Victor Józse (1895, p.391) who proclaimed that a woman “is a being apart, another thing, endowed with other functions by nature than the man with whom she has no business competing in public life. A woman exists only through her ovaries”. This newly

constructed scientific and medical knowledge was used to justify the view that women could not effectively or legitimately work outside of the domestic arena and were therefore only suitable for the roles of housewife and mother or as a passive object of desire (Ehrenreich & English 1979). One such medical ‘truth’ constructed women as physically inferior due to the fact that their “nerves, vessels, muscles, and ligaments are thinner, finer, and more supple and therefore indicate the kinds of duties for which the female is naturally predetermined” (Roussel 1775, p.5). The delicate condition of the female internal organs and nervous system was also perceived as making them more sensitive and preventing them from higher and rational thought while their smaller skull was similarly seen as evidence of females’ intellectual inferiority (Libbon 2007).

The division between traditional gender roles has been blurred within contemporary society. However, medicine has continued to reflect and maintain traditional gender divisions to some degree in both its workforce and in its discursive content. Due to the authoritative role that medical discourse plays in our society, the division of gender roles continues to a certain extent to be seen as natural in society. One area of contemporary medical discourse that has been particularly influential due to its popularity in the public arena has been contemporary anatomical exhibitions such as *Body Worlds*, *The Amazing Human Body* and *Premier Exhibitions*. It has been noted by critics that these exhibitions display a profusion of stereotypical messages (Schulte-Sasse 2011). *Body Worlds*, the most famous and controversial public anatomical exhibition that uses real, plastinated bodies for the purposes of both education and art, is particularly guilty of visually stereotyping the female body. The creator of the body worlds exhibition, Dr Gunther von Hagen, has stated that the technique of plastination, a process in which the water and fat in cadavers is replaced by plastic, make his anatomies mechanically objective; “a pure representation of the human body without the contamination of human intervention” (van Dijck 2001, p.117). However, his bodies are not only influenced by artistic choices but are also chosen and posed based on preconceived notions about gender.



Figure 3. A pregnant, plastinated female cadaver from Von Hagen's *Body Worlds* exhibition (Dotinga 2004).

Firstly, the limited number of female bodies in the *Body Worlds* exhibition conforms to the longstanding view that the male body is the norm. Von Hagen's reason behind the lack of females was that he did not wish to appear 'voyeuristic', indicating a belief that women's bodies cannot be viewed clinically but are sexualised by the viewer's gaze (Stern 2006). The female bodies are also displayed in gender stereotypical ways, particularly in the focus on reproductive systems and roles (Figure 3). This mirrors traditional views that the female body is primarily of anatomical interest for the display of the reproductive system. *Body Worlds* has also been criticised for promoting an idealised body and Schulte-Sasse (2011, p.87) has argued that, by celebrating a perfect, and for most people, unachievable body image, Von Hagen has created a body which "is alienated, aestheticized, and commodified – in short, incrementally dehumanized". Lastly, the representation of different ethnicities was not only limited in general but also non-existent for women (Moore & Brown 2007). Despite the criticism levelled at the *Body Worlds* exhibition, it has been hugely successful with the general public (van Dijck 2001). This is significant as the gender messages it conveys, which already have their origins in medical discourse, reinforce the medical legitimacy of these ideas within broader social

discourse. Importantly, this also signifies the central role that educational visuals can play in subtly defining and maintaining particular cultural views of the body, all while conveying a dispassionate scientific disinterest in gender politics.

3.4.2 The gendered division of labour in medicine

In contemporary society the lines have been blurred between the traditional gendered division of labour; however, occupational segregation still exists between genders to some degree (Coltrane 2000; Coltrane 2010; Frederick 2011; Lachance-Grzela & Bouchard 2010; Sanchez 1994; Sayer et al. 2004; Shelton 1996;). Cultural beliefs and attitudes about women's occupational and social abilities, shaped by historical, institutional and social experiences, continue to "bias people's expectations about women's ability to participate in paid work or can negatively influence a woman's expectations about her own abilities" (Damaske 2011, p.411). Gender role stereotypes have also been reflected in, and had an adverse effect on, the careers of healthcare professionals (Hartigan 2001). As mentioned previously, female physicians are far less likely than men to go into specialties such as surgery or to occupy senior or academic positions (Bruce et al. 2015; Carr et al. 2015; Royal Australasian College of Surgeons 2014). Women are instead more likely to enter specialties such as primary care or paediatrics, which are traditionally viewed as of lower status fields in medicine (Bickel & Ruffin 1995; Showalter et al. 1999). Female surgical students have also reported that, compared with their male peers, they receive fewer skill development opportunities and experience a higher rate of negative attitudes from educational staff (Calkins et al. 1992). Male healthcare providers have also been limited by gender role stereotypes in their exclusion from female-specific health areas such as obstetrics and gynaecology (Zahid et al. 2015). Zahid and colleagues (2015) found that during their obstetrics and gynaecology education, male students experienced higher levels of discrimination by educators and received fewer opportunities to develop their skills. However, it should be noted that men are still more likely than women to receive a promotion in these areas (Wise et al. 2004).

Gender bias against female healthcare providers, especially in the form of sexual discrimination, is linked to "attitudes and behaviours that promote the stereotyping of social roles" (Nicholson 2002, p.1057). Several studies have identified that the culture

of medical education requires students to conform to and accept the status quo in order to progress within medicine (Babaria et al. 2012; Brainard & Brislen 2007; Faunce et al. 2004; Wear & Aultman 2009). As a result, female medical students have reported that they are not only expected to put up with discrimination but are also required to adopt the identity of ‘woman doctor’ (Babaria et al. 2012). As Regina Morantz-Sanchez (2000, p.200) has argued, “a central theme in the story of women in medicine has been the tension between ‘femininity’, ‘feminism’ and ‘morality’, on the one hand; and ‘masculinity’, ‘professionalism’ and ‘science’, on the other”. As the professional attributes that are most highly valued within medical culture are stereotypical masculine traits such as being confident, tough and aggressive, female physicians have felt the need to adopt such behaviour (Hinze 1999). However, unlike their male counterparts, female physicians have simultaneously felt the need to assume stereotypically feminine roles due to expectations from both peers and patients that they be more nurturing and sympathetic (Clack & Head 1999; Kilminster et al. 2007; Lempp & Seale 2006). Lastly, the experience of being sexualised and consequently devalued by patients, peers and teachers has led female healthcare providers to try and conceal their femininity (Babaria et al. 2012; Wear et al. 2007). As a result of these conflicting expectations and experiences, the identity of ‘woman doctor’ is based on a combination of stereotypical masculine and feminine gender roles “ranging from adopting stereotypically female attributes to erasing their sexuality and adopting masculine behavior to challenging their own expectations of female doctors” (Babaria et al. 2012).

Beyond the healthcare workforce, medical discourse also reflects and reproduces a stereotypical gender division of labour within its visual and literary content. For example, multiple studies have shown that advertisements in medical journals frequently promote a traditionally gendered division of labour, as well as stereotypically masculine and feminine roles (Cambronero et al. 2012; Curry & O’Brien 2006; Hawkins & Aber 1993; Riska & Heikell 2007). Cambronero and colleagues (2012) recently found that pharmaceutical advertising often depicted men in occupational roles and women in domestic roles. As narrative images within medical literature also increase, there is a need to examine what gender roles they represent and therefore promote. Indeed, considering the role that medicine has

historically played in naturalising ideas about gender, the representation of stereotypical gender roles should be identified and examined.

3.4.3 Female reproductive stereotypes

Perhaps one of the most persistent and harmful gender stereotypes has been the association of the female body with its capacity to reproduce. In contrast to the normative male body in healthcare, women's health has almost exclusively been framed as reproductive (Inhorn & Whittle 2001; Krieger & Zierler 1997). The quest to present women's inequalities as natural and therefore valid during the Enlightenment period resulted in misconstrued and biologically reductionist views of the female body, and with women being embodied by their reproductive abilities alone (Schiebinger 1986). The work by obstetricians such as William Smellie (1754), Charles Nicholas Jenty (1758) and William Hunter (1774) reflected this through their images of a "disembodied pregnant female body, whose reproductive 'truth' is inscribed in the truncated depictions of female anatomy" (Doyle 2006, p.315). Illustrations from Hunter's work for example (Figure 4), removed all traces of the female apart from her uterus. Doyle and O'Riordan (2002) have argued that by restricting these images to isolated, reproductive parts, the female body was reduced to the conditions of reproduction and other important physiological processes were ignored.

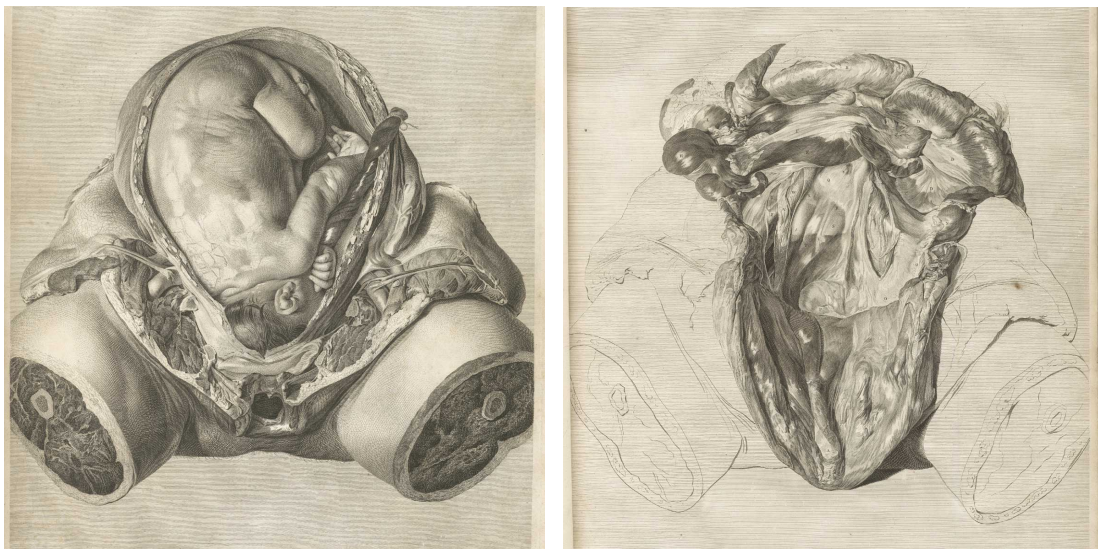


Figure 4. The stages of pregnancy, 1774, from William Hunter's *The Anatomy of the Human Gravid Uterus Exhibited in Figures* (Historical Anatomies 2012).

The medical figuration of the female body as primarily reproductive is still dominant in contemporary culture (Verdonk et al. 2009; Zimmerman 2000). Medical diagnoses have a propensity to construct a woman's "reproductive capacity as a direct indices of women's gender conformity or nonconformity" (Handwerker 1995, p.374). Clark and colleagues (2002) found that over half of the articles on women's health in general medical journals were focused on the traditional women's health topics of reproduction or breast and cervical cancers. This narrow conceptualisation of what women's health entails has resulted in an over-emphasis on female reproductive and maternal conditions and a neglect of other leading health issues that disproportionately affect women such as lung cancer, heart disease and dementia (ABS 2011; Clark et al. 2002; Misra 2001). Further, this perspective has promoted the implicit social message that a woman's importance lies in her sexual and reproductive abilities (Giacomini 1986). The Stanford Visible Female (SVF) is a three-dimensional, digital scan of a 32-year-old female's pelvis (Figure 5). The rationale behind the SVF was that it provided the "uterus and ovaries ... of a reproductive age female and [did] not reflect the atrophic signs of post-menopause" (Stanford University 1997). Unlike its male, full-bodied counterpart, the SVF literally reduces the female to her generative organs, mirroring the work and attitudes of eighteenth-century obstetricians. Further, it deprecates and pathologises women's infertile and post-menopausal conditions.

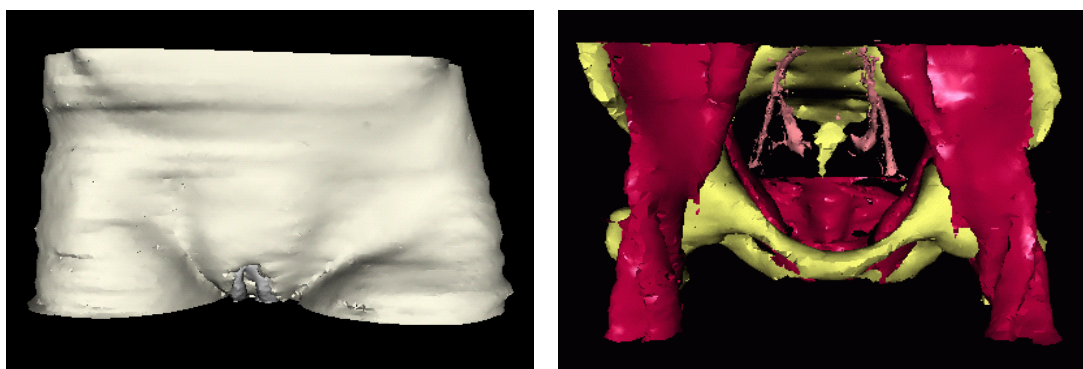


Figure 5. The Stanford Visible Female (Stanford University 1997).

3.4.4 The effect of femininity and masculinity on healthcare outcomes

The existence of masculine and feminine stereotypes in medicine has a range of negative healthcare outcomes for both men and women, impacting diagnosis and treatment, as well as the behaviour of patients. Socially dominant gender stereotypes

place restrictions on the way women and men are expected to look, behave and feel (Poulin & Gouliquer 2003). This affects the way that men and women both act and are treated. Some of the most socially dominant gender stereotypes include the mental and emotional expectations of men and women (Brody & Hall 2000; Fischer 2000). As will be discussed below, masculine stereotypes negatively affect male patients in terms of their own behaviour (Courtenay 2000b). Feminine stereotype also affect the behaviour of women but this is more likely to be a reaction to the way in which these stereotypes influence the treatment of women by healthcare professionals (Munch 2004).

Feminine stereotypes. One reason behind the existence of bias against women in healthcare is the significant role that psychological symptoms, such as stress and anxiety, play in the assessment of women's health (Bernstein & Kane 1981; Bertakis et al. 2001; Colameco et al. 1983; Redman et al. 1991). One of the most socially prevalent feminine stereotypes has been that women are more emotional than men and that this emotion can cause them to lose control of their behaviour (Bernardez 1987; Bowman 1982; Fabes & Martin 1991; Fisher & Good 1994; Hare-Mustin 1983; Robinson & Johnson 1997; Timmers et al. 2003; Weiner & Boss 1985). This is despite studies having shown that women are often better at expressing their emotions, likely due to the fact that it is socially acceptable for them to do so (Briton & Hall 1995; Kring & Gordon 1998). Regardless, Brody and Hall (2008, p.396) have argued, "gender and emotion stereotypes are imprecise, are overly general, and ignore the importance of the modality in which an emotion is expressed, as well as the situational and cultural context within which emotional expression occurs". The failure in medicine to identify and highlight the role that gender stereotypes, devoid of empirical support, play in the diagnosis, treatment and behaviour of patients has potentially serious implications. A prime example of this is the way in which healthcare professionals are more likely to view female rather than male patients' symptoms as psychological (Bernstein & Kane 1981; Colameco et al. 1983; Hoffmann & Tarzian 2001).

Research has shown that physicians more frequently diagnose female symptoms as psychosomatic and male symptoms as organic. In a study with 253 primary care

physicians, Bernstein and Kane (1981) found that women were more often perceived as being influenced by their emotions and their symptoms were more frequently identified as psychosomatic. In their study with 120 physicians, Colameco and colleagues (1983) also found that female patients were perceived as more emotional than male patients. Redman and colleagues (1991) found that physicians were more likely to diagnose undisturbed patients as psychologically disturbed if they were female. Wool and Barsky's (1994) review of medical literature from 1951 to 1991 revealed a far more frequent identification of somatisation in woman than in men. When gendered nouns and pronouns were changed in medical vignettes, physicians viewed women as more emotional and demanding and evaluated their symptoms as psychological more frequently than when the patient was male (Bernstein & Kane 1981; Colamenco et al. 1983; Bertakis et al. 2001). Studies have also shown that psychoactive drugs are more frequently prescribed to woman than men (Ashton 1991; Linden et al. 1999; Sayer & Britt 1999; Simoni-Wastila 2000).

The medical assumption that female symptoms are more likely to be psychological rather than somatic fits into a long history of misdiagnosing women as having mental disorders (Tasca et al. 2012). Medical discourse has played a significant role in constructing gender stereotypes that associate women with being irrational, emotional and even insane (Darcy 2015; Ussher 2011). For example, certain deviations from socially normative femininity were pathologised within medicine and linked to a defective reproductive system (Libbon 2007). The most infamous diagnosis used for pathologising the deviant behaviour of women has been hysteria, which was used to medically explain displays of 'excessive' or 'uncontrollable' emotion and justify the control of non-normative bodies and behaviours (Gilman 1993). Hysteria is no longer a medically recognised diagnosis. However, its influence on pathologising "symptoms of depression, rage, nervousness, the tendency to tears and chronic tiredness, eating disorders, speech disturbances, paralysis, palsies and limps, or complain of disabling pain", particularly in women, has been indelible (Ussher 2013, p.64). The long-standing influence of the term hysteria can also be discerned in the systemised nomenclature of the medical term 'hysterectomy' (Lipsitt 2016). Although the standard nomenclature for surgical removal of an organ is organ-specific (e.g. appendectomy, lumpectomy,

tonsillectomy), the removal of the uterine continues to be called a hysterectomy rather than a uterectomy. The symptoms associated with hysteria are also reflected in the diagnosis and treatment of conditions such as anxiety and depression. Indeed, when physicians cannot provide a definitive diagnosis for female symptoms, they often turn to psychological causes (DeAngelis 2013). A study by Ashton (1991) revealed that physicians often ignored the causes of women's emotional distress and were more likely to prescribe them with mental health medication compared with male patients. This issue has been further compounded by the fact that the generalisation of male symptoms to all patients due to the androcentric nature of medical research has meant that physicians lack knowledge about female differences in symptoms and consequently label atypical presentations as psychological (Colameco et al. 1983).

Women are more likely than men to show symptoms of anxiety and depression (Gater et al. 1998; Kessler et al. 1994; Pigott 2003; Robbins et al. 1999). For example, Pigott (2003) identified that, in general, females have higher and more widespread rates of anxiety disorders than males. In their study on adult cancer patients, Shag and Heinrich (1989) found that women reported anxiety more frequently and with greater intensity than men in healthcare contexts. Women also seek treatment for anxiety and depression more often than men (Kroenke & Spitzer 1998; Sleath & Rubin 2002; Wool & Barsky 1994). As a result, women are more likely to be correctly diagnosed with depression (i.e. true positive; Borowsky et al. 2000), but are also more likely to be incorrectly diagnosed with psychological rather than somatic disorders (i.e. false positive; Smith 2011). However, despite evidence that female patients are more likely to report symptoms of depression and anxiety, women face multiple barriers to treatment due to the restrictions of gender stereotypes. As women are often the primary caregivers of their children, their responsibilities make seeking healthcare difficult if they cannot find or afford childcare (Salganicoff et al. 2014). Further, stereotypical expectations about the way women behave have meant that anxiety symptoms can often be dismissed as female behaviour (Bernstein & Kane 1981). Indeed, women are often hesitant to share the full extent of their symptoms with their physicians for fear of being labelled as emotional or of being accused of overreacting (Lichtman et al. 2015; Munch 2004;

Wenger & Collins 2005). In her study on the gender politics of doctor-patient relationships, Eda Smith (2011) found that not only had many women experienced discrimination based on their sex but that half had also stopped seeing their doctor due to this experience and that some felt they needed to deemphasise their symptoms for fear of appearing irrational. Smith (2011) also found that women were more likely than men to receive a psychosomatic misdiagnosis that often resulted in negative health outcomes.

Pain management in healthcare provides a significant example of the way in which stereotypes can have an impact on the health of women. Females are far more likely than males to not only have their pain undertreated but to also have it misdiagnosed as psychological (Payne et al. 2003; Rust et al. 2004). These reports are concerning as the majority of people who suffer from chronic pain are women (Kendall-Tackett et al. 2003). A 2014 survey found that 90% of women suffering from chronic pain felt discriminated against due to their gender (Anson 2014). A study by Hoffmann and Tarzian (2001) found that women not only received less aggressive treatment for pain but they were also more likely to have their reports of pain perceived as being emotional and therefore unreal. In an examination of gender differences in the diagnosis and treatment of neck pain, Hamberg and colleagues (2002, p.653) found that physicians were more likely to give female patients “nonspecific somatic diagnoses, psychosocial questions, drug prescriptions, and the expressed need of diagnostic support from a physiotherapist and an orthopaedist”. This preoccupation with psychological explanations for female symptoms is also reflected in the finding that laboratory tests are more frequently requested for male patients (Hamberg et al. 2002). Feminine stereotypes have a clear impact on the health of women. However, it is important to note that masculine stereotypes, especially those associated with mental and emotional factors, also have a significant impact on men’s health.

The effect of masculine stereotypes on men’s health. Gender stereotypes can have a deleterious effect on the health of men. In spite of having greater access to social and economic resources than women, men have, on average, shorter life spans (Arias et al. 2003; Centres for Disease Control and Prevention 2008; Heron et al. 2009; Mathers et al. 2001; Springer & Mouzon 2011; White & Cash 2003; WHO 2000b).

Within a medical context, traditional social stereotypes of masculinity have had an influence on “research design, data collection, analysis, conclusions, and men’s own responses” (Moynihan 1998). The biggest impact of masculine stereotypes on health outcomes appears to be their effect on male health behaviours and beliefs (Courtenay 2000b; Galdas et al. 2005; Mahalik et al. 2007; O’Brien et al. 2005; Verbrugge 1985). In particular, men are less likely than women to participate in health improving behaviour, such as healthy eating, and are more likely to participate in high-risk behaviour such as smoking (Caspersen & Merritt 1995; Holtzman et al. 2000; Patrick et al. 1997; Slesinski et al. 1996). Increased high-risk behaviours among men can be extended to the fact that men are also more likely to avoid or refuse medical care (Kaufman 1994; Mahalik & Lagan 2006; Mahalik et al. 2007; Springer & Mouzon 2011). Socially dominant practices of masculinity have meant that men often view the acknowledgment of pain and illness as a weakness that would undermine their pursuit or maintenance of positions of power (Kaufman 1994). Indeed, illness and disability have the ability to “reduce a man’s status in masculine hierarchies, shift his power relations with women, and raise his self-doubts about masculinity” (Charmaz 1995, p.268). A study by Himmelstein & Sanchez (2016) revealed that men who rated high on measures of masculinity were more likely to prefer a male physician but were less able to communicate effectively with male physicians. Indeed, masculine stereotypes that position men as strong, independent and unemotional have meant that men are less likely than women to report symptoms associated with mental health. Studies have shown that women are more willing than men to discuss emotional or stressful issues with their physicians (Kroenke & Spitzer 1998; Sleath & Rubin 2002; Wool & Barsky 1994). Freeman and Freeman (2013) reported that women were 75% more likely to report symptoms of depression and 60% more likely to report symptoms of anxiety. Physicians are also more likely to ask their female patients about issues related to depression (Sleath and Rubin 2002). As a result, men are less likely to be correctly diagnosed with mental health problems than women (Borowsky et al. 2000).

Men’s health behaviour reveals that normative gender stereotypes play a significant role in constructing reality, especially when those who don’t conform suffer from social penalties. However, beyond the effect of masculinity on men’s reluctance to

acknowledge pain and illness and their avoidance of medical care, research on the role of masculinity in health has been limited (Addis & Mahalik 2003; Galdas et al. 2005; O'Brien et al. 2005; Springer & Mouzon 2011). Further, existing research on the effects of masculinity on male health behaviour focuses on younger populations and ignores variations in socioeconomic positions and alternate ways that men seek healthcare (Addis and Mahalik 2003; Calasanti & King 2005; Galdas et al. 2005; Thompson 1994). By naturalising gender stereotypes and providing limited information on the effect of masculinity on men's health, medical discourse acts to support and promote these potentially damaging stereotypes (Courtenay 2000b).

Conclusion. Gender stereotypes have commonly attributed female medical conditions to either a defective reproductive system and/or to psychological problems. Female bodies and behaviours that deviate from normative feminine stereotypes have often been pathologised and presenting symptoms often misdiagnosed as mental illness. Masculine stereotypes can also have a significant influence on men's health behaviour and restrict their access to healthcare services. These issues indicate the need for medical discourse to provide more in-depth knowledge about the complexities of gender as a determinant of health. As with the other forms of gender bias reviewed, the visual content used in medical education can take a central role in perpetuating gender stereotypes.

3.5 Gender Bias Intervention Research

This review of the literature has identified the core role that medical education can play in constructing and maintaining gender bias. The proposed research aims to explore this issue from a multidimensional and multicontextual perspective. However, it is important to consider whether interventions aimed at reducing gender bias in medicine at the educational level would be effective. A number of studies have shown that gender bias interventions in medicine, mostly among academic medical educators and students, can be effective. One of the first gender bias interventions in academic medicine, conducted by Fried and colleagues (1996), aimed to address obstacles in the careers of female academics. The intervention made a substantive improvement on women's careers in medicine with a 550% increase in the retention and promotion of junior female faculty and around half reporting that

promotions had increased and experiences of gender bias decreased (Fried et al. 1996). Carnes and colleagues (2015) more recently found that the implementation of a gender bias intervention for medical educators positively influenced gender attitudes and effectively increased the promotion of gender equity in members of the faculty. Girod and colleagues (2016) reported that an educational gender bias intervention in academic medicine had a positive impact on the implicit bias of faculty members. Despite the individual success of these interventions, gender bias is still being identified in multiple arenas within medicine. The reduction of gender bias in healthcare “requires systematic approaches to building awareness and transforming values among service providers, steps to improve access to health services and developing mechanisms for accountability” (Sen et al. 2007, p.xvii). Further, beliefs about gender are deeply embedded in social and organisational structures and practices, and adopting changes at only the curricula or faculty level may therefore be less successful or even ineffective (Benschop & Doorewaard 1998). Theobald and colleagues (2005) have argued that gender issues in healthcare cannot be legitimately tackled in medical education until such issues have been addressed by government policy that has then been integrated into institutional practice. This was confirmed by a study by Verdonk and colleagues (2008a) that found factors influencing the mainstreaming of gender in medical education existed at the faculty, organisation and policy levels. It is clear that in order to make gender issues and female health a priority within every sector of healthcare, interventions and programs therefore need to be implemented in combination with organisational and policy changes (Vlassoff & Moreno 2002). This thesis provides some of the groundwork for undertaking this important work.

3.6 Conclusion

An exploration of the literature has revealed the continued existence of gender bias in medicine and the detrimental effects this has on health. Representations that promote a narrow and normative body by excluding, othering or stereotyping particular bodies and behaviours can have severe consequences in a healthcare context. Attitudes within contemporary medicine seem to maintain historical views that value women’s bodies only in terms of their reproductive abilities, perceive the male as the norm, pathologise female differences and prioritise the gender binary. The gender-

biased views held by medical researchers, educators and practitioners has resulted in the underrepresentation of women and health-related gender issues, deficient sex/gender knowledge and the substandard medical treatment of women and sex/gender variant people, particularly when they are from marginalised and minority groups (Phillips & Ferguson 1999). With research revealing that the existence of gender bias within medical ideologies has adverse implications for healthcare, there is a significant need to locate and expose specific biases (Alexanderson et al. 1998; Braun & Wilkinson 2001; Phillips & Ferguson 1999; Stratton et al. 1995; Zimmerman 2000).

A repeated theme of this literature review is the role that medical education plays in constructing or supporting gender bias. The elimination of gender bias within medical education is therefore important as education provides students with professional knowledge about gender-related health issues. Further, a less biased perspective in education will give students fewer opportunities to adopt negative attitudes towards women and minority/marginalised identities (Hamberg 2008). As mentioned above, focusing on gender bias at the educational level is only one step in the process of elimination. Nevertheless, as this review has shown, it remains a central organising context and thus, research into the existence of bias within educational resources remains extremely important. The use of images in medical education is an area of particular significance, especially given perceptions that these provide an unbiased reflection of reality. The following section therefore focuses on the significance of visual culture, especially when it comes to representations of gender bias within medical discourse.

Part 2: Visual culture and gender bias in medicine

As shown in the previous section, medical discourse exhibits bias through gender exclusion, ‘othering’ and stereotyping, and these biases have multiple repercussions for healthcare. This thesis is concerned with how the practices of visual representation reflect and perpetuate these gender biases in medicine and what effect this has on its audience specifically and on healthcare practices in general. The significance of visual culture in producing meaning, particularly in regards to gender norms and the authoritative context of medicine, is discussed here.

3.7 Contemporary Visual Culture

The proliferation and impact of visual culture in contemporary society has been immense, and many argue that our society has become dominated by visual images (Croteau & Hoynes 2014; Kress 1998; Mitchell 2005; Rose 2001; Seward 1997; Shlain 1998; Stephens 1998). Art historian WJT Mitchell (2005, p.1) used the term “pictorial turn” to describe “the widely shared notion that visual images have replaced words as the dominant mode of expression in our time”. Mass communications historian Mitchell Stephens (1998, p.11) has made the claim that “the image is replacing the word as the predominant means of mental transport”. It is not the purpose of this thesis to claim that images are more significant than words. Rather, as a visual communicator, this research aims to look at one aspect of education that is perhaps understudied. At the very least, images have been recognised as significant contributors towards constructing and maintaining cultural ideas and values (Julier 2006). Visual scholar Gillian Rose (2001, p.6) has argued, “the visual is central to the cultural construction of social life in contemporary Western societies”. The role of images in both reflecting and shaping culture has meant that they are important tools for helping humans to understand the world (Fyfe & Law 1998, p.2). However, as is the case with all forms of discourse, images have the potential to construct flawed and potentially harmful views about the world and social power relations. The way in which images represent and influence unequal power positions has meant that the “particular forms of representation produced by specific scopic regimes are important to understand” (Rose 2001, p.9).

As a result of the increased use of images in our society, there has been a growing interest in researching visual communication within the humanities and social sciences (Ball & Gilligan 2010). Such research has shown the powerful effect that images have on not only the individual viewer but also on society at large. Several studies have shown that the inclusion of even incidental information in images can have an impact on the attitudes, beliefs and behaviours of individuals. For example, images have been shown to help improve news information retention and recall (Brosius et al. 1996; David 1998; Graber 1990; Newhagen & Reeves 1992) and to increase how important a viewer perceives social issues covered by the media (Aust & Zillmann 1996; Gibson & Zillmann 2000; Knobloch et al. 2003; Stone 1987; Wanta 1988; Zillmann et al. 1999). Gibson & Zillmann (2000) found that, in a report on tick disease, the use of images of ticks increased viewers' perception of risk and that this perception was even higher when the image included victims. Further, some research has demonstrated the pictures are more easily remembered and recognised when compared to words (Ally & Budson 2007; Anderson 2009; Brady et al. 2008; Mintzer & Snodgrass 1999; Nelson et al. 1976; Schacter et al. 1999; Shepard 1967; Standing 1973). Images in combination with text have also been shown to be more educationally effective than text alone (Mayer et al. 1995; Mayer 1984; 1989).

Of interest in this thesis is the way in which the visual portrayal of certain bodies, or lack thereof, has an impact on social attitudes. For example, multiple studies have revealed that negative and positive images of obese persons can, respectively, promote or reduce negative attitudes toward obesity and obese people (Pearl et al. 2012; Puhl et al. 2013; McClure et al. 2011). The role that images play in constructing the attitudes, behaviours and beliefs about specific groups of people is therefore significant as these "representations can reallocate roles [and] rearrange the social relations between the participants" (van Leeuwen 2008, p.32).

3.8 Gender and Visual Culture

Images are a central medium of communication when it comes to the social construction of gender and they play an important role in constructing gendered power relations (Pollock 1988). The visual narrative of embodiment can express fundamental ideas about what male and female bodies should look and act like, and

about what type of roles they should occupy in our culture. This is of particular concern when restrictive gender narratives become the mainstream of dominant discourses. A number of significant studies have identified the way in which visual representation of gender in art, media and education continue to perpetuate gender norms (Berger 1972; Bordo 1997; Carlson 2007; Gill 2009; Goffman 1979; Guo 2003; Jassey 1998; Kim 2012; Low & Sherrard 1999; Ortner 1974; Otlowski 2003; Schroeder & Borgerson 1998; Ullah et al. 2014; Zhao 2003; Zhu 2011). Elizabeth Brunner (2013, p.31) has argued that the “Patriarchal visual rhetoric of containment, evident in contemporary media portrayals, particularly of women, systemically and institutionally oppresses women”. Pooke and Newall (2008, p.161) have similarly suggested, “Through the stereotyping of gender characteristics and differences, art has mediated and reinforced patriarchal structures”. The perpetuation of normative gender stereotypes is significant as evidenced by the finding that repeated exposure over time to the same messages influences perspectives that are consistent with their content (Zajonc 2001). Repeated visual portrayals in the media “cultivates or creates a worldview that, although possibly inaccurate becomes the reality simply because we, as a people, believe it to be the reality and base our judgements about our own everyday worlds on that reality” (Baran & Davis 2006, p.330). Indeed, research has shown that cultural representations of gender have a significant influence on how women and men view themselves, as well as each other (Heinberg & Thompson 1995; Henderson-King et al. 2001; Irving 1990; Krawczyk & Thompson 2015; Pope et al. 2000; Press 1991; Radway 1984; Tannen 1990). For example, a number of studies have found that idealised images of thin females in the media cause increased body dissatisfaction in women (Cusumano & Thompson 1997; Dittmar et al. 2009; Glauert et al. 2009; Harrison et al. 2006; Heinberg & Thompson 1995; Irving 1990). Research has also shown that children adopt and recycle gender stereotypes portrayed in their home, social context and in visual media such as television and books (Brechet 2013; Martin et al. 1990; Martin et al. 2002; Oskamp et al. 1996; Powell & Abels 2002; Ruble et al. 2006). Lesikin (2001, p.281) found that gender bias and stereotypes in both written and visual texts had detrimental effects on female students, including feelings of exclusion, devaluation and reduced expectations. These effects highlight just some of the potential consequences that representations of gender can have.

3.9 Visual Culture in Science and Medicine

Science and medicine have long been viewed within society as objective providers of truth, despite the fact that the influences of social and individual values and biases make such complete objectivity impossible (Haraway 1988; Wilholt 2009). This is particularly true from a social constructionist perspective where the social context in which knowledge, including scientific knowledge, is located produces meanings that are contingent on the social ideologies of that context (Hacking 1999; Kuhn 1962). Modern Historian Ludmilla Jordanova (1989, p.5-6) has argued that scientific and medical discourse:

... are never simple descriptions or reflections of an actual state of affairs; that their rhetoric and their use of verbal and visual devices is constitutive of their character; and that no domain can be devoid of symbolic forms.

All forms of communication, including visual, articulate power relations and it is essential that we understand how texts, especially those that are perceived as unbiased, “realize, articulate and disseminate ‘discourses’ as ideological positions” (Kress & van Leeuwen 2006, p.14). Indeed, a number of feminist researchers have identified the way in which scientific discourse depends on narratives and metaphors as tools to help make sense of information, and that the choices made about how to frame this information not only lacks objectivity but also reveals certain biases (Haraway 1989; Haraway 1991; Longino 1990; Martin 1991). For example, Emily Martin’s (1991) examination of the way in which the fertilisation of the female egg by the male sperm is narrated reflects stereotypical conceptions of femininity and masculinity by casting the egg as passive and the sperm as active.

3.9.1 The authoritative role of scientific and medical images

Images are useful narrative and conceptual tools for helping communicate scientific knowledge and, as such, occupy a dominant and authoritative position within medical and scientific communication (Daston & Galison 1992; Jordanova 1989; Wall 2009). The seemingly authoritative nature that is provided by machine-

produced images (such as photographs) in particular further promotes the objectivity of science and medicine (Beaulieu 2001). Lorraine Daston and Peter Galison (1992, p.98) have argued that the introduction of mechanical image technologies has resulted in the:

... full-fledged establishment of mechanical objectivity as the ideal of scientific representation. What we find is that the image, as standard bearer of objectivity, is inextricably tied to a relentless search to replace individual volition and discretion in depiction by the invariable routines of mechanical reproduction.

Michael Shapiro (1988, p.124) has argued that photography in particular is “one of the most easily assimilated [forms of representation] into the discourses of knowledge and truth, for it is thought to be an unmediated simulacrum, a copy of what we consider the ‘real’”.

The assumed objectivity of scientific images is flawed, especially when considering that a single image is often used as prototype of an entire group, thus stripping away all within group variation. Indeed, this narrowing down of a group to a single representative individual is seen as one of the critical purposes of scientific images. For example, Daston and Galison (1992, pp.84-85) have argued that anatomical texts act:

... to standardize the observing subjects and observed objects of the discipline by eliminating idiosyncrasies ... to make nature safe for science; to replace raw experience – the accidental, contingent experience of specific individual objects – with digested experience.

However, accurate representation through standardisation is frequently impossible as the “typical is rarely if ever embodied in a single individual” (Daston & Galison 1992, p.87). Moira Gatens (1996, p.iiv-iiiv) has pointed out that, despite attempts to accurately represent the human body in anatomical textbooks, such a task is impossible as:

Human bodies are diverse and, even anatomically speaking, the selection of a particular image of the human body will be a selection from a continuum of differences. Many anatomical depictions which purport to represent the human body turn out to be depictions of white male bodies – with the bodies of others called upon to illustrate specific capacities: the female reproductive system, for example.

Choices are therefore always made about what to include in an image and this often results in either a form that is assumed to be most typical, or an idealised form, which is not just typical but also perfected (Daston & Galison 1992). Producing an idealised image is often viewed as being particularly beneficial for educational purposes. For example, although mechanical technologies such as photographs are considered to include less subjective information, they are limited to providing only surface level information and the original sources are not always functional as they can be “broken, dirty, bloody, crushed, distorted, and/or confusing” (Hodges 1989, p.104). In contrast, illustrations can remove unnecessary information, reveal layers beyond the surface and interpret and clarify something that would otherwise be visually confusing (Hodges 2003). Despite the benefits of illustration over photography, the illustrator’s act of interpretation, as well as requests made by clients, can include certain ideologically influenced decisions. For this reason, the choices made about how to visually represent scientific and medical knowledge have been critiqued by a number of feminist researchers (Gatens 1996; Haraway 1991; Meynell 2008). Letitia Meynell (2008, p.1) has asserted, “feminists should attend to pictures in science as distinctive bearers of epistemic content that cannot be reduced to propositions”. Similarly, Donna Haraway (1991, p.189) has argued that the increased use and dominance of visual technologies in science and medicine has become “unregulated gluttony” where “all perspective gives way to infinitely mobile vision, which no longer seems just mythically about the god-trick of seeing everything from nowhere, but to have put the myth into ordinary practice”. In producing images that are assumed, through the authority of science, to truthfully embody the typical, scientific discourse can promote a normative and unrealistic ideal. This issue is particularly difficult to address when it comes to images of

anatomy in medical education where educational materials repeatedly attempt to portray what a ‘normal’ body looks like (Wall 2009).

3.9.2 Anatomical images in medical education

The visual has become a critical part of medical discourse and education (Wall 2009). Kress & van Leeuwen (2006, p.14) have argued, “educationalists everywhere have become aware of the increasing role of visual communication in learning materials of various kinds”. This is particularly true of medical education as many of the ideas and much of the information it aims to convey “can be communicated best through visual cues. For instance, anatomy and its allied fields, embryology, histology, radiology and pathology, are highly visual domains” (Habbal & Harris 1995, p.69). Anatomical images are central for helping to document and share medical knowledge about the body (Roberts 1996). These visual representations of the body are important as they “make legible our invisible, visceral regions as well as our visible selves” (Wall 2009, p.133). Further, when viewed within the authoritative context of medicine, visual representations of anatomy hold “all the more persuasive power to activate and inform our body image” (Wall 2009 p.136). However, as bioethicist Alice Dreger (2004) has argued, we should be critical of the way in which anatomy visually defines the normal body as such a construction is burdened with social values and often assumes that any difference is inherently abnormal. For this reason the role that images in educational anatomical texts play in creating and supporting normative views about the gendered body is an area of critical concern. The following section outlines the theoretical framework used in this thesis for investigating anatomical images. This framework acknowledges the embodiment of images in context and how their construction and digestion occurs within a system of linked stakeholders, while also considering how specific aspects of images can contribute to social meaning and inequality.

3.10 The Production of Meaning in Images

In her book *Visual Methodologies*, Gillian Rose (2001, p.16) discusses three sites at which meaning is made in visual communication: “the site of the production of an image, the site of the image itself, and the site where it is seen by various audiences”

(Figure 6). By examining visual gender bias through the framework of these three dimensions, this thesis aims to provide a more comprehensive understanding of this bias, including the influence of its context and the effects on its audience. Rose (2001) further identifies the three modalities that exist at each of these sites, which contribute to the production of meaning. These modalities include: the technologies used to create the image such as painting, photography or the internet; the composition of the image, which includes its formal components such as colour and layout design; and the social components of the image, which includes the “economic, social and political relations, institutions and practice that surround an image and through which it is seen and used” (Rose 2001, p.17). Most analyses of medical illustrations have focused on the “density and arrangement of information, rather than the meanings of the images as representations of the body” (Elkins 1999, p128). The aim of these examinations has been to improve the functionality of medical information by exploring the technological and compositional components used to visually represent it rather than to provide an understanding of what social implications they present. The technological and compositional factors may indeed contribute to the social meaning produced in images. However, the primary aim of the current research is to examine the social components of visual representations of the gendered body. Specifically, this thesis aims to examine how gender is constructed in anatomical images and, by doing so, identify and articulate the ways in which gender bias is visually represented.

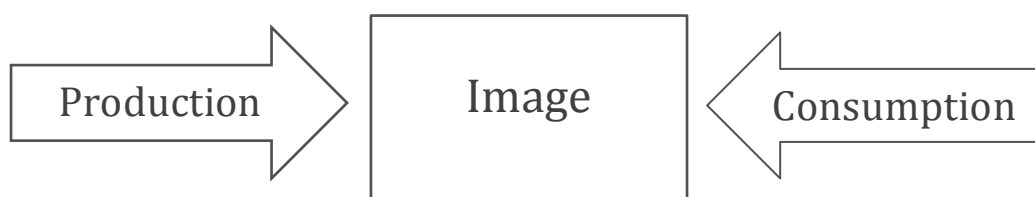


Figure 6. The three sites of meaning making in an image.

Previous literature has shown that gender bias exists within anatomical images (Giacomini et al. 1986; Lawrence & Bendixen 1992; Mendelsohn et al. 1994; Moore & Clarke 1995; Morgan et al. 2014). To date, no research has examined the production of gender-biased meaning at all three sites of meaning production in medical images. In order to undertake a comprehensive investigation into the

gendered meaning of medical images this thesis will undertake three separate but related studies that aim to investigate each site of meaning production. Based on this, the current research posits a number of aims. The next chapter of this thesis details these aims and the methodologies employed to explore them.

4 METHODOLOGY

Abstract

This chapter outlines the methodological approaches used within this thesis to examine gender bias within medical images. Specifically, it delineates the methodologies and aims of the three separate studies used to investigate the site of the medical image, its production and its audience. A detailed explanation of the research design is provided, as well as an overview of the more complex statistical methods used. In addition, specific methodological issues are discussed including an examination of causality as it applies to this thesis.

4.1 Introduction

The purpose of this thesis has been to examine if and how gender bias in medicine is created and sustained through images in anatomical textbooks. To address this aim, it was necessary to investigate the three sites of the image as proposed by Gillian Rose (2001, p.16):

1. The site of the image – the how and what of the image’s pictorial and physical composition.
2. The site of the production of the image – questions concerning the image’s commissioning, manufacture and publication or exhibition.
3. The site of the image’s audience – who sees the image and under what conditions.

The current research has therefore been divided into three separate but interrelated objectives: first, to identify what gender assumptions are encoded within images from anatomical textbooks; second, to investigate how the context in which medical illustrations are produced influences the inclusion of gender bias; and third, to examine the impact that visual gender bias in medical imagery has on its audience’s attitudes. This chapter explicates the aims of each study in more detail and outlines the methodological approaches that were used to examine them. The literature surrounding these approaches, as well as an explanation and justification of their relevance to this thesis, is given.

4.2 Study Aims

In order to address the objectives of this research, this thesis will test the following aims based on the interrelated spheres of image, production and audience.

Site of the image. In 1986, Giacomini and colleagues revealed that visual gender bias existed within anatomical textbooks. Since then, research has shown that this bias has been slowly decreasing (Lawrence & Bendixen 1992; Mendelsohn et al.1994). However, the last study to complete a comprehensive and systematic analysis of visual representations of gender bias occurred more than 20 years ago,

and an updated investigation to see whether this trend has persisted is required. Further, the studies in this area have examined limited boundaries of visual gender bias in terms of just reporting the representational frequency of gender in images of general and reproductive anatomy (Giacomini et al. 1986; Lawrence & Bendixen 1992; Mendelsohn et al.1994). The existence of previously unexplored visual gender bias is therefore possible. Thus:

The first aim of this thesis is to investigate whether visual gender bias found in previous research persists in the primary anatomical textbooks used in Australian Medical Schools, and whether visual gender biases that have previously been unidentified also exist.

Site of production. Previous studies on medical images have focused on how gender biases are visually represented. However, research has not examined how the site of medical image production contributes to the inclusion of bias. In order to fully understand all the implications of, and reasons behind, the choices made in how to represent something as significant as the gendered body, it is important that visual researchers place an examination of images into their broader context (Pauwels 2015). This context is not limited to the individual choices made by creators but also includes broader institutional and social discourses and conventions (Kress & van Leeuwen 2006). Medical illustrators, as the central players in the production of anatomical images, provide the most direct access to the context in which choices are made about how to represent the gendered body. Thus:

The second aim of this thesis is to identify the multilayered contextual factors that influence gender-biased representation during the production of medical image via the perspective of medical illustrators.

Site of the audience. The consideration of the audience is an essential part of producing effective visual communication whose entire function is to inform and persuade its viewers (Tyler 2006). Good visual design practice therefore examines the impact that visual communication has on its audience. However, in order to produce visual communication that is not only functional but also socially

responsible, the influence that images have on an audience's social beliefs and attitudes should also be scrutinised (Frascara 2006). Despite this, subtle concepts that have nothing to do with the primary purpose of an image, but which incidentally communicate socially constructed ideas and beliefs, are often left unexplored. The unconscious visual construction of marginalised and minority groups in stereotypical ways has the potential to negatively influence audiences' perceptions of these groups. Further, both implicit and explicit attitudes have a significant influence on behaviour (Greenwald et al. 1998; Perugini 2005). When considering the biased gender information that exists within visual medical communication, the question of what impact this has on future health practitioners' attitudes and beliefs are therefore crucial. Thus:

The third aim of this thesis is to investigate whether visual representations of gender-biased images have an effect on the implicit and explicit gender attitudes of students studying anatomy.

These three aims will be examined via three corresponding studies; Study 1: The identification of visual representations of gender bias in contemporary anatomical textbooks through content analysis; Study 2: An examination of the context in which medical illustrations are produced via a computer-assisted self-interview with illustrators; Study 3: An evaluation of the impact that gender-biased images have on the explicit and implicit attitudes of anatomy students via an online randomised control trial. The following section outlines the methodological approaches designed to explore the site of the image, its production and its audience.

4.3 Research Design

4.3.1 Mixed methods

In order to explore all three sites in a rigorous way, this thesis employed a mixed methods approach. Johnson and Onwuegbuzie (2004, p.17) have defined mixed methods research as a combination of “quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study”. The integration of both qualitative and quantitative research is important as it provides a

greater “breadth and depth of understanding and corroboration” (Johnson et al. 2007, p.123). Quantitative methods produce a rigorous explanation of phenomena by looking at large samples of data and, under some research designs (e.g. randomised control trials), can provide evidence of causality. In contrast, qualitative methods flesh out the results of quantitative data, allowing for more nuanced evaluation, highlighting new hypotheses, and providing insights into the mechanisms and processes that may explain the quantitative results. Historically, qualitative and quantitative research has been maintained as distinctly separate social science research methodologies (Johnson & Onwuegbuzie 2004). Though these two methodological paradigms were traditionally viewed as incompatible, this view has recently changed within the social sciences with many researchers utilising both to their full extent (Morgan 2007). Indeed, many researchers advocate for the integration of both qualitative and quantitative methods as a way of producing more comprehensive research outcomes and as a way to take advantage of both methods’ strengths while compensating for their individual weaknesses (Adamson 2005; Teddlie & Tashakkori 2003).

This thesis employed a mixed methods approach across the three studies. Study 1 employed a quantitative visual content analysis of images in anatomical textbooks. Study 2 utilised a computer-assisted self-interview (CASI) that consisted of a mix of open and closed-ended questions that was sent to medical illustrators from the Association of Medical Illustrators and the Medical Illustration Sourcebook. The results from this interview were analysed using a mix of quantitative and thematic analysis. Lastly, Study 3 recruited students studying anatomy at the University of Wollongong to complete a randomised control trial (RCT) in which participants received a visual treatment or control task. Linear regression was used to measure the effect of this task on a) implicit attitudes of gender bias using the Implicit Association Test (IAT) and b) explicit attitudes of gender bias using a questionnaire consisting of open and closed questions that were specifically developed for this research.

In the field of visual research, the method of content analysis, used in Study 1 and 2, is relatively common. However, the RCT experimental design employed in Study 3

is more novel. What follows is a brief discussion of the advantages of the approach taken. The non-experimental research provides an understanding of the processes and mechanisms that allow gender bias to exist and the context in which they occur. The RCT allows for the research to provide evidence of causation between content of medical illustrations and their effect on the attitudes of students studying anatomy. Since Hume (1777) we have known that evidence for causality requires three objectives to be met:

1. The variables in consideration are associated with each other.
2. The expected cause temporally precedes the expected effect.
3. There is an absence of other causes that may explain the association between variables (i.e. correlation does not equal causation).

An example case study where correlation is shown to not equal causation is the association found between increases in violent crime and increases in ice cream sales. The increase in violent crime is not due to ice cream itself or vice-versa. Rather, an unobserved variable (i.e. hot weather during summer) causes both: violent crimes occur more frequently when there are more people in public, and ice cream sales increase during hotter weather, both of which occur simultaneously during summer (Pearl et al. 2016).

A RCT meets the three objectives proposed by Hume (1777). Objective 1 is assessed using statistical analysis. Objective 2 is resolved by setting up an experiment in which an expected cause is manipulated and subsequent changes in the effect are observed. For example, a typical RCT in medicine might randomly assign individuals to receive either an active or placebo pill and monitor the subsequent effect on their medical symptoms. Objective 3 is solved in a RCT via the random assignment of participants to different groups. On average, any potential third variables will therefore be approximately equal across all groups and their potential additional influence will be shared equally across all groups. Thus, any difference in the outcome between groups cannot be due to these third variables. This is referred to as obtaining balance across all known and unknown confounding effects (Hagger-Johnson 2014). The extent to which balance is achieved is an assumption that

depends on sample size. Therefore, additional steps are sometimes undertaken to ensure balance on key confounding variables that the researcher assumes are of particular concern. This is done statistically via a regression adjustment. When a study both randomly assigns participants and uses regression adjustment it is said to be ‘doubly robust’ against third variable bias (Pearl et al. 2016).

4.3.2 Study 1: The Site of the Image

Images within scientific discourse not only communicate facts but also carry culturally constructed meanings (Kress & van Leeuwen 2006). Study 1 included an extensive visual content analysis that was used to identify what culturally constructed gender biases were encoded within contemporary visual representations of anatomy. This investigation focused on the visual representation of gender presented in anatomical textbooks used within Australian Medical Schools. The sample consisted of textbooks that were prescribed and/or recommended for use in anatomy subjects in 2014. All images in which the sex or gender of the subject could be determined were analysed using visual content analysis.

Content analysis is an objective and systematic examination and summarisation of key categories within messages in any form of social communication, including written, verbal and visual communication (Neuendorf 2002). Krippendorff (2013, p.24) has further defined it as a “research technique for making replicable and valid inferences from texts (or other meaningful matter) to the context of their use”. The strength of content analysis lies in its ability to make strong, unbiased quantifications about cultural patterns within large samples of information (Bryman 2012; Rose 2001; Weber 1990). Further, the methodological procedures of content analysis are empirical, methodical and use reliable and explicit classifications (Bell 2001).

The data obtained from the content analysis was statistically analysed. Relative frequencies (i.e. the number of occurrences of a particular outcome divided by the total number of occurrences across all possible outcomes) were used to determine whether differences existed between sex, other variables of interest, and their intersection. The statistical significance of these differences were evaluated using

chi-square (χ^2) tests as an omnibus test with standardised residuals used to identify specific combinations of variables that were significantly different from expectations. The chi-square test indicates whether there is a difference in observed frequencies from expected frequencies, which are calculated under the assumption that no relationship between variables exists (Crawley 2015). A small test statistic from the chi-square test means that the data were similar to the expected distribution of images and thus the null hypothesis is supported. A large test statistic indicates that the expected distribution is not similar to the observed data. For example, chi-square tests were used in Study 1 to examine the difference between sex and the occupational setting, or between sex and active roles. To determine statistical significance, the test statistic was compared to the known distribution of chi-square values, which provided the probability (p-value) of the test statistics emerging by chance under the assumption that the null hypothesis was true. Results were considered to be statistically significant at the $p < .05$ level and were taken to indicate that a systematic relationship between the variables of interest (e.g. sex and occupational roles) was likely to be present.

For each analysis there was likely to be a different number of images under investigation and therefore it would be difficult to tell whether, for example, difference among 20 images in one analysis and 30 images in another analysis were the same. Standardised residuals were therefore used to normalise (i.e. put on a common metric so that the results can be compared) the data from the chi-square testing by calculating the ratio of the difference between the observed frequency and the expected frequency relative to the expected frequency (Crawley 2015). This ratio follows a known distribution with values greater than absolute 1.96 consistent with a value of $p < .05$. Both the size and the direction of these residuals are important. A residual less than -2 indicates that the observed frequency is less than expected, and higher than 2 indicates that the observed frequency is higher than expected. The statistical program R was used to calculate all statistics (R Core Development Team 2014).

Odds ratios were also calculated for the results of Study 1. An odds ratio provides the odds of an event occurring and is calculated by dividing the probability of an event occurring by the probability of the event not occurring (Field et al. 2012). For

example, if the odds of a subject being male in a textbook are 5 and the odds of a subject *not* being male are 0.5 then the odds ratio is $\frac{5}{0.5}$ or 10. This means that a subject is 10 times more likely to be a male in a textbook. Odds ratios were provided as an effect size to indicate whether the effect was of practical significance, and this measure was considered alongside statistical significance when interpreting results.

Content analysis provides an effective means for discovering culturally constructed meanings in images; however, many researchers have noted its limitations (Rose 2001; Bell 2001). Rose (2001) identifies that this method ignores the roles that the sites of production or the audience play in the construction of meaning. Indeed, used alone, the method of content analysis “is seldom able to support statements about the significance, effects or interpreted meaning of a domain of representation” (Bell 2001, p.13). Similarly, Study 1 in isolation cannot provide insights into how bias is produced in anatomy texts or the effects it may have on its audience. For this reason the context in which anatomical images are created was examined in Study 2, and the effects of biased images on the attitudes of its audience were explored in Study 3.

4.3.3 Study 2: The Site of Production

Numerous researchers have commented on how the circumstances of construction can contribute to the meaning of an image (Brandt 1997; Kress & van Leeuwen 2006; Schrijvers 1993). This includes not only the kinds of technologies and mediums used but also the cultural, social, economic and political contexts in which they are made. The second study of this thesis accessed the site of production directly by asking medical illustrators to participate in a computer-assisted self-interview (CASI) that allowed for both open and closed-ended responses. A CASI is a form of interviewing where participants are able to provide answers on a computer. The method of collecting data online was chosen as it provides participants with anonymity. Research has shown that participants offer more extensive responses when taking part in computer interviews than when they are being interviewed face-to-face (Newman et al. 2002). Further, their responses are less likely to suffer from social desirability distortion, that is, responding in ways that are perceived as socially desirable rather than in ways that are in line with their actual beliefs, if provided with

such privacy (Richman et al. 1999). The CASI was used as a tool to investigate if and how the culture and ideologies that are part of the context of creation influence the formation of gender bias in medical illustrations. During the CASI, participants were asked about the context in which they create their images, including the role they and their clients play in making gendered decisions in their work. Participants were also asked questions concerning the broader values and beliefs of the medical institution.

The responses from the CASI were analysed using a mix of qualitative and quantitative methods. First, the frequencies of the closed-ended responses were assessed. Then, long-form responses were examined using the qualitative procedures of thematic analysis. Thematic analysis involves searching for and identifying significant and repeated themes in the data (Patton 2002; Ritchie & Lewis 2003; Vaismoradi et al. 2013). The coding process of this approach allows for the discovery of themes that contain both latent (underlying) and manifest (concrete) meanings (Marks & Yardley 2004). During thematic analysis, a number of codes that did not fit within the themes but which were identified as quantitatively significant (i.e. occurred repeatedly and were of interest to the study) were reported in a separate quantitative results section. The use of both qualitative and quantitative methods allowed for the most important themes and information within the entire data set to be identified.

Study 2 provided an understanding of the ways in which the context of the creation of medical illustrations influences the production of bias but did not account for the potential effects that biased medical images could have on the attitudes of their audiences. Although the negative influence of biased images could be assumed, a third study that examined their impact on attitudes would provide empirical evidence of this. If evidence supported this outcome, it could be used to support the need to address the issue of biased imagery in medical education.

4.3.4 Study 3: The Site of the Audience

Study 3 examined the site of the audience of medical illustrations in order to determine whether gender bias in contemporary anatomical images has a significant

impact on the attitudes of individual viewers. This approach is based on the tenet in Relational Frame Theory (RFT) that suggests that an individual's targeted attitudes are context sensitive and therefore open to change (i.e. if the context is changed, the attitude can also be changed; Blackledge 2003). To examine this, an experimental approach was taken to explore the effect of a visual priming task on students' implicit and explicit attitudes.

Study 3 used a RCT to assess the effect of an experimental design in which medical imagery was manipulated. A RCT randomly allocates participants into different priming groups: an experimental treatment group, or a control group in which no treatment was received (Cartwright 2010). Unlike other research designs, RCTs provide strong evidence of causality. In this study, the RCT consisted of two groups who viewed a visual priming task prior to undertaking an implicit attitudes test. The first group was the control group who were exposed to non-gendered imagery while the second group was a treatment group who were exposed to imagery that portrayed gender bias. After being presented with their respective images, all participants completed an Implicit Attitudes Test (IAT), which measured their implicit attitudes. Participants then completed an online questionnaire, which explored their explicit gender attitudes.

The data from the IAT was analysed by ordinary least squares (OLS) linear regression (this is mathematically equivalent to ANOVA). OLS linear regression uses a single independent variable to find the function that best fits the data. Multiple regression models were then used to test the effect of the treatment on the outcome by accounting for covariates such as age and gender (Field et al. 2012). Covariates are dependant variables that may predict the study's outcome and are potentially related to the treatment variable and thus may bias the effect of the treatment on the outcome. Controlling for these confounding variables helps to provide unbiased estimates of the treatment effect (Morgan & Winship 2014). Moderator analysis was used to find out whether the association between two variables depended on a third variable (such as gender or program of study). For example, the effect of the priming task on the IAT scores might be systematically larger for males than it is for females. Moderator analysis provides a test of whether differences of this type are statistically

significant. Results from the regression models were given on both the original metric of the variables, as well as in a standardised form or Cohen's *d*. Results in this form represent effect sizes and allow for an interpretation of whether the results are of practical significance. As with odds ratios, these are used in conjunction with statistical significance when interpreting results.

During the questionnaire, participants were given several opportunities to provide qualitative responses. In this case, whether a participant responded or not was the outcome of interest. Specifically, whether an individual responded to questions relating to their direct experience of gender bias was used as a measure of whether the priming task had made such experiences more salient. In these cases, data were analysed using chi-square tests and p-values were derived from the Monte-Carlo simulation.

4.3.5 A note on research transparency

In order for readers to assess the value of this research it is important to provide adequate information through the inclusion of detailed descriptions, data and of the development of study designs (Freeman et al. 2007). This thesis therefore includes several appendices that help to provide transparency in the research and its processes (See Appendices A-G). Online access to the data has also been provided via a link within each study chapter.

5 STUDY 1: THE SITE OF THE IMAGE

Abstract

Background: The unequal visual representation of women in anatomical textbooks has been well documented. However, this has not been recently re-examined and additional forms of gender bias, including gender stereotypes and the unequal representation of intersections of gender such as ethnicity, remain unexamined within these texts. An updated investigation of the equality of gender representations, as well as an examination of alternative representations of bias is needed.

Objectives: This study investigates if and how gender bias is represented within the primary anatomical textbooks used at Australian Medical Schools.

Method: A systematic visual content analysis was conducted on the 6004 images in which sex/gender could be identified, sourced from 17 major anatomical textbooks published from 2008-2013. A second, more in-depth content analysis was performed on the 521 narrative images found within the same textbooks.

Results: Representations of gender in images from anatomical textbooks were found to have slightly improved in equality since the last study was conducted over two decades ago. However, they remain predominantly male except within sex-specific sections. Further, other forms of bias were found to exist via the visualisation of stereotypical gendered emotions, roles and settings, in the lack of ethnic, age and body type diversity and in the almost complete adherence to a sex/gender binary.

Conclusion: This study represents evidence that, despite increased attention to gender issues in medicine, the visual representation of gender in medical curricula continues to be biased. The biased construction of gender in anatomical textbooks designed for medical education provides inadequate and unrealistic views of patients for future healthcare providers. Perspectives on diversity also need to be broadened within medical discourse.

Keywords: Gender bias, gender stereotypes, visual culture

5.1 Introduction

Previous research has shown that men are treated as the norm in educational medical texts while women are underrepresented and primarily identified by their reproductive attributes (Alexanderson et al. 1998; Giacomini et al. 1986; Lawrence & Bendixen 1992; Mendelsohn et al. 1994; Metoyer & Rust 2011; Moore & Clarke 1995). This is concerning given the influence that biased education can have on future healthcare practitioners' attitudes and behaviours (Burke et al. 2015; Risberg et al. 2003a; van Ryn et al. 2015). The current study provides a more current and comprehensive analysis of gender bias in educational material by examining whether images from anatomical textbooks include bias in the form of gender stereotypes and in the underrepresentation of the intersections of gender with other minority or marginalised groups. By employing a content analysis of images found in contemporary anatomical textbooks commonly used in Australian Medical Schools, this research identifies what cultural messages have been visually ascribed to the gendered body within an educational context.

5.2 Background

The pervasiveness and influence of visual culture in contemporary society has been well documented (see for example Chandler 2007, Mirzoeff 1998 and Rose 2001). Visual culture theorist Nicholas Mirzoeff (1998, p.5) has contended that Western culture is determined by the visual and "is best imagined and understood visually". The field of visual analysis has become an important sociological arena for deconstructing and understanding the world. Of interest in the current study is the role that images play in producing and maintaining socially constructed ideas and beliefs. Beyond their primary function of communicating facts, images have the ability to contain secondary information about social rules and values for constructs such as gender (Barry 1997; Dikovitskaya 2012). As Kress and van Leeuwen (2006, p.47) have argued, visual discourses:

... do not simply reproduce the structures of 'reality'. On the contrary, they produce images of reality which are bound up with the interests of the social

institutions within which the images are produced, circulated and read. They are ideological.

Images contain the power to not only passively present a particular view of reality but to also actively construct that reality. High exposure to reoccurring themes within images has been shown to influence attitudes, beliefs and behaviours in both implicit and explicit ways (Banks 2003). Further, reality is constructed by dominant discourse in a way that justifies and preserves existing power structures. For example, the way in which gender hierarchies and roles are visually represented in dominant discourses often supports and promotes patriarchal practices and structures. This makes the role that visual media plays in the construction of gender within the authoritative discourse of science and medicine particularly significant (Kress & van Leeuwen 2006).

The field of medicine, including the discipline of anatomy, is assumed to provide authoritative and objective representations of the human body (Moore & Clarke 1995). Social values and beliefs about gender “are inextricably linked to medicine and to medical practice, and are re-produced as scientific ‘fact’ through their location in medical texts” (Braun 2003, p.7). The discipline of anatomy deals directly with bodily structures and therefore plays a pivotal role in constructing normative bodies, not only in medicine but also in society in general (Moore & Clarke 1995). As a part of the broader medical and social environment then, anatomical discourses have the capacity to either reinforce or counteract negative gender norms and ideologies. This includes anatomical images, which can both reflect and inform the broader discourse within which they are situated. The existence of gender bias within the context of medical discourse therefore plays a significant role in influencing visual representations. Evidence of this can be seen in how a traditionally androcentric orientation within medical discourse has meant that, outside of reproductive areas, women are frequently underrepresented in images (Giacomini et al. 1986; Lawrence & Bendixen 1992; Mendelsohn et al. 1994).

As medical education is often a health practitioner’s first significant encounter with the culture of medicine, it is important to examine any existence of bias in the gender

ideology presented during this time (Risberg et al. 2003a). Hegemonic gender ideologies act as the standard by which men and women are both judged and understood. For example, Klinge (2010) has argued that by maintaining an ideology in which the White male body is understood as the norm, sex/gender and racial/ethnic differences in biological and social processes and symptoms remain understudied and therefore unknown in medicine. The lack of knowledge about the sex/gender and racial/ethnic differences in epidemiology, symptoms, diagnosis and treatment means that physicians have inadequate information when caring for diverse patients (Klinge 2010). The ideologies that are maintained and promoted in medical discourse broadly, and medical education specifically, can therefore have a significant influence on healthcare outcomes. The following section reviews existing research on gender bias in medical textbooks and identifies gaps in the literature.

5.2.1 Existing research

An increasingly large amount of research has focused on biased representations of women and their bodies in medicine (see for example Campo-Engelstein & Johnson 2014, Dijkstra et al. 2008, Morgan et al. 2014 and Turbes et al. 2002). These studies have examined the ways in which females are represented and compared to males in both medical images and texts. Similar to the current research, several studies have investigated the existence of gender bias in images from anatomical textbooks. In a 1986 study on representations of male and female bodies in eight anatomical textbooks, Giacomini and colleagues (1986) found that only 11% of all images, outside of urogenital sections were of women. For all images in which gender could be determined, a majority of 85% were male. Lawrence and Bendixen (1992) completed an exhaustive study on 31 anatomical textbooks used between 1890-1989 and found that the ratio of male images in these texts consistently outnumbered female images by approximately 2.5:1, and that males comprised 68% of all gendered images. They also found evidence that men were treated as the norm, with male-specific issues addressed before female-specific issues and sex-specific structures discussed with 'the' for men but specifically identified as 'female' for women. Mendelsohn and colleagues (1994) analysed 12 popular anatomical textbooks and found similar results with males again comprising 68% of all gendered images, and only 11% of images that did not represent the urogenital system being

female. In their examination of how the clitoris has been visually represented in medical textbooks, Moore and Clarke (1995) performed a visual analysis that focused specifically on representations of female genitalia in anatomical textbooks. They found that the clitoris was primarily either unrepresented and/or unclear and unlabelled. Recently, Morgan and colleagues (2014) analysed 10 anatomical textbooks used in Wales and France and, although not a quantitative study, they reported that most textbooks were male dominated.

Complementary to the visual research on gender bias, several studies have examined how women have been textually represented in medical textbooks. Petersen (1998) examined multiple editions of the highly successful and influential *Gray's Anatomy* and found that the female body was frequently presented in comparison to the male norm and was portrayed as inferior, weak, underdeveloped and defective. Alexanderson and colleagues (1998) investigated the foremost medical textbooks used in 1996 and also found that the male body was often positioned as the norm in that female health was given far less attention, gender differences were unexamined and traditional gender roles were reinforced. Turbes and colleagues (2002) examined 983 medical curriculum case studies used in an American university between 1996-1998 and discovered that these were male-dominated, did not correctly reflect gender differences in pathology, featured only 1.2% intersex individuals and, when race was identified, represented mostly White individuals. Lastly, Dijkstra and colleagues' (2008) examination of 11 of the leading medical textbooks used in the Netherlands between 2004 and 2006 identified that these texts lacked necessary gender-specific information.

Gender bias has also been identified in studies on gynaecological textbooks which, being female-specific texts, have focused on the existence of damaging gender stereotypes. In 1973, Scully and Bart (1973) conducted a pivotal study on 28 gynaecological textbooks published between 1943-1972 and found that representations of female sexuality were either non-existent or stereotyped as essentially reproductive and/or for the benefit of a woman's husband. Modelling her research on Scully and Bart's (1973) study, Koutroulis (1990) found that although improvements had been made since 1973, the same stereotypes still existed and

discussions about women's health and sexuality remained scarce. Emily Martin's (1991) influential study examined descriptions of the egg and sperm in gynaecology textbooks. She found that traditional gender stereotypes were used to frame the female egg as passive, vulnerable and dependent and the male sperm as active, superior and dominant. Martin (1991, p.489) highlights the distinctions made between the egg and sperm in one passage:

The egg is seen as large and passive. It does not move or journey, but passively "is transported", "is swept", or even "drifts" along the fallopian tube. In utter contrast, sperm are small, "streamlined", and invariably active. They "deliver" their genes to the egg, "activate the developmental program of the egg", and have a "velocity" that is often remarked upon. Their tails are "strong" and efficiently powered. Together with the forces of ejaculation, they can "propel the semen into the deepest recesses of the vagina". For this they need "energy", "fuel", so that with a "whiplashlike motion and strong lurches" they can "burrow through the egg coat" and "penetrate" it.

Updating Martin's (1991) research, Metoyer and Rust (2011) and Campo-Engelstein and Johnson (2014) similarly found that in gynaecology and science textbooks, respectively, stereotypical gender metaphors were used to portray female reproductive features and processes as secondary and passive, and male reproductive features and processes as primary and active.

5.2.2 Gaps in the research

Previous research has shown that visually, men are often treated as the norm in anatomical textbooks and women remain underrepresented except in reproductive sections. However, there has not been a large-scale systematic exploration of the visual representation of gender in anatomical textbooks since 1994. Thus, there is a need to explore the current ratio of female and male representation in medical textbooks. In addition, other than the stereotype that frames a woman's role as fundamentally reproductive, none of these studies have examined how gender bias can also be visually represented through gender stereotypes such as the representation of women in domestic roles and men in occupational roles. Further,

previous research fails to take into account the ways in which intersections of other oppressive systems, such as racism, can make the effects of gender bias exponentially worse. Images constitute a large part of medical discourse and visualisations of gender stereotypes contribute to the construction and regulation of gendered bodies and identities. Medical images therefore have the potential to either negate or reinforce damaging stereotypes about what a 'normal' body should look like, and influence social perceptions about gender. Illustrations, photos, diagrams and models are important visual tools in anatomical studies that can carry socially constructed gender signifiers. These signifiers can be represented through what Kress and van Leeuwen (2006) have called conceptual images, which represent static concepts, or narrative images, which represent an unfolding story. Previous research on gender bias has not considered the distinction between conceptual and narrative images. However, narrative images are significant as they carry additional social information, such as occupational role, gaze and emotion. Narrative images are also less restricted by the need to provide purely clinical information, as the narrative framing of an image operates in a semi-autonomous manner to that of the medical information being described. In this way, narrative images can provide a window into how gender is explicitly and implicitly viewed within medical discourse. In the following section the significance of gender stereotypes will be considered for both conceptual and narrative representations.

5.2.3 Gender stereotypes

In the field of medicine, gender bias exists not only in the neglect of male or female health issues or gender differences in general but also in gendered stereotypes (Dijkstra et al. 2008; Hamberg 2008). As a process of cognitive categorisation and generalisation, stereotyping can have positive effects. However, many researchers have found evidence that the negative implications of stereotypes often outweigh the positive benefits (Bobo 1999; Hegarty & Pratto 2004; Meisner 2012; Pratto et al. 2007). Prevailing gender stereotypes play a significant role in legitimatising and perpetuating social norms and in producing discrimination (Burgess & Borgida 1999; Hoffman & Hurst 1990; Jost & Banaji 1994; Sidanius & Pratto 1999). Further, research has shown that those who contravene gender stereotypes are often cast as socially deviant and penalised for this (Costrich et al. 1975; Eagly & Karau 2002;

Goffman 1959; Heilman et al. 2004; Rudman & Glick 2001). Traditional gender stereotypes underlie and produce social expectations for female and male roles, occupations, behaviours, personality traits and physical attributes (Deaux & Lewis 1983; Eagly 1987). They also influence the way scientific and medical discourse view and represent the human body (Martin 1991; Tuana 1989). Stereotypical physical attributes can be represented in both conceptual and narrative images, while roles, occupations, behaviours and traits are usually expressed through narratives.

Gendered physical attributes. Gender stereotypes exist in the narrow and idealised physical attributes associated with masculinity and femininity. The use of gendered stereotypes in portrayals of the physical body can act, in a Foucauldian sense, as a form of disciplinary power that regulates which body type is normative and dictates the standards for which gender, age, race and body type are socially valued (Saltzberg & Chrisler 2003). For men, these stereotypes predominantly revolve around indicators of their physical strength while for women they encompass not only body types but also complex notions of beauty (Follo 2010). Indeed, our society has constructed attractiveness as “one of women’s most important assets, and something all women should strive to achieve and maintain” (Baker-Sperry & Grauerholz 2003, p.185). Further, the beauty standard set for women is a homogenous ideal that reflects very few actual women and is therefore impossible for most to achieve (Deliovsky 2008). Indeed, dominant female beauty norms have been shown to increase women’s body dissatisfaction (Cusumano & Thompson 1997; Glauert et al. 2009; Heinberg & Thompson 1995; Irving 1990). The pervasive representation of these female beauty standards is what has exaggerated the importance of female appearance, thereby creating unrealistic and unhealthy ideals that influence cultural perspectives. Concerningly, when normative beauty standards are reproduced in the authoritative context of medicine they can conflate health with these stereotypes of beauty. Certainly medical discourse has participated in a long history of equating female health with idealised beauty (Gilman 1995). Additionally, this ideal female body invokes traditional stereotypes in order to highlight both reproductive and moral health (Gilman 1995).

Weight and strength are a central part of the normative gendered body. The feminine body is stereotypically portrayed as thin and toned (Krane et al. 2004). Thinness in particular has been the most dominant and influential beauty standard for women for the last 50 years (Calogero & Thompson 2010). A study by Fikkan and Rothblum (2011) found that weight bias in medical practice resulted in fat women receiving inadequate medical care. The already restrictive normative expectation of thinness has become increasingly complex with the contemporary requirement that the female body should also have “well-defined, but sleek, muscle tone” (Erchull 2015, p.163). Paradoxically, the ideal female body is increasingly expected to be fit, yet in a way that maintains slenderness and is comparatively weaker than the male body (Glick & Fiske 1996). Indeed, in contrast to the slim and toned female body, the ideal male body is expected to be large, muscular and thus present an overall image of strength (Roth & Basow 2004). Trends towards the normalisation of a toned female body are complicated by the traditional view that the female body is weak, especially in comparison to the male body, which is never allowed to reveal weakness (Follo 2010). Historically, one of the reasons provided for why women could not participate in the public domain was their supposedly frail or weak bodies and minds (Dowling 2000). In a medical context this could have implications for representations of health. For example, aligning with this particular gender stereotype could mean that women are more likely to be represented as unhealthy or injured than men.

Closely connected with social views that prioritise the fit body is also the social preoccupation with maintaining a young body that has resulted in prevalent age discrimination. Youth is strongly associated with beauty ideals and with femininity in particular (Wearing 2007). Indeed, the social penalties that the aging female body faces are far more extreme than they are for men (Cruikshank 2009; de Beauvoir 1949; Sontag 1972; Woodward 1999). In line with the aging female being viewed by society as losing her beauty, older women are more likely to have increased body dissatisfaction (Bedford & Johnson 2006; Lewis & Cachelin 2001; Mangweth-Matzek et. al 2006; Peat et al. 2008; Webster & Tiggemann 2003). Older women are perceived to “lose their social value simply by growing old” due not only to the fact that aging women are seen to lose their youthful looks but also because they are no longer able to reproduce (Garner 1999, p.4). Indeed, in addition to physical beauty,

women's value in society comes mainly from her ability to reproduce (Clarke 2011; Markson 2001). The social irrelevance of older women is further exacerbated by the absence of the aging female body from popular culture (Baumann & de Laat 2012; Bessenoff & Del Priore 2007; Lemish & Muhlbauer 2012). Significantly, this absence is reflected in healthcare with older women being underrepresented in medical research (Bird 1999; Morse et al. 2004).

One of the most disturbing conventions in normative beauty standards is the racialisation of femininity. Within Western society, visual discourse portrays whiteness as normative and racial diversity is consistently underrepresented (Dyer 1997). The long history of over-representing whiteness has contributed to a normative femininity that is White (Collins 2004; Frankenberg 1993; Young 1999). Susan Bordo (2003, p.25) has argued that existing representations of racially marginalised women are “explicitly framed as exotica”, and are never “permitted to overwhelm the representation and establish a truly alternative or “subversive” model of beauty or success”. Non-White representations can also act to make whiteness and its associated attributes even more visible (Dyer 1997). As such, the White female has become the signifier of an ultimate femininity that denotes not only beauty but also other, equally damaging, stereotypes such as motherhood and purity (Deliovsky 2008). Women of colour already face inequality in healthcare (Balsa & McGuire 2003; Fiscella et al. 2000). The added bias that being White is more feminine could also have negative outcomes in a healthcare setting.

The choices made about how to conceptually represent anatomical bodies reveal a particular worldview about what gendered physical attributes are considered normative in a medical context. The lack of visibility of fat, old and/or ethnically diverse women socially devalues them. However, in comparison to conceptual images, narrative images may present an even clearer insight into this context due to the additional social content that they carry. What follows is a discussion of the importance of the gender roles, occupations, behaviours and traits that are important to consider when exploring narrative images in particular.

Gendered roles and occupations. During the Industrial Revolution, gender roles were separated into the male public sphere, such as political roles, and the female private sphere, such as domestic roles (Nicholson & Fisher 2014). This in turn contributed to the perspective that men and women were unequal and opposite (Lacquer 1990). Despite the fact that this division is no longer so extreme in Western society, the legacy of its influence remains as, not only do women continue to do most of the domestic work (Arrighi & Maume 2000; Fuwa 2004; Kan et al. 2011; Knudsen and Wærness 2008; Lachance-Grzela & Bouchard 2010), but they are also still being primarily portrayed in domestic roles (Blumberg 2007; Gooden and Gooden 2001; Lee & Collins 2010; Mills & Mustapha 2015; Sheehan 2014). One of the most ubiquitous social stereotypes has been that a woman's value lay almost solely in her role as a mother and wife (Wood 1994). As has been shown in previous research, the primary association of women with their reproductive functions and the consequent assumption that their value lies in their role as a mother is a pervasive stereotype within medical discourse (Lawrence & Bendixen 1992; Verdonk et al. 2009).

Despite the prevalent representation of females in domestic roles, women are increasingly less restricted to the private domain and their participation in the workforce has significantly improved over the last few decades (Major & Germano 2006). Significantly, research has shown that men are more rigid in adhering to gender stereotypes while women are more likely to adopt roles, behaviours and traits that have been traditionally seen as male (Durkin & Nugent 1998; Powlishta 2000). However, while women are more likely to cross-occupational domains than men, traditional gender occupations, such as those associated with the labour and domestic spheres, continue to be dominated by the expected gender. For example, managerial and blue-collar occupations are considered to be masculine and are indeed male dominated while female-dominated positions, such as nursing and teaching, are considered to be feminine (Rudman & Glick 2008). The division of social and labour roles by gender in social representations not only encourages stereotypical thinking but also influences the gendering of behaviours, traits and physical attributes.

Gendered behaviours and traits. A number of studies have found that social expectations of feminine and masculine traits and behaviours continue to align to

stereotypical gender roles (Prentice & Carranza 2002). The persistence of stereotypical gender behaviours and traits can be seen, for example, in the pervasive portrayals of women as passive and men as active (Gauntlett 2002; Mulvey 1975; van Zoonen 1996). Research has further shown that men and women are likely to be socially penalised for displaying behaviours and traits that are outside of stereotypical gender roles (Rudman & Fairchild 2004; Rudman et al. 2012). Psychologist Alice Eagly (1987) has argued that the gendered division of labour contributes to gender role stereotypes. Specifically, attributes associated with domestic roles, and therefore femininity, include being nurturing, emotionally expressive and dependent while attributes associated with public roles, and therefore masculinity, include being assertive, rational and independent (Holland & Skinner 1987; Macionis 2012; Martin & Ruble 2004; Wood 1994).

Passive and active roles. The construction of gender as active for males and passive for females has been a persistent social stereotype (Campo-Engelstein & Johnson 2014; Davidson 1981; Metoyer & Rust 2011). The assignment of these roles is significant as it positions men in roles of control and power. The active male and passive female roles can be visually represented in two ways: through a narrative expression of action (active) or inaction (passive), or through the ‘gaze’ (Kress & van Leeuwen 2006). The gaze is an important visual element because it “implies more than to look at – it signifies a psychological relationship of power, in which the gazer is superior to the object of the gaze” (Schroeder 1998, p.208). The act of ‘looking’ is traditionally understood as part of the active male role while the passive role of being looked at is perceived as a female characteristic (Mulvey 1975). According to Kress and van Leeuwen (2006), when a represented individual looks directly at the reader, the gaze can function as an active demand for some kind of connection with the viewer. Conversely, when a represented individual instead looks away, they become a passive object to be examined by the viewer (Kress & Van Leeuwen 2006). In this way the gaze contributes to a passive or active role for the gender being represented.

Stereotypical displays of emotion. Gender stereotypes also influence expectations of masculine and feminine emotion. Historically, women have been regarded as

emotionally sensitive while men were considered to be far too rational and physically oriented to display emotion (Libbon 2007). The perception that women both experience and express emotion more than men remains one of the most common gender stereotypes (Kelly & Hutson-Comeaux 1999; Plant et al. 2000). Not only are women assumed to experience emotion more often and intensely, but men are also usually stereotyped as being either emotionless or inexpressive of their emotions (Cranny-Francis et al. 2003). An exception exists in the association of men with the negative emotions of anger and annoyance, which are acceptable, if not encouraged, as they reinforce the masculine characteristics of being aggressive and dominant (Davidson 1981). The stereotype of women as emotional has implications for healthcare. Research has shown, for example, that physicians are more likely to perceived female reports of pain and other symptoms as being emotional and therefore unreal (Hoffmann & Tarzian 2001). As such, they are more likely to diagnose female symptoms as psychological while male symptoms for the same diseases are more likely to be diagnosed as somatic (Bernstein & Kane 1981; Colameco et al. 1983; Hamberg et al. 2002; Hoffmann & Tarzian 2001). Women are conventionally perceived to express emotions of sadness and fear. However, the idealised female is expected to express only positive emotions and to mask negative emotions (Johnson & Shulmans 1988; Parkins 2012; Sheehan 2014). Indeed, research has shown that many women are hesitant about sharing the full extent of their symptoms with their doctors due to the general fear that they will be labelled as emotional and accused of overreacting (Lichtman et al. 2015; Munch 2004; Wenger & Collins 2005).

Conclusion. In summary, numerous studies have identified the ongoing pattern of treating the male body as the norm and relegating the majority of female bodies to reproductive chapters. It is critically important that gender representations in medical textbooks continue to be scrutinised and that other forms of bias are also identified. Existing research on anatomical textbooks has explored the issue of equality in visual representations of gender quantitatively, but a more in-depth exploration of other manifestations of inequality is required. Beyond equal representation, there are other factors that can influence the perception and treatment of women and their bodies such as gender stereotypes surrounding physical appearance, behaviours and roles.

Likewise, much previous research has neglected to examine how gender intersects with other marginalised and minority groups to contribute to bias. Utilising theories about gender stereotypes and intersectionality, this research will investigate the question of whether visually encoded gender signifiers exist within anatomical textbooks and whether these demonstrate a harmfully biased view of gender.

5.3 Hypotheses

The overall aim of this study is to investigate whether visual representations of gender in anatomical textbooks continue to be unequal, and if previously unexplored visual gender biases also exist. Indeed, it is expected that the results of this content analysis will reveal several kinds of gender bias within anatomical textbooks. Based on a review of the literature, a total of 11 hypotheses were proposed for this study: six for Analysis 1 (all images) and five for Analysis 2 (narrative images only).

Analysis 1 hypotheses:

H1.1: Anatomical textbooks will have a higher visual representation of men than women.

H1.2: Anatomical textbooks will have a higher visual representation of women than men in sex-specific images.

H1.3: Women in anatomical textbooks will be more frequently White and less racially diverse than will men.

H1.4: a) Women in anatomical textbooks will be more frequently visually represented with toned body types while b) men will be more frequently represented with muscular body types.

H1.5: Women in anatomical textbooks will be more frequently visually represented as young than will men.

H1.6: Women in anatomical textbooks will be more frequently visually represented as unhealthy or injured than will men.

Analysis 2 hypotheses:

H1.7: Men in anatomical textbooks will be more frequently visually represented in traditional gender roles than will women.

H1.8: Women in anatomical textbooks will be more frequently visually represented in domestic settings while men will be more frequently represented in occupational settings.

H1.9: Men in anatomical textbooks will be more frequently visually represented in active roles while women will be more frequently represented in passive roles.

H1.10: The gaze of men in anatomical textbooks will be more frequently directed to the viewer while women will more frequently look away.

H1.11: Women in anatomical textbooks will display more positive and less neutral and negative emotions than will men.

5.4 Methods

5.4.1 Study design and implementation

The current study used quantitative content analysis to examine visual representations of gender in anatomical textbooks. The method of content analysis provides clear and systematic procedures for objectively evaluating the social values and beliefs found in large quantities of data (Bryman 2012; Neuendorf 2002; Rose 2001). Specifically, content analysis is useful for exploring: 1) the inclusion or exclusion of certain ideas and information; 2) the frequency with which certain ideas and information are included, indicating their level of perceived importance; and 3) the subjective attribution of positive, negative or stereotypical characteristics to certain ideas and information (Krippendorff 2013). Content analysis facilitates the testing of these issues via the quantification of distinct categories found within images from anatomical textbooks (Bell 2001; Krippendorff 2013). It is one of the most commonly applied methods in media studies and has been successfully used to explore gender issues in a variety of studies, many of which focused on visual representations (see for example Gerding & Signorielli 2014, Goldey 2014, Kempner 2006, Kordjazi 2012, Mateos et al. 2014, Neuendorf 2010 and Rudy et al. 2010).

5.4.2 Textbook sample

Contemporary anatomical textbooks used in Australian Medical Schools (based on the website: <http://www.australianuniversities.com.au/schools/medical/>) were examined for visual gender bias. Textbooks that were included in analysis were those that were prescribed and/or recommended for anatomy subjects at Australian universities during the 2013-2014 academic year. These were identified from online course information provide by medical schools or from the online Co-op or university bookshops, which list textbooks used for medical classes in all Australian universities that offer medical education. This resulted in a total of 17 anatomical textbooks that were published between the years 2008 and 2013. From these textbooks, all images in which the sex or gender of the subject could be determined were analysed. Physical indicators of sex (such as genitalia etc.) and cultural indicators of gender (such as dress, hair etc.) were used to select images and resulted in the identification of 6004 images for analysis. The lead author coded all images and an additional trained coder coded a random sample of images. The inter-rater reliability was always above .90 and ranged from .93 for age to .99 for ethnicity, indicating good agreement.

5.4.3 Development of a coding schema

A coding schema was designed to ensure that the data collection was consistent across each textbook (Appendix A). The coding categories developed for the initial analysis aimed to collect general data on how gender was represented in all images. Codes were developed from the initial screening of images and then categories were revised, added and removed where detailed exploration of the images suggested this was required. The final categories included: the type of illustration (i.e. conceptual, narrative); whether the image was meant to illustrate something sex-specific; gender/sex; ethnicity; age; body type; and if the subject was represented as healthy, unhealthy or injured.

This initial analysis was extensive and explored which gendered social constructs were represented in these anatomy images. However, analysis of images that were identified as narrative, in which an active story was shown to be unfolding, contained added information about gender roles than those identified in conceptual images.

Again, using a random sample of images, a coding schema was developed based on traditional gender stereotypes in order to carry out a more in-depth analysis on these narrative images (Appendix A). The following additional categories were identified: the subjects work role (i.e. occupational, domestic); the specific narrative role; whether this was a traditional or non-traditional gender role based on the subject's sex; whether their role was passive or active; whether their gaze was directed towards or away from the viewer; and their facial expression/emotion.

5.4.4 Data analysis

The data from the content analysis was used to determine how the ratio of men and women differed overall, as well as in specific representational arenas, and whether their gendered representation was in any way negatively stereotyped. Relative frequencies were used to determine whether relationships between gender and other variables were present in the data. The chi-square test was used to assess whether these relationships were statistically significant. Results were considered to be significant at conventional levels (i.e. $p < .05$). Exploration of where the significant differences lay was based on exploring the standardised residuals of the chi-square tables where any cell with a residual over 1.96 was taken to be significant. All data can be viewed at: https://figshare.com/articles/Study1_Data/3798213

5.5 Results

5.5.1 Analysis 1: all images

From the 17 anatomical textbooks examined, a total of 6004 images in which the gender of the subject could be determined were quantitatively analysed for gender bias.

Hypothesis 1: Anatomical textbooks will have a higher visual representation of men than women. Overall, men were represented more frequently than women in anatomical textbooks: $\chi^2(1) = 497.17, p < .001$. The odd's ratio (OR) of males to females in the 17 anatomical textbooks was 2.22 (SD = 0.94), demonstrating that for every image of a female there were more than two images of a male. There was a large variation between books in this regard, ranging from almost no difference in gender representation (OR = 0.99) to a considerable gender difference favouring

males (OR = 4.43). However, even in textbooks where the ratio of males to females was close, men still outnumbered women in all but one book (Table 1). There were only five intersex representations across all books.

Table 1
Odds Ratios of Being Males by Book

Textbook	Year of publication	Year of 1 st edition	Odds male	<i>p</i> value
General Anatomy, 2 nd ed. (Eizenberg et al.)	2008	2006	4.43	***
Last's Anatomy: Regional and Applied, 12 th ed. (Sinnatamby)	2011	1954	3.40	***
Color Atlas of Anatomy, 7 th ed. (Rohen et al.)	2011	1983	3.31	***
Gray's Anatomy for Students, 2 nd ed. (Drake et al.) ¹	2010	2005	2.95	***
Clinical Atlas of Human Anatomy, 7 th ed. (Abrahams et al.)	2013	1977	2.60	***
Atlas of Anatomy, 1 st ed. (Tank & Gest)	2009	2009	2.51	***
Atlas of Anatomy, 2 nd ed. (Gilroy et al.)	2012	2008	2.51	***
Clinical Anatomy by Regions, 9 th ed. (Snell)	2012	2008	2.44	***
Atlas of Human Anatomy, 5 th ed. (Netter)	2011	1989	2.24	***
Grant's Atlas of Anatomy, 13 th ed. (Agur & Dally)	2013	1951	1.77	***
Human Anatomy, 3 rd ed. (McKinley & O'Loughlin)	2012	2005	1.75	***
Essential Clinical Anatomy, 4 th ed. (Moore et al.)	2011	1996	1.54	***
Human Anatomy, 7 th ed. (Martini et al.)	2012a	1995	1.50	***
Clinically Oriented Anatomy, 7 th ed. (Moore et al.)	2013	1980	1.41	***
Fundamentals of Anatomy & Physiology, 9 th ed. (Martini et al.)	2012b	1989	1.28	*
Anatomy & Physiology, 6 th ed. (Saladin)	2012	1989	1.11	NS
Human Anatomy & Physiology, 9 th ed. (Marieb & Hoehn)	2012	1998	0.99	NS

Notes. * $p < .05$, *** $p < .001$, NS = not significant.

¹ Professor Bernard Moxham (2016, personal correspondence) noted that unlike my own research, his research with colleagues (Morgan et al. 2014) had found the representation of gender in *Gray's Anatomy* to be balanced. However, after a reanalysis, only a slight difference in my results was identified and the female/male ratio remained the same. It was concluded that this discrepancy was likely due to differences between the two studies in the inclusion criteria for gendered images.

Hypothesis 2: Anatomical textbooks will have a higher visual representation of women than men in sex-specific images. Images that were meant to show distinctly female or distinctly male anatomical feature were identified as sex-specific. A total of 2089 (35%) images were labelled as sex-specific to men or women. Overall, women were more likely to be represented in sex-specific than non sex-specific images when compared to the same ratio for men: $\chi^2(1) = 607.92, p < .001$. This effect was large with an odd's ratio of 4.01 (frequencies and standardised residuals are in Table 2).

Table 2
Relationship Between Sex and Sex-specific Content

Sex-specific content	Frequencies		Standardised Residuals	
	F	M	F	M
Not sex-specific	967	2970	-24.68***	24.68***
Sex-specific	1169	893	24.68***	-24.68***

Notes. Images labelled as intersex were not included in this analysis. F = female, M = male. *** $p < .001$.

Hypothesis 3: Women in anatomical textbooks will be more frequently White and less racially diverse than will men. A total of 3869 images were coded for ethnicity, including Asian, Black, Hispanic, South Asian, Middle Eastern and White. The majority of these representations were White (78%). Overall, there was a significant effect for sex difference with women being significantly more likely to be White rather than non-White relative to the same comparison for men: $\chi^2(1) = 19.43, p < .001$ (OR = 1.46; frequencies and standardised residuals are in Table 3).

Table 3
Relationship Between Sex and Ethnicity

Ethnicity	Frequencies		Standardised Residuals	
	F	M	F	M
Non-White	225	625	-4.45***	4.45***
White	1044	1975	4.45***	-4.45***

Notes. See Appendix B for a break down of non-White ethnicities. F = female, M = male. *** $p < .001$.

Hypothesis 4: a) Women in anatomical textbooks will be more frequently visually represented with toned body types while b) men will be more frequently represented with muscular body types. The representation of body type was accounted for during the content analysis by categorising images as muscular, toned, untoned, overweight, pregnant or physically disabled. Women and men were unequally distributed among the different body type categories in a statistically significant manner: $\chi^2(4) = 761.60, p < .001$. Males were significantly more likely to be represented as muscular than as any other body type (see Table 4). Not only were the majority of men (65%) represented as muscular but they were also 42 times more likely to be muscular than females. Women were statistically significantly more likely to be represented as toned (73%) compared with other body types (Table 4). Only 2.7% of images in which body type could be identified represented people with a physical disability and females were more likely than men to be represented as physically disabled (OR = 2.6).

Table 4
Relationship Between Sex and Body Type

Body Type	Frequencies		Standardised Residuals	
	F	M	F	M
Muscular	25	1211	-26.19***	26.19***
Overweight	14	36	0.51	-0.51
Physically disabled	30	37	3.81**	-3.81**
Toned	456	562	19.08***	-19.08***
Untoned	96	27	13.98***	-13.98***

Notes. F = female, M = Male. ** $p < .01$, *** $p < .001$.

Hypothesis 5: Women in anatomical textbooks will be more frequently visually represented as young than will men. Most images were coded as adult (F = 1731, M = 3447). However, the stage of adulthood was unclear in these images. Only 2.2% images could be confidently classified into young adult, middle age or elderly stages of adulthood. When comparing these three classifications, females were

significantly more likely than males to be represented as a young adult: $\chi^2(2) = 7.5, p = 0.02$ (frequencies and standardised residuals are in Table 5).

Table 5
Relationship Between Sex and Age

Age	Frequencies		Standardised Residuals	
	F	M	F	M
Young adult	21	4	2.65**	-2.65**
Middle-aged	22	21	-1.66	1.66
Elderly	29	21	-0.57	0.57

Notes. F = female, M = male. ** $p < .01$.

Hypothesis 6: Women in anatomical textbooks will be more frequently visually represented as unhealthy or injured than will men. Overall, there was a significant difference in the way in which men and women were represented as either healthy or unhealthy: $\chi^2(2) = 22.30, p < .001$ (frequencies and standardised residuals are in Table 6). In particular, women were significantly more likely to be represented as injured or unhealthy than were men.

Table 6
Relationship Between Sex and Health

Health	Frequencies		Standardised Residuals	
	F	M	F	M
Healthy	1951	3640	-4.25***	4.25***
Injured	50	42	3.78***	-3.78***
Unhealthy	135	181	2.71**	-2.71**

Notes. F = female, M = male. ** $p < .01$, *** $p < .001$.

5.5.2 Analysis 2: narrative images

Following the analysis of all images, the current study considered those coded as narrative in more detail in order to consider what social role information they communicated. The number of narrative images found within all anatomical textbooks analysed was 521, which was 9% of all coded images (frequencies of narrative images for each of the analysed books are shown in Table 7). Of these,

45.3% were female and 54.7% were male. This is in contrast to the fact that males comprised 64% of all images from the entire study. The improvement in the equality of representation was statistically significant: $\chi^2(1) = 24.14$, $p < .001$, although only moderate with an odd's ratio of 1.58.

Table 7
Frequency of Narrative Images by Book

Textbook	Year of publication	Frequencies
Human Anatomy & Physiology, 9 th ed. (Marieb & Hoehn)	2012	149
Fundamentals of Anatomy & Physiology, 9 th ed. (Martini et al.)	2012	99
Clinically Oriented Anatomy, 7 th ed. (Moore et al.)	2013	68
Anatomy & Physiology, 6 th ed. (Saladin)	2012	61
Human Anatomy, 7 th ed. (Martini et al.)	2012	58
Human Anatomy, 3 rd ed. (McKinley & O'Loughlin)	2012	23
Essential Clinical Anatomy, 4 th ed. (Moore et al.)	2011	22
General Anatomy, 2 nd ed. (Eizenberg et al.)	2008	11
Clinical Anatomy by Regions, 9 th ed. (Snell)	2012	10
Gray's Anatomy for Students, 2 nd ed. (Drake et al.)	2010	9
Grant's Atlas of Anatomy, 13 th ed. (Agur & Dally)	2013	3

Hypothesis 7: Men in anatomical textbooks will be more frequently visually represented in traditional gender roles than will women. Overall, there was a significant effect for sex difference in the distribution of images among traditional and non-traditional roles: $\chi^2(1) = 114.81$, $p < .001$ (frequencies and standardised residuals are in Table 8). Men were more frequently represented in traditional roles while women were more frequently represented in non-traditional roles.

Table 8
Relationship Between Sex and Gender Role

Gender Role	Frequencies		Standardised Residuals	
	F	M	F	M
Traditional	54	165	-10.84***	10.84***
Non-traditional	87	9	10.84***	-10.84***

Notes. F = female, M = male. *** $p < .001$.

Hypothesis 8: Women in anatomical textbooks will be more frequently visually represented in domestic settings while men will be more frequently represented in occupational settings. Overall, there was a significant sex difference in the distribution of images among domestic and occupational roles: $\chi^2(1) = 5.25, p = 0.02$ (frequencies and standardised residuals are in Table 9). Women were significantly more likely to be represented in a domestic setting and significantly less likely to be represented in an occupational setting compared with me

Table 9
Relationship Between Sex and Domestic or Occupational Settings

Role	Frequencies		Standardised Residuals	
	F	M	F	M
Domestic	22	14	2.48*	-2.48*
Occupational	51	83	-2.48*	2.48*

Notes. F = female, M = male. * $p < .05$.

Hypothesis 9: Men in anatomical textbooks will be more frequently visually represented in active roles while women will be more frequently represented in passive roles. Overall, there was no significant difference in the distribution of gender across active and passive roles: $\chi^2(1) = 0.78, p = 0.38$ (frequencies and standardised residuals are in Table 10).

Table 10
Relationship Between Sex and Action

Action	Frequencies		Standardised Residuals	
	F	M	F	M
Active	158	174	0.98	-0.98
Passive	78	103	-0.98	0.98

Notes. F = female, M = male.

Hypothesis 10: The gaze of men in anatomical textbooks will be more frequently directed to the viewer while women will more frequently look away. Overall, there was no significant sex difference between the gaze classifications of direct and away: $\chi^2(1) = 1.74, p = 0.19$ (frequencies and standardised residuals are in Table 11).

Table 11
Relationship Between Sex and Gaze

Gaze	Frequencies		Standardised Residuals	
	F	M	F	M
Away	204	232	1.46	-1.46
Direct	20	35	-1.46	1.46

Notes. F = female, M = male.

Hypothesis 11: Women in anatomical textbooks will display more positive and less neutral and negative emotions than will men. Overall, there was a significant effect for sex difference across positive, negative and neutral facial expressions: $\chi^2(2) = 81.95, p < .001$ (frequencies and standardised residuals are in Table 12). The results indicated that women displayed significantly more positive emotions than men, while men displayed significantly more negative and neutral expressions.

Table 12
Relationship Between Sex and Facial Expression

Facial Expression	Frequencies		Standardised Residuals	
	F	M	F	M
Negative	14	33	-2.24*	2.24*
Neutral	117	224	-6.93***	6.93***
Positive	105	28	9.03***	-9.03***

Notes. F = female, M = male. * $p < .05$, *** $p < .001$.

5.6 Discussion

Utilising a comprehensive content analysis, the current study examined 17 of the leading anatomical textbooks used in Australian Medical Schools. The results revealed that representations of gender and gender stereotypes, as well as intersectional factors such as ethnicity and body type, showed an overall pattern of bias. The current study has updated and extended previous research on visual representations of gender in medical texts which found that gender bias existed in the underrepresentation of women and in the predominant association of the female body with reproductive or sex-specific images (Giacomini et al. 1986; Lawrence & Bendixen 1992; Mendelsohn et al. 1994). The current study has broadened this

research by examining other ways in which gender bias manifests itself visually, including through dominant gender stereotypes, as well as through unequal representations of intersections of ethnicity, body type and age. An overview of the results according to the study's hypotheses is provided in Table 13. This table also includes an estimated odds ratio (OR) as a measure of effect size.

Table 13
Results of Study 1 Findings by Hypothesis

Analysis 1: All images		
Hypotheses	Outcomes	OR
H1.1: Anatomical textbooks will have a higher visual representation of men than women.	Confirmed	2.22
H1.2: Anatomical textbooks will have a higher visual representation of women than men in sex-specific images.	Confirmed	4.02
H1.3: Women in anatomical textbooks will be more frequently White and less racially diverse than will men.	Confirmed	1.47
H1.4: a) Women in anatomical textbooks will be more frequently visually represented with toned body types while b) men will be more frequently represented with muscular body types.	Confirmed	6.45 (a)
	Confirmed	43.55 (b)
H1.5 Women in anatomical textbooks will be more frequently visually represented as young than will men.	Confirmed	4.32
H1.6: Women in anatomical textbooks will be more frequently visually represented as unhealthy or injured than will men.	Confirmed	1.55
Analysis 2: Narrative Images		
H1.7: Men in anatomical textbooks will be more frequently visually represented in traditional gender roles than will women.	Confirmed	33
H1.8: Women in anatomical textbooks will be more frequently visually represented in domestic settings while men will be more frequently represented in occupational settings.	Confirmed	2.56
H1.9: Men in anatomical textbooks will be more frequently visually represented in active roles while women will be more frequently represented in passive roles.	Unsupported: no significant difference	1.19
H1.10: The gaze of men in anatomical textbooks will be more	Unsupported:	1.54

frequently directed to the viewer while women will more frequently look away.	no significant difference	
H1.11: Women in anatomical textbooks will display more positive and less neutral and negative emotions than will men.	Confirmed	7.36

Anatomical textbooks and diversity. The findings of this study revealed that, although anatomical textbooks have improved their representation of gender over time (see Table 14), there is still a higher representation of men than women in these texts. These results are consistent with previous research that explored the existence of gender bias in medical education materials through unequal representation (Alexanderson et al. 1998; Dijkstra et al. 2008; Giacomini et al. 1986; Lawrence & Bendixen 1992; Mendelsohn et al. 1994; Turbes et al. 2002). The slight improvement of 32% to 36% in gender representation could point to recent medical institution trends to provide greater attention to gender issues in healthcare (Klinge & Wiesemann 2010). However, the reasons for the four-percentage point increase are unclear as there was no obvious relationship between when a textbook was published, or when its first edition was published, and the degree of gender representation (Table 14). This could be due to the relatively small sample of books examined in this study or it could suggest that, in spite of attempts to improve gender equality, issues of gender bias persist in medical discourse. Despite evidence of individual textbooks successfully addressing issues of gender equality, such as Marieb and Hoehn (2012) and Saladin (2012), it is difficult to suggest that there is clear evidence of a general cultural change in anatomical textbooks in this regard.

Table 14
The Visual Representation of Females in Gendered Images from Anatomy Textbooks Over Time

Study	Year of textbooks	Country	No. of texts	Percentage of females
Giacomini et al. (1986)	1973-1983	America	8	15%
Lawrence & Bendixen (1992)	1890-1989	America	31	32%
Mendelsohn et al. (1994)	1981-1992	America	12	32%
Current study: All images	2008-2013	Australia	17	36%
Current study: Narrative images	2008-2013	Australia	11	45%

The results also confirmed that women were more frequently represented in sex-specific images than men. This is significant since sex-specific images were frequently related to reproductive health. This again reflects previous research which has shown that women are better represented in sex-specific and reproductive sections than men (Lawrence & Bendixen 1992). The attention given to sex-specific differences in women is important, yet their comparative lack of representation in non-sex-specific images indicates the treatment of men as the norm and promotes the view that women's importance lies in her reproductive role. The current study has also revealed the paucity of representations of intersex individuals in anatomical textbooks. The small number of intersex images (0.08%) indicates considerable bias against a group that comprises up to 4% of the Australian population (OII Australia 2013). Further, these examples of intersex individuals were presented as special case studies, which contributed to their positioning as abnormal within a medical context.

Medical discourse has increasingly focused on gender diversity over the past four decades. However, feminist researchers have identified the neglect of intersectional research in healthcare (Crenshaw 1989; Hankivsky 2012; Shield 2008). By ignoring intersections of gender, such as ethnicity and age, medical research lacks a comprehensive understanding of the effects that heterogeneity has on health (Bauer 2014). The current study utilised an intersectional approach by also examining representations of gender differences in ethnic, body type, age and health representations. This research found that there was a general lack of ethnic diversity in anatomical textbooks with images of Whites accounting for a staggering 78% of all images in which ethnicity could be identified. This issue was compounded when gender was taken into account with female representations of ethnicity being more frequently White than were males (Table 3). Such representations both reflect and contribute to a normative White femininity that severely disadvantages women of colour (Deliovsky 2008).

Significantly, representations of Indigenous peoples were largely absent. The majority of textbooks came from the United States and yet only a single representation of an Indigenous American was found (Marieb & Hoehn 2012, p.268). Further, no Indigenous Australians were represented in the Australian published

textbook, *General Anatomy* (Eizenberg et al. 2008). These results are concerning considering the fact that, not only are Indigenous people one of the most disadvantaged groups in the world but they also receive substandard healthcare (Gray et al. 2008; International Working Group on Indigenous Affairs 2006; United Nations Economic and Social Council 2005).

The gendered construction of body types in anatomical textbooks was also problematic as women were overwhelmingly represented as toned while males were represented as muscular. Further, the effects sizes for these comparisons were very large. The emphasis on muscular bodies for men and slim, toned bodies for women in particular reflects unrealistic standards for both female and male health. In a medical setting these standards contribute to the marginalisation of fat bodies. As has been shown in previous research, this is particularly harmful for women as antifat biases towards female patients have multiple negative outcomes including the increased reluctance of physicians to perform important preventative care services (Fikkan & Rothblum 2011). The examination of body types also highlighted the limited representation of people with a physical disability (2.7%), which is a considerable under-representation of the true demographic representation of 18.5% of the Australian population (Australian Network on Disability 2016). Despite social expectations that both men and women have physically strong bodies, the traditional stereotype of portraying women as weaker than men was also maintained, with men more likely than women to be depicted as healthy, and less likely to be shown as injured or unhealthy. Though again this difference was relatively modest it does reflect the concerning trend that men are expected to not show weakness which is counterproductive in a medical setting (Courtenay 2000b; Kaufman 1994).

Lastly, although most images in anatomical textbooks were represented as adult, the stage in adult life was largely imperceptible. These images could have potentially sat within an age group of 18-50, but they clearly did not represent elderly individuals. Only 2.2% of images were clearly identifiable as either young adult, middle-aged or elderly. A lack of age diversity in anatomical textbooks is further evidence that these texts do not accurately reflect current populations. For example, not only do elderly individuals make up a large percentage of the population but their need for healthcare

is also disproportionately high and their representation within medical discourse is therefore of critical importance (Shenoy & Harugeri 2015). Importantly, within representations of young adult, middle-aged and elderly in anatomical textbooks, women were significantly more likely than men to be represented as young adults. This is consistent with research that has shown that the ageing female body in particular is underrepresented in popular cultural (Baumann & de Laat 2012; Bessenoff & Del Priore 2007) and medical research (Bird 1999; Morse et al. 2004).

Overall, the results indicated not just a lack of diversity but, from an intersectional perspective, a tendency to view or represent diversity in a very narrow way. In other words, anatomical images are more likely to be diverse either in terms of gender or ethnicity or body type than they are to be in any combination of these characteristics. This may indicate that attitudes towards diversity are directed by a diversity quota or checklist so that when a 'diversity' box is checked, further consideration is rarely given. Importantly, the findings revealed that anatomical textbooks do not accurately represent the demographics of contemporary society.

Gender roles in narrative images. Previous research had not distinguished between images that are purely conceptual in nature and those that are narrative. However, narrative images provide critical insight into how gender roles are perceived in the medical community and in the broader social context. Some previous studies of anatomical textbooks identified the gender stereotype of associating women primarily with their reproductive roles (Giacomini et al. 1986; Lawrence & Bendixen 1992; Mendelsohn et al. 1994; Moore & Clarke 1995; Morgan et al. 2014). However, none examined whether gendered stereotypes existed within narrative image. The current study therefore adds important and novel findings in relation to gender representation in narrative images from anatomical textbooks.

The results from the analysis of narrative images were in some ways more positive than the initial analysis, both in terms of the amount of females represented (45%), and in how they were represented. Specifically, there was no significant gender difference in active versus passive roles or gazes. However, there were other ways in which gender bias was communicated within narrative images. To begin with, men

were more likely to be represented in traditional roles than were women. This is in line with research which indicated that women are more likely than men to transgress gender roles (Durkin & Nugent 1998; Powlishta 2000; Prentice & Carranza 2002). In general, this is a positive trend for women. However, the higher representation of females than males in all sex-specific images indicates that women are still heavily associated with the most ubiquitous stereotypical role of reproduction. Further, traditional gender roles for men usually prioritised power and status (Ickes 1993). For example, men being represented as physicians rather than patients emphasises their social position of power. Lastly, the portrayal of restrictive gender roles for men contributes to a narrow and stereotypical construction of masculinity. In a healthcare setting the promotion of masculine stereotypes has a negative impact on men's health behaviour, as well as on physicians attitudes towards and treatment of their male patients (Borowsky et al. 2000; Courtenay 2000b; Galdas et al. 2005; Sleath & Rubin 2002).

The results of the analysis of narrative images also indicated that women were more often represented in domestic settings and males in occupational settings. It is unfortunate that these textbooks reflect the actual gender dominance of these settings rather than taking the opportunity to counteract such social views (Knudsen & Wærness 2008; Lachance-Grzela & Bouchard 2010). The narrative representations also reinforced stereotypical gendered emotions. Women displayed more positive emotions than did men. Men displayed more negative emotions and, in particular, more neutral expressions than women. As previous research has shown, female patients often feel they need to mask negative emotions such as fear or sadness due to the concern that their physician will dismiss them as emotional (Lichtman et al. 2015; Munch 2004; Wenger & Collins 2005). The more frequent representation of females displaying positive emotions contributes to physician expectations that women should behave in certain ways. Further, the dominant representation of male emotion as neutral constructs men as stoic and controlled. Therefore, if men do hide their emotions, a physician's stereotypical understanding of this association might mean that male patients are not offered the help they need (Moynihan 1998; Sleath & Rubin 2002).

5.6.1 Implications

Overall, the unequal representation of women, and the narrow and stereotyped representation of gender, ethnicity, age and body type, are problematic within textbooks that are used to educate future health practitioners. The lack of information on heterogeneous populations means that anatomy students are inadequately prepared for the types of patients they are likely to see on a daily basis. Despite the increased attention given to gender issues in medicine, a cultural shift within medical curricula specifically, and the medical institution generally, is required in order to develop perspectives that are not restricted to gender stereotypes and are more inclusive of diversity in education.

5.6.2 Limitations and future directions

It is important to note that anatomical textbooks are not the only visual content used within educational programs that could contribute to gender bias. Resources provided by faculty, such as lecture slides, handouts, laboratory manuals and eLearning materials, as well as Internet resources, educational posters and anatomical models are all additional sources of potential gender bias. The diverse range and prevalence of these materials means that they also contribute towards students' beliefs and attitudes; however, assessment of this was beyond the current research. Further, non-visual elements can play an equally pivotal role in how gender is constructed and these, as well as the combination of the two, could be considered in future research. A detailed examination of the historical development of the individual textbooks would provide greater insight into why and how changes in gender-biased representations have occurred, although this was beyond the scope of the current study. In order to counteract or prevent visual gender bias in anatomical textbooks it is important to understand the reasons why and how these biases emerge within medical imagery. The following study set out to achieve this by investigating the site of image production via medical illustrators. An important further step is to understand the impact of gender-biased imagery on its primary consumer. That is, how do gender-biased images shape the behaviours and attitudes of students studying anatomy? The third study in this thesis therefore examines the influence of biased images on anatomy students' attitudes.

5.7 Conclusion

The current study revealed that anatomical textbooks not only continue to underrepresent women in all areas except reproduction but that they also promote traditional gender stereotypes and a lack of diversity that disadvantages everyone. The representation of homogenised and idealised gendered bodies in a medical context not only positions all other bodies as abnormal but also as potentially unhealthy. The authoritative voice of the medical institution can powerfully influence society's normative perspectives on gender and the body. The current study shows that the unequal representation of women in medical textbooks has barely improved since the last study of this kind occurred more than 20 years ago. Inequality highlighted in previous research might have been excused because the gender ratio in anatomical textbooks was an unidentified issue. However, the results from the present study cannot be blamed on a lack of knowledge about this issue. As such, medical illustrators, writers, publishers and educators should be encouraged to remain aware of how gender bias can be represented and how to counteract this issue. Further, medical students and health practitioners should be educated about the implications that gender-biased views can have on their practice and urged to critically evaluate the social ideas and values presented in educational material.

6 STUDY 2: THE SITE OF PRODUCTION

Abstract

Background: Studies on medical illustrations have investigated and shown the existence of visual representations of gender bias in medical discourse. However, no research to date has focused on how the site of production influences the inclusion of gender bias in these images.

Objective: This study aims to identify the multilayered contextual factors that influence the representation of gender bias during medical image production via the perspective of medical illustrators.

Method: A 28 question, computer-assisted self-interview was sent to 236 medical illustrators via the Association of Medical Illustrators and Medical Illustration Sourcebook membership lists. Data were analysed using a mix of quantitative and thematic analysis.

Results: Interview responses (n = 83) indicated that multiple levels of proximal and distal context had an influence on how gender was represented in medical images including the intrapersonal processes of the illustrator, the immediate physical and social context of the image and the broader institutional and societal contexts. Six major themes also emerged during thematic analysis: the sexualisation of nudity, the use of gendered stereotypes, the impact of social networks, the limitations with diversity and pathology, the representation of average bodies and the tension between resource accuracy and accessibility.

Conclusions: Multiple levels of context influence the production of gender bias in medical illustrations. Illustrators should be aware of these influences and the ways in which they can be counteracted. Implications for policy and practice are discussed.

Keywords: Gender bias, medical illustrator, proximate influence, distal influence

6.1 Introduction

Research on medical textbooks has persistently shown that women are not only visually underrepresented but are also portrayed in stereotypically gendered ways (Giacommi et al. 1986; Lawrence & Bendixen 1992; Mendelsohn et al. 1994; Morgan et al. 2014). These studies have focused on the degree of gender bias and the types of values associated with gender-biased representations in medical images. However, to date, research has not examined how those values came to be represented. In her book *Visual Methodologies*, sociologist Gillian Rose (2001) identifies the site of an image's production as one of the key areas in which meaning is encoded in visual communication. The site of production encompasses the conditions and contexts in which images are constructed and includes not only the kinds of technologies and mediums used but also the cultural, social, economic and political context in which images are made. The social context can play a constant and important role "in the historical shaping of the resources, in the individual agent's social history, in the recognition of present conventions [and] in the effect of the environment in which representation and communication happen" (Kress & van Leeuwen 2006, pp.12-13). Despite its effect on meaning, only a few studies have investigated how the context of creation has influenced the construction of gender bias in images (see for example Brandt 1997 and Schrijvers 1993), while none, to this researcher's knowledge, have examined how this phenomenon might occur within medical illustrations. The current study focuses on how the site of production contributes to the way in which gender is represented in medical images by examining the views and experiences of medical illustrators.

6.2 Background

The visualisation of medical and health information is important within medical education for healthcare professionals, students and patients. However, it is important that medical illustrations provide representations that are free of bias so that medical information is imparted in the most accurate and educationally beneficial way. Indeed, "certain pictures of the anatomical body, when used and reproduced uncritically, can perpetuate alienating conceptions of a normative, mechanistic body" (Wall 2009, p.133). Charles Berg (2002, p.19) has argued that

the repeated use of stereotypes gives rise to a “vicious cycle” in which the expression of “learned stereotypes reinforces and to that extent validates and perpetuates them”. Audiences have a certain amount of leeway in their individual interpretation of images. However, the persistent use of negative stereotypes acts to normalise and therefore legitimatise these values in the eyes of viewers and can increase perceived differences and discrimination between social groups (Banaji 2002; Berg 2002).

Stereotypes are natural human phenomena and yet the content of stereotypes and the form they take is dependent on the specific social structures in place (Dovidio et al. 2010). Certain structures can play a role in the formation of negative stereotypes that marginalise certain bodies and position them as ‘other’ or abnormal. An investigation of the structures that exist at the site of an image’s production is therefore crucial for understanding how gender stereotypes are constructed and reproduced. Like most forms of cultural information, the structures influencing images are multilayered and can exist anywhere from the individual to the institutional or even social level. For medical illustrations, this includes direct influences such as the chosen materiality of an image, the use of existing medical information as reference and the attitudes and values of the people involved in the creation of an image. It is equally important to consider indirect influences such as the institutional practices of medicine, as well as the cultural ideologies of society.

6.3 Theoretical Approach

The current research hypothesises that contextual influences on the construction of bias in medical illustrations are multilayered and include distal and proximal influences, as well as personal and professional influences. This aligns with the theoretical model of Urie Bronfenbrenner (1979) in which individuals are located within a nested set of contexts, all of which have a multitude of direct or indirect effects on the individual. The following section provides a brief overview of Bronfenbrenner’s ecological model of the individual as a basis for developing a contextual model of the image.

Bronfenbrenner (1979) hypothesised that an individual's entire environmental system, made up of multiple subsystems, is what guides human development. His (1979) ecological model identified the following nested environmental systems as influencing the development of an individual:

1. The **Microsystem** is the most proximal system to the individual and includes their immediate surroundings, such as their family or school;
2. The **Mesosystem** provides a link between microsystems, such as the connection between parents and school;
3. The **Exosystem** is an indirect system that impacts microsystems without the individual directly participating in it, such as the connection between mass media and a neighbourhood;
4. The **Macrosystem** is the most distal system as it encompasses the ideologies and practices of the broader cultural environment, such as the connection between culture and history.

It is important to note that a characteristic of this theoretical model is that these systems can impact each other bi-directionally. Put simply, while individuals are influenced by the systems they find themselves in, they also have the capacity to shape those systems in turn. Examining all the levels that constitute the context of an individual's development enables researchers to gain a more complete understanding of how a human develops.

Within the current research, the image is viewed in a similar way to the individual in Bronfenbrenner's model in that its context is made up of a sequence of nested, bi-directional systems that influence its development. As we move from the sphere of the image to the social context, influences move from proximal and having a direct influence on the image, to distal and mediated through more proximate layers.

Leveraging off this ecology model, the current study hypothesises that the development of a medical illustration exists within the following system:

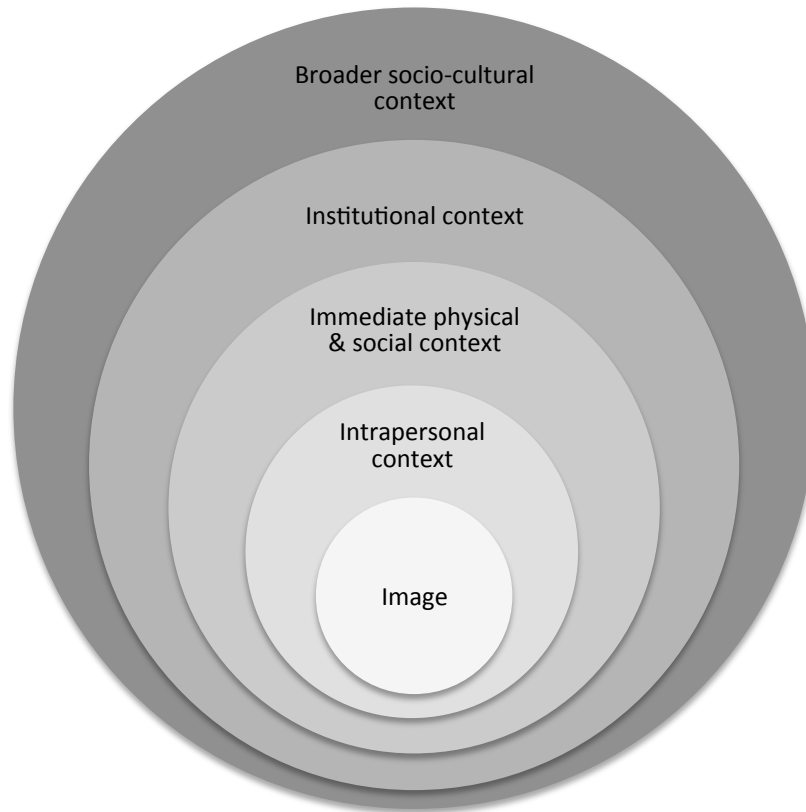


Figure 7. The multilevel contextual influences model indicating the influences that affect the development of an image.

The multilevel contextual influences model shows the various levels operating on the production of an image (Figure 7) and replaces Bronfenbrenner’s individual with the image as the focus of development. In the second sphere of this model is the intrapersonal context that encompasses the illustrator’s internal values, attitudes, beliefs and knowledge. The third sphere is the immediate physical and social context of the illustrator and includes influences such as interpersonal connections with collaborators and the use of resources such as medical textbooks in guiding an illustrator in the creation of an image. The second and third spheres have a direct connection to the development of an image and are enclosed within the broader spheres of the institution and then of society in general. The institutional sphere is similar to Bronfenbrenner’s macrosystem in that it includes the broader ideologies and practices of the culture of the medical institution that indirectly influence the development of an illustration. This is positioned within the overarching macrosystem of the socio-cultural context where social values and beliefs influence

and are influenced by medical discourse. The current study hypothesises that each of these spheres has an impact, whether directly or indirectly, on the way in which gender is treated within an image. A multileveled examination of the influences of each of these spheres can therefore help to provide a more complete understanding of how gender bias is produced in medical illustrations. A more detailed discussion of each of these spheres as they relate to the development of a medical image follows.

6.3.1 The intrapersonal context of medical illustration

The intrapersonal context involves the internalised processes of a medical illustrator that affect their work. The medical illustrator is one of the most central and direct players at the site of an image's production. Their professional and personal choices can significantly impact the meanings embedded in their work including the choices that maintain, create or change how social inequality is represented. The complexity of the medical illustrators' influence on the meanings produced in their work can be seen in the "interplay between conceptual judgments, observation, technical rendering choices, and clarity of communication" (Meynell 2008, p.11). The end results of medical illustrators' choices directly contribute "to the discursive production of the biomedical body" (Wall 2009, p.134). The stereotypical or negative attitudes that illustrators hold about social categories such as gender, race and class have the ability to significantly contribute to the visualisation of social inequality. The role of a creator in constructing social messages is therefore a crucial area requiring examination, especially when it comes to themes of social inequality.

6.3.2 The immediate physical and social context of medical illustration

Technology. The physical and social context of an illustration is comprised of multiple arenas including technology, clients and references. Most studies that have focused on the site of image production when exploring the messages produced by visual culture have focused on technological aspects such as how the medium of an image can impact its meaning (see for examples Finnegan 2004, Rosenblum 1978 and Schwartz 1986). The kinds of technologies, methods or materials used to produce an image are significant in that they can "shape or even constrain the possible content" (Banks 2005, p.51). For example, the perceived objectivity of

photography has meant that photographs construct what is understood by viewers to be reality (Campbell 2003). Digital manipulation technologies, and even the photographer's mediate choices about factors such as light and composition, can have a crucial impact on an image's meaning (Barry 1997; Carlson 2009; van Dijck 2001). For example, the media has a history of digitally manipulating photographs of women to be thinner, younger and even whiter (Byerly & Ross 2006; Gordon 2015; Reaves et al. 2004). As multiple studies have shown, exposure to media representations that promote socially normative and idealised appearances often results in increased body dissatisfaction in women (Han 2003; Heinberg & Thomas 1995; Irving 1990; Stice & Shaw 1994). An image's medium and the multiple options for manipulating it (whether digitally or physically) therefore have the potential to reduce diverse features such as skin colour and body type and result in the promotion of socially normative and idealised bodies. However, it is important to note that these interventions still mostly depend on factors such as the choices made by the illustrator or client.

Clients. The commercial aspects of medical illustration have meant that images must be acceptable to both their clients (e.g. publishers, healthcare professionals or medical device manufacturers) and their audiences (e.g. students or professionals within the health industry; Meynell 2008). Cassio Lynn (quoted in Taub 2001), illustrator for the *Journal of the American Medical Association*, described medical illustrators as “the transmitter, the tool to communicate, the middle way between, on the one hand, those who are extremely learned in a field and, on the other, their colleagues, the people in related but separate fields, and the lay public”. It is therefore important to remember that medical illustration often occurs in collaboration with others, such as clients, physicians or even other illustrators. In particular, the clients who commission medical illustrations have a direct impact on the production of an image. In *The Guild Handbook Of Scientific Illustration*, Elaine Hodges (2003) highlighted the fact that an illustrator's work is purchased by their client and must therefore satisfy the demands of the client. As an illustrator's commission must always be mediated, at least to some degree, by the demands and attitudes of their clients, the illustrator may not have complete control over how gender is represented in medical illustrations. The briefs provided by clients, their

requests for changes and their perceptions of the audience for whom they are publishing, all have the potential to play a part in shaping gendered representations (Meynell 2008).

References. Existing medical images and the availability of references also have the ability to influence meaning in medical illustrations. Hodges (2003) has noted that one of the challenges of creating scientific illustrations is finding reliable reference material. For medical illustrators, the most accurate reference would be human specimens. However, access to such a resource is limited by practical and ethical concerns. As such, the use of existing images found in medical textbooks and resources is a common substitute (Hodges 2003). Indeed, Hodges (2003, p.492) has stated that “The dependence on others’ illustrations is exaggerated by the practical and ethical difficulties of getting access to specimens, especially living specimens, when doing research for an illustration”. Letitia Meynell (2008, p.13) has further argued that a reliance on pre-existing images means that “any values and norms embodied in the illustrations of the past will tend to filter into the present”. In using inaccurate and biased representations to inform the production of their images, medical illustrators are at risk of reproducing flawed, and therefore potentially dangerous, knowledge.

6.3.3 The broader medical context of medical illustration

The broader discourses of the institution of medicine, although less direct, can also have an impact on representations of gender in medical imagery. As Kress and van Leeuwen (1996, p.115) have argued, visual communication can only succeed if it fits within “rigidly defined conventions, and adhere to the more or less rigidly defined values and beliefs of the social institution within which their work is produced and circulated”. Considering Kress and van Leeuwen’s (1996) observation, the influence of certain gendered values and ideologies within dominant medical discourse are of particular concern. For example, the fact that medicine has historically only valued the female body for its reproductive abilities is reflected in the continued underrepresentation of women in all medical areas except reproduction (Verdonk et al. 2009; Zimmerman 2000). The influence of medical ideologies on the illustrator and their collaborators therefore also necessitates examination.

6.4 Existing Research

As mentioned above, studies that have examined the meanings produced in visual culture via the site of image production have usually done so by focusing on the immediate physical and social context and, in particular, the technological aspects. Examinations of the ways in which phenomena such as gender bias are developed or reproduced during the production of visual communication are limited. Several studies do exist, specifically in the field of visual ethnography, that investigate how the site of production influences gender representation via reflexive explorations provided by the individual image creator (see for example Brandt 1997 and Schrijvers 1993). In Deborah Barndt's (1997, p13) examination of her experiences photographing university staff she discovered that hierarchies of power directed by staff position and gender had an impact on what and where she could photograph:

It seemed much harder to get into the space of the powerful than into the space of the less powerful: the (primarily female) secretaries in the departmental office were easier prey, for example, than the (usually male) full professors; you had to pass through two doors and get their permission before you could photograph them.

Reflexivity is a process that identifies the central and subjective role that the researcher, who in this case would also be the image creator, plays in the production of their work (Pink 2007). These kinds of studies are important but focus on the individual and do not address the context of an entire group of image producers such as medical illustrators.

The current research has examined the experiences of multiple illustrators by asking them to provide both a reflexive account of their own experiences as image producer, as well as an account of those influences that exist outside themselves that may or may not necessarily be central to this process. Thus, the purpose of this research was to investigate how the collectively held norms and ideologies of visual content producers, and the multiple levels of context that surround them, can have a significant influence on representations of gender bias in medical illustrations. This expands upon previous research, which has mostly provided reflexive accounts of the

researchers own work. Indeed, as the current study examines the site of image production via a large number of image producers from one particular industry rather than through just one or two individuals, the results of this research will be more generalisable to the medical illustration industry as a whole.

6.5 Hypotheses

As medical illustrators were the conduits used in this study to explore the context of an image's production, there was a greater focus on the most proximal systems as direct influences would be the easiest for participants to identify and describe. This included the intrapersonal context of the illustrator and the immediate physical and social context. However, it was expected that responses would provide at least some insight into the more distal influence of the institutional and social contexts. As such this study used the following hypotheses to guide the research:

H2.1. The intrapersonal context provided by the illustrator will influence the inclusion of gender bias in medical illustrations. Specifically, an illustrator's attitudes and values will influence the choices they make when representing gender.

H2.2. The immediate social and physical context of the illustrator will influence the inclusion of gender bias in medical illustrations. These contexts will include the influence of technology, clients and references on how gender is represented.

H2.3. The distal influences of the broader institutional and social contexts will have an influence on the inclusion of gender bias in medical illustrations.

While this research used the multilevel contextual influences model as a framework (Figure 7), it was important to be open to new elements emerging within these spheres other than those hypothesised. These be considered in the analysis and interpreted in light of the model.

6.6 Methods

6.6.1 Study design and ethics

In order to test these hypotheses, a computer-assisted self-interview (CASI) was developed using Google forms (Appendix D) and was administered online between the 18th of September and the 1st of December 2014 after ethics approval was obtained from the University of Wollongong Human Research Ethics Committee (ethics approval number HE14/130; Appendix C). Illustrators were sent an initial email invitation to participate, which included a link to the participant information sheet (Appendix C) and to the CASI. A month later, a reminder email was sent to illustrators. Respondents were informed in their recruitment email that their participation was voluntary and their responses would be kept confidential and anonymous. The identities of the participants were kept confidential by assigning them a unique alphanumeric code that ranged from P1 to P83.

6.6.2 Participants

The CASI was sent to 236 medical illustrators who were identified through the membership list of the Association of Medical Illustrators (AMI; <http://ami.org>) and the Medical Illustration Sourcebook (MIS; <http://www.medillsb.com>). These sources were chosen as they provided the largest, most accessible and most comprehensive list of current medical illustrators. Only medical illustrators who illustrated human anatomy were recruited. Those who illustrated anatomy where features such as gender, age and ethnicity were impossible to identify (such as those who only illustrated the microscopic and cellular mechanisms of anatomy) were excluded.

6.6.3 Instrumentation

The CASI was designed to promote mostly open-ended responses from participants about their experiences with clients, reference materials, and their own work, with a particular focus on gender bias. It consisted of a total of 28 questions that were designed to explore the research hypotheses of the current study and took approximately 15 minutes to complete (Appendix D). As the interview was done online, the researcher was not available to provide an explanation of the purpose of the questions if one was needed. Thus, in order to protect against out of scope

answers driven by misunderstanding of what the question was asking, definitional assistance was given for potentially confusing questions (e.g. for the question, ‘What kinds of references do you use for anatomical illustrations?’), the following definitional assistance was provided: ‘For example, do you use live models, plastic models, photos, etc.?’).

6.6.4 Data analysis

Once the data were collected it was uploaded onto the digital platform Dedoose (2015). Frequency counts were then performed on all closed-ended responses. Due to the large data set and the qualitative nature of the open-ended responses, the method of thematic analysis was used to conduct analysis on long-form responses. The process of thematic analysis involved several phases as outlined by Braun and Clarke (2006). After familiarisation with the data, during which time initial ideas were noted, the first stage of coding was conducted. This involved an exhaustive line-by-line analysis where distinct concepts, as well as reoccurring phrases and words, were identified and coded. Once initial coding was completed, codes were further developed, relationships between them were identified and themes were generated. During this stage, codes that were quantitatively significant (e.g. the types of companies that participants reported working for), but which did not fit into a particular theme, were separated into a quantitative results section. After the themes were reviewed in the context of the entire data set they were either refined or synthesised into overarching themes. All data can be viewed at:

https://figshare.com/articles/Study2_Data/3798222

6.7 Results

From the 236 invitations to participate, 83 CASI responses were collected (response rate 35%). Of these, 55.5% of participants were female ($n = 46$) and 44.5% were male ($n = 37$). Participants had a mean age of 49 years ($SD = 14$, median = 46, range = 20-84). The ethnic diversity of the participants was unknown; however, contact information from the AMI revealed that members were primarily located in the United States but some were also from Canada, the UK and Australia.

6.7.1 Quantitative results

The following section outlines the quantitative results found in the data. These results are divided into information that participants provided about themselves, their clients and the resources they used as references for their work.

6.7.1.1 Participants

Training, employment and methods. Fifty-four (65.1%) participants had a medical illustration degree, 13 (15.7%) a fine arts degree, six (7.2%) a graphic design degree and three (3.6%) participants identified as self-taught. Twenty-five (30.1%) participants reported that they underwent medical training as a part of their medical illustration degree while 19 (22.9%) reported that they had received no medical training. Of those who had training, 11 (13.3%) reported that this was conducted in classes for medical students.

Participants were employed across a number of platforms including medical education institutions, university teaching hospitals and state or private supported medical facilities and clinics. Freelance medical illustrators also worked independently for physicians and medical students as well as for pharmaceutical, publishing, medical instrument and advertising companies. The mean number of years of experience as a medical illustrator among participants was 20 (SD = 13, median = 22, range = 1-55). Forty (48.2%) participants were self-employed and/or worked as freelance illustrators, 17 (20.5%) participants worked within a single organisation and 25 (30.1%) worked for both an organisation and as a freelance illustrator. In creating their work, 51 (61.4%) respondents used a combination of traditional and digital mediums while 28 (33.7%) used only digital mediums and two (2.4%) participants used only traditional mediums. From those using digital mediums, 63 (79.7%) participants identified using Photoshop, 49 (62%) used Illustrator and 29 (36.7%) reported using 3D modelling programs.

Methods to distinguish gender. Other than breasts and genitalia, 48 (57.8%) participants used musculoskeletal features or body shape to indicate gender. Twenty-nine (34.9%) specifically referenced using hips and/or pelvis shape, 20 (24.1%) used

shoulder width and 8 (9.6%) used waist-hip ratio. Forty-one (49.4%) participants reported using hair to indicate gender with four (4.8%) participants indicating that they used body hair and 10 (12%) specifically reported giving females long hair and males short hair. Twenty-one (25.3%) participants said they used facial features to indicate gender.

Ratio of gender in illustrations. When asked about the ratio of males and females in their own work, 73 out of the 83 participants respond (88%). From these responses, 32 (43.8%) participants indicated that this was relatively equal and 12 (16%) reported that they illustrated more females. Therefore, a total of 60% of participants reported illustrating equal or higher representations of women in their work. Of those who reported a higher representation of women in their work, two indicated that this was because they were female themselves, five said that their work was female-specific (e.g. for women's health magazines) and four indicated that this was due to their work for plastic surgery which often request the figures to be female. Twenty-eight (38.3%) participants reported that they illustrated more males. Of these, six said this was because they themselves were male and six said it was because men had no breasts, which were perceived as a distraction. Twenty (24.1%) participants separately reported that the majority of their female figures were used to represent the female reproductive system.

Difficulty in illustrating gender. When asked whether they found either gender easier to illustrate, 78 out of the 83 participants responded. From these responses, 46 (58.9%) participants reported that they were equally easy to draw. Twenty-three (29.5%) participants found female figures easier to illustrate and nine (11.5%) said that males were easier to illustrate. Two main reasons were given for why females were easier to illustrate: either the participants themselves were female ($n = 6$) or the female body was perceived to be smoother and/or curvier ($n = 15$). When this was analysed based on participants' reports of the gender ratio in their work, it was discovered that only four of the 12 participants who drew more females reported that females were easier to illustrate and only five out of the 28 participants who drew more males reported that males were easier to illustrate. Four out of the 28 participants who drew more males actually reported that they found females easier to illustrate.

6.7.1.2 Clients

In their responses on which clients they worked for, participants reported a number of different client types. Overall, 13 client types were identified (Table 15). The most highly referenced clients were healthcare professionals (42) and educational resources including textbooks (41).

Table 15
Client Types

Client	Count
Healthcare Professionals	42
Textbooks & Educational Resources	41
Patient Education	28
Researchers and Research Institutions	27
Pharmaceutical Industry	26
Journals	26
Medical Legal	22
Publishers	20
Medical Device Manufacturers	17
Medical Advertisers	16
Editorial/ Magazines	12
Health & Public Relations Campaigns	7
Plastic Surgeons	5

Level of client influence. In response to the amount of control that clients had on the outcomes of their work, 6 (7.2%) participants reported that their work was entirely directed by their clients and/or employers with no influence of their own, 28 (33.7%) participants felt that their work was mostly directed by their clients and/or employer, 25 (30.1%) participants reported that it was approximately equally controlled by themselves and their clients/employers and 23 (27.7%) participants reported that their work was mostly self-directed. When it came to how much influence participants' clients had on their choice of reference (i.e. if resources to help guide illustrators' work were chosen by clients), 35 (42.2%) reported that reference choice was entirely their own while 48 (57.8%) participants reported that their clients did have some influence.

6.7.1.3 References

Participants identified ten different kinds of resources they used as references for their work (Table 16). The most frequently mentioned resources were photographs (n = 58), medical texts (n = 53) and live models (n = 45).

Table 16
Reference Types

References	Count
Photographs	58
Anatomical/Medical Texts	53
Live Models	45
Plastic 3D Models	27
Anatomical Specimens	20
Internet Searches	17
Diagnostic Data	13
Surgical Videos	13
Illustrations	11
Textual Descriptions	5

Other influences. In response to whether other illustrators had inspired them in their work, participants listed 120 different illustrators (34 female, 86 male). Of these 120 illustrators, Frank Netter was the highest referenced with 28 participants citing him as a major influence in their work. Max Brödel was the second most referenced (n = 22), followed by Jane Hurd (n = 17), Robert Demarest (n = 15), John Daugherty (n = 13) and Gerald Hodges (n = 11). Female illustrators were referenced a total of 86 times while male illustrators were referenced a total of 248 times. Interestingly, the third most referenced illustrator was female and yet only 28% of the illustrators nominated as inspirational were female. Considering that, of the 236 members of AMI who were originally contacted, 55% are women, this number does not accurately reflect the number of female medical illustrators currently in the field.

Gender bias in references. From a closed-ended question, 61 (73.5%) participants reported that male and female references were equally available. Fourteen (16.9%) participants reported that male references were more often available, while 6 (7.2%) reported that female references were more often available. However, 26 participants

(31.3%; 16 female, 10 male) noted in an open-ended response section that the references were male dominated, two claimed that females were dominant and 13 claimed that they were equally represented. Twenty-two participants (26.5%; 12 female, 10 male) separately stated that they did not believe that bias (both gender and other) existed in resources.

Ethnic bias in references. From the 56 participants who reported on the ethnic diversity in resources, 43 (76.8%) reported that there was a lack of ethnic diversity in available resources with 19 (33.9%) participants specifically identifying that resources were dominated by White figures. Fourteen (25%) participants reported that there was already a broad range of ethnicities in the resources.

Body type bias in references. From the 53 participants who reported on the body type diversity in resources, 41 (77.4%) participants found that there was a lack of body type diversity in available resources. Seventeen (32.1%) participants specifically identified idealised bodies as the dominant body type, eight (15.1%) participants identified “thin” bodies as dominant within resources and five (9.4%) described the dominant body type as “attractive”. Fifteen (28.3%) participants reported that a broad range of body types already existed in the resources.

Age bias in references. From the 54 participants who reported on the ethnic diversity in resources, 38 (70.4%) participants found that there was a lack of age diversity in available resources. Thirteen (24.1%) participants specifically noted that young adults and adults were the dominant groups represented in resources while nine (16.7%) participants identified a lack of children in the resources. P24 explained that “the references I'm looking for are showing the body, and if they are not nude they show a lot of the figure. So you can see how finding these types of references particularly of children can be difficult”. Seventeen (31.5%) participants reported that there was already a broad range of ages in the resources.

6.7.2 Thematic results

The CASI was primarily constructed so that participants could provide long-form, open-ended response. Given that the participants could comment on anything they

found relevant, the focus in this section was given to themes that were present across the data set. In their responses, participants made reference to a number of key issues related to bias within the medical industry, from their clients, in the available resources and in their own work. A total of six broad themes were identified in these responses: 1. The sexualisation of nudity; 2. The use of gendered stereotypes; 3. The impact of social networks; 4. The limitations with diversity and pathology; 5. The representation of average, normal and generic bodies; and 6. The tension between accuracy and accessibility in resources.

6.7.2.1 The sexualisation of nudity

Several participants indicated that, despite the medical context, their clients and society in general, held a puritanical view of nudity. For example, P47 reported, “unfortunately clients in the [pharmaceutical] advertising world often ask for ‘androgynous’ figures. Clients are absolutely terrified of genitalia” and then later commented, “people in the US seem to be petrified of genitalia. It’s very interesting given all the sexual innuendo we see around us in the media”.

This was particularly the case with the female body, especially female breasts, which were frequently assumed to be sexual objects by either the participants themselves or by their clients. P20 noted, “Women are considered sex objects in our culture and who could deny men and women are affected by the very shapeliness of the female form”. P4 also identified this as a prevalent attitude in society, commenting, “I think society frowns upon showing the female form in compromising position because the eyes may naturally be drawn to breasts and genitalia... the male form is easier to make androgynous”.

One of the most significant outcomes of the sexual objectification of the female body in particular has been the use of the male figure in its place in order to avoid offending puritan attitudes. P13 commented on this attitude in clients:

We have to illustrate the naked human form a lot. Male bodies are almost a default form, as many clients prefer to minimize ‘sexual’ appearances. Even if we blur in the genitals, the female body outline with the breasts, etc. is

something many clients perceive as gender defining. We can illustrate the female form only in gender related issues.

P78 similarly noted:

There are definitely more male references than female. I think perhaps easier access to male primary references, and also because the male body has not been as sexualized as the female body, so more of it can be shown without sexual issues arising (basically the breasts).

Some participants identified the sexualisation of the female body as the reason for a higher ratio of male figures in their own work. P37 reported, “I frequently use the male figure by default because there is less of a ‘sexual’ connotation” and P58 similarly stated, “I only use women when the illustration needs to be woman-specific. I find I use the man usually because the woman can be a bit of a distraction (my models usually don't wear clothes!)”.

Many of the comments surrounding the sexualisation of the female body revolved around female breasts. P59 commented that in “high school textbooks, [there are] more male because figures are mostly waist up and client prefer not using females and breasts when not necessary for high school audience” and then later stated, “Female breasts needed to be subdued, less attention to nipples, smaller breasts preferred”. P11 reported, “Occasionally, client will ask that something involving chest anatomy (not breast related) be shown on a male, just to simplify the issue”. Again, this view of female breasts as sexual was one of the reasons given for using male figures over female. In response to the question about the gender ratio in their work, P19 reported that they used “More male torsos since it does not include breasts”. P33’s reasons behind an unequal gender ratio in favour of men were similar: “More male. For head anatomy it seems easier to do male because of short hair, for torso illustrations breasts can be an added distraction to the illustration”.

The aversion to nudity seemed to predominantly be a concern with female breasts; however, participants noted several times that female genitalia were preferred over

showing the male penis and scrotum. P29 expressed their concern about audiences' reactions to male genitalia:

Boy, still seems to be a phobia here showing penises!!!! I once had to do an image of a full frontal nude of a woman for a children's dictionary project and they ended up worrying about the Muslim population having a fit if they saw any nudity. The breasts and genitalia were blurred out and the image was changed from color to grayscale. Unbelievable.

Other participants identified both the female chest and the male genitalia as being problematic for clients. P10 noted:

I have both figures in my library and do not knowingly use one more than the other except that it is often easier to depict the torso of a nude man simply because clients are often distracted by nudity and ask breasts be covered. Paradoxically it is less noticeable to depict a nude female pelvis in an illustration (of pelvic lymph nodes for instance) simply because the genitalia is not as prominent. We are often asked to cover, blur or deemphasize genitalia on men and women.

P50 reported similar actions when deciding what gender the figure should be:

If the topic is on the lungs or heart and the surface of the chest has to be shown, then it seems men are depicted more often simply to avoid having to show breasts and nipples. The reverse might be true for hip region stuff not related to reproductive organs, again because of the desire for publishers to avoid featuring a penis if they can avoid it.

Similarly, P80 noted:

Americans still seem prudish about bare breasts in illustrations, even medical illustrations and never in advertising, and even greater reluctance to see male

genitalia unless there seems to be a valid ‘medical/anatomical’ reason. I often think twice about what to show in any specific illustration, male or female.

Participants’ responses revealed a variety of concerns about nudity that revolved around the sexualisation of breasts and genitalia and the perceived offense that showing these might cause in their audience. Participants mostly indicated that these attitudes were held by their clients or were assumed to be held by society in general.

6.7.2.2 The use of gendered stereotypes

Within their responses, many of the participants described the visual differences between male and female bodies in stereotypically gendered ways. Male bodies were most frequently described as “angular” and “muscular”, while female bodies were primarily described as “soft” and “curvy”. When it came to body hair, female bodies were described as “smooth” and the inclusion of body hair was identified as a sign of masculinity.

Fifteen participants used the adjective “soft” or “curvy” when explaining how they found female figures either easier or more difficult to illustrate. For example, P20 commented:

Men are easier [to illustrate] just because of the muscle architecture is always so pronounced and easy to discern. Women are so soft and subtle of contour, one has to just slim, trim and gently curve nearly every angle to make her just look feminine.

In contrast, P59 found women easier to illustrate but described gendered bodies in a similar way: “male musculature needs to be accurate because there is more defined surface anatomy. Females are softer, therefore easier”. P80 also used “soft” in comparison to “muscular” when differentiating gender: “I select men who are muscular; women with softer curves. I always strive to convey ‘ideal’ gender types”. This kind of comment hints at the way in which the idealisation of gendered bodies reduces people to homogenous stereotypes.

Fifteen participants noted the association of muscle as a particularly masculine trait. P1 commented, “Usually musculature is male since you can really exaggerate the back muscles and arm muscles while still having the image look realistic and not ‘too much’”. P41 made a similar distinction:

I did a single illustration for a book on women’s health with as many surface muscles as possible visible. It was difficult to keep the figure looking female when it’s carpeted with muscles. No muscles in breasts, after all. The final piece looks good, but not particularly feminine.

The adjective “angular” was used by eight participants in a similar fashion to describe male bodies and was often contrasted with the “curvy” female body. P24 noted, “males will have more angular features while females more curved”. P57 used this distinction to explain why they preferred to illustrate male figure:

If gender is not important to the central communication, I prefer to draw males. My style is often linear in nature and I find the slightly more angulated shapes of male figures more satisfying to draw than the slightly more curved female forms. For example the leg muscle surface anatomy in a male leg often appears more delineated than that of a female leg.

Other participants referred to using smooth body shapes instead of curves to signify the female form. P50 made a similar distinction between gendered bodies:

In women I typically worry less about muscularity as I depict the norm, so smoother body shapes can be somewhat easier to render. Male figures are more angular and can be slightly exaggerated if necessary without appearing aberrant.

The use of the adjective “smooth” when describing female bodies in contrast to associating male bodies with hair also indicated a gendered perspective on body hair. P21 said, “Females are smoother, males more textured, hairy” and P25 said, “I suppose body hair in general can be descriptive – like chest hair that was included on

a male pace-maker inset, vs. the woman's one that had very pristine smooth hairless skin". P50 also associated body hair as masculine: "Body hair featured on male figures".

The frequent repetition of these terms to differentiate female and male bodies indicated the kinds of gendered stereotypes that exist within medical illustration discourse. Further, they point towards the influence of medical illustrations in contributing to the construction of homogeneous and normative bodies and the ways in which illustrators might manipulate their illustrations to conform to those stereotypes and thus sacrifice accuracy to cultural hegemony.

6.7.2.3 The impact of social networks

Participants who identified as being from minority and/or marginalised groups seemed to have a better representation of diversity in their work and to be more aware of diversity biases. For example, female participants indicated a higher awareness of gender bias, as they were 1.6 times more likely than males to identify that the references were male dominated.

Age and gender of the participants were the only demographics that were collected. However, it would be reasonable to assume that being part of other marginalised groups would also increase awareness of bias. Indeed, P13, who worked in Australia but identified as having Turkish background, indicated an awareness of a broad range of biases related to age, body and ethnicity. P13 was one of the few participants to explicitly identify racial stereotyping as an issue in the medical illustration field:

Industries like advertising and promotion are almost always after a certain racial stereotype. Any time I attempted to illustrate the facial features of the ordinary person on the street, I am asked – in pretty unambiguous terms – to change it to a 'blue-eyed blonde'. Just like the faces we see on Australian television, our illustrations struggle to reflect the true ethnic/racial diversity.

Significantly, 15 participants reported that they used members within their social network as models and eight reported that they used themselves as a reference. The

use of friends, family, neighbours, etc. as references could have the effect of either increasing or limiting diversity in medical illustrations. Many participants reported that they chose references for ease of access and this would make using an immediate social network particularly appealing. P57 gave an example of this:

It is usually simpler, less time consuming and cheaper to ask a work colleague (or use my own body e.g. hands) to pose for a quick reference photo rather than try to find something online or hire a model.

P1 provided an anecdote that gave a similar explanation:

Sometimes the reference images chosen are more based on convenience for the illustrator than anything else, for example Frank Netter used his neighbors and own family members in a lot of his work, simply because they were easy to photograph.

If one's social network were diverse then this of course would be beneficial. P25 noted, "Sometimes I will pose friends and family and photograph them and work from those photos". They further explained, "I work in and around New York City. I feel blessed to have diverse references for my work; I try not to use the same model twice". However, if an illustrator's social network is limited in diversity, this could likewise hinder the representation of diversity in their work.

6.7.2.4 The limitations with diversity and pathology

A number of participants provided unsolicited reports that their own work either included or lacked age, ethnic or body type diversity. Only two participants reported that they aimed to provide a broad range of ages in their work, while 11 others indicated that the age range among their illustrations was often limited to 20-30 years. In terms of the level of ethnic diversity in their work, eight participants reported that they did illustrate ethnic diversity while nine reported that their work lacked ethnic diversity. Six participants reported a broad range of body types in their work while 12 indicated a lack of body type diversity, revealing that their work was often restricted to fit and athletic bodies. Interestingly, seven participants who

reported that their work lacked diversity indicated that they would add diversity if it was indicative of the pathology that was being represented.

The use of pathology to indicate demographic information is important but should not be the only reason that diversity is included, especially if the illustration is non-pathological. The link between pathology and diversity, although only discussed by four participants, was identified as an important theme as it provided one explanation for the lack of diversity in medical illustrations. In particular, participants indicated that the inclusion of diverse ages, ethnicities and body types could be mistaken for being linked to the pathology being represented. These participants [P10, P19, P41, P46] noted that if a non-normative gender or body type was used in an illustration then the audience could attribute that trait as part of the pathology. In talking about diversifying body weight, P10 noted:

The flip side of this is that to depict someone with an illness or injury, say a broken wrist, who also happens to be overweight is to draw a correlation between obesity and broken bones (which is absurd but because the subject has a physical body type which strays from the norm is to say obesity is relevant to the story).

P41 made a similar observation:

Body type is not important, although anything extreme in a medical context can raise questions, e.g. 'does this heavy figure mean that only overweight women are likely to come down with endocrine disorders/lupus/jaundice/schistosomiasis?' Or the condition being discussed may require a particular body type, so I go with that.

P46 had a comparable issue with representing gender:

I've thought about this before, for example, if asked to show the internal anatomy of a person superimposed over a silhouette of the external body, I try to mix it up and show a male sometimes and female sometimes. I worry though

that people would assume if a female is depicted to illustrate the ‘average person’, that the illustration must be dealing with a ‘woman’s issue’.

These perspectives highlight the problem with constructing a normative body that is not inclusive of diversity. If diversity were instead the norm for representing bodies then such concerns would no longer be relevant.

6.7.2.5 The representation of average, normal and generic bodies

Twenty-eight participants (33.7%) referenced illustrating ‘average’, ‘normal’ or ‘generic’ bodies. What was meant by these terms was rarely defined; however, several comments identified certain physical traits as ‘average’. These definitions often connected the concept with a lack of diversity and reflected normative ideals. For example, six participants identified average as White, male and/or healthy:

Definition of ‘average’	Participant	Quote
Healthy	P36	I try to use ‘average’ ‘healthy’...
Healthy	P35	Normal figures ... healthy
Male	P44	Probably more male unless subject matter dictates female. Male is considered more ‘generic’
Male	P48	Generic torso: men, without genitalia
White	P57	I would aim at a generic ‘middle type’. The racial type would almost always (98%) be Caucasian
Healthy and White	P77	[I] trend towards the average common – so medium height, medium weight, Caucasian, healthy.

Other one-off identifications of what was considered average or normal included:

Definition of ‘average’	Participant	Quote
Body weight	P14	Not super skinny, not overweight
Body weight	P48	Normal body weight, unless specified as overweight (diabetes, etc.)
Body weight/type	P42	Most often than not the body in the reference has to be averagely built and not too fit
Body type	P8	I would go for an average body type (not an Apollo)
Body type	P43	... more toward the average of body types. They end up looking like androids.
Body type	P50	Most appear to be of a general mesomorph body type. This,

however, is typical in scientific and medical illustration because unless the topic being presented is about a specific person, body type or gender, the goal is to depict the most common, general, average presentation of anatomy or pathology.

Body type	P66	... not too muscular or obese
Ethnicity	P36	I try to use 'average' 'healthy' and 'ethnic neutral' ideals
Age	P35	'Normal' figures ... whatever THAT is!!! ... bodies that look to be in their 20s-30s

The diversity of these comments indicates a lack of cohesion in identifying what an average body would look like. Indeed, P27 commented, "Average is a rather elusive concept when dealing with anatomy in general and the peoples of the world". Comments about utilising an average or normal body were sometimes used in opposition to an 'ideal' body. However, other comments about features such as ethnicity, age, gender and health often linked the concept of an average body to a uniform and socially normative body that lacked diversity. Indeed, the very idea of predominantly illustrating a single, average body type would indicate a lack of diversity.

Several participants also identified the potential issue of using normative or generic images. P25 identified issues such as gender stereotyping that could result from this:

I think a lot of medical illustrators have been using 3D Models as the basis for a lot of their work lately, and I find those fairly disturbing. The very generic 'MAN'/ 'WOMAN' might go over fine for a video game, but I dislike seeing them as an educational model for patient education. I guess that's just a personal opinion, but I find it insulting that they commonly reinforce a lot of the gender stereotypes and anatomical inaccuracies that modern media thrives on. (Thin women with voluptuous high-set breasts, broad shouldered men with chiselled pecks and abdomens...) I don't know. It's gross. I think varied bodies are much more engaging and classy.

P13 also noted the issue of ethnic stereotyping in generic images:

As a medical artist in the world market for the past 25 years, market-driven racial stereotyping has been an issue that always bothered me. The current

nature of our industry is that generic images are more and more supplied through stock art, and medical illustrators bread and butter is more about surgery and conceptual stuff.

Interestingly, 6 participants specifically reported that they aimed to create an idealised figure in their work. If beliefs about what an average body would look like reflect a normative idealisation of certain body types, then those who claim they illustrate average bodies may actually be reflecting this idealisation.

6.7.2.6 The tension between accuracy and accessibility in resources

Participants provided several reasons for why they chose certain types of references over others. Twenty participants cited accuracy as the reason they chose their references. Some indicated that as a result, certain types of references were better than others. For example P45 explained:

I look for what is the most anatomically correct. I look at several different references to ensure that there is consistency across the board. There are several atlases and medical illustrations out there that are incorrect.

This concern with accuracy in medical texts was echoed by P53:

Not all references are equal – some I trust better than others. Gray’s and Cunningham’s are good. Netter’s work is usually very good. Always treat other references with suspicion.

The characteristic of accuracy was one reason given by 21 participants for why they preferred using live models as references. For example, P19 noted, “If I have a chance to view a subject in real time, I will – what I see does not lie. Photographs are very helpful, but can be distorted”. Identifying several ways in which the accuracy of models was helpful, P50 noted, “Live models provide a more dimensional understanding which is more helpful in discerning specific orientations and position with the body” and P82 stated that models were a better reference than photographs,

as “Photographs tend to flatten space. Live models/lighting helps to increase the ability to observe natural forms”.

Some comments by participants indicated that choosing the most accurate reference was not always possible due to accessibility issues. Twenty-one participants stated that they chose references that were the most accessible. P35, for example said they chose references that were the “‘easiest’ and most available, depending on access and timelines”. A limited time frame was identified as one of the factors affecting accessibility. For example, P29 identified that a short deadline meant that more readily accessible references like photographs would be chosen over more accurate references like live models: “It all boils down to the deadline. Live models would be preferred, but more than likely a photograph is what I end up using”. Four participants also identified affordability as a reason why participants did not use more expensive references such as hired models. For example, P10 commented that “Hiring models is not practical for reasons of time and money” and P23 noted, “I don't have the time or the budget to hire professional models, so I tend to use friends, co-workers, and family for my models”. Time and budget were clearly factors that affected how accessible certain references were. Indeed, 20 participants cited time and/or budget issues affecting their work. The fact that some participants chose to use live models for accuracy whereas others indicated that live models were infeasible due to their lack of accessibility highlights the tensions that exist in trying to resolve these two demands and find the best possible references.

6.8 Discussion

The purpose of this study was to explore the contexts that can influence the portrayal of gender bias in medical illustrations. It was hypothesised that gender bias would influence a medical illustration within at least two nested spheres of context: the illustrators’ intrapersonal context and the image’s immediate physical and social context. The quantitative and thematic results revealed a number of ways in which these contexts influenced how gender and diversity are represented in medical illustrations. Participants also made several references to the influence of the institutional and socio-cultural contexts on bias in medical illustrations. Thus,

participants recognised distal influences on the inclusion of gender bias in medical illustrations.

6.8.1 The multilevel contextual influences model

A multilevel contextual influences model was introduced in this study, which consisted of the image surrounded by nested spheres of influence. From most proximate to distal, these spheres were: the intrapersonal context, the immediate physical and social context, the institutional context and, finally, the socio-cultural context. Based on the results of the current study, a revised model that is specific to the development of a medical image is provided below (Figure 8). What follows is a discussion of the results as they relate to each of these spheres, how they are influenced by other spheres and what implications this has for practice and policy.

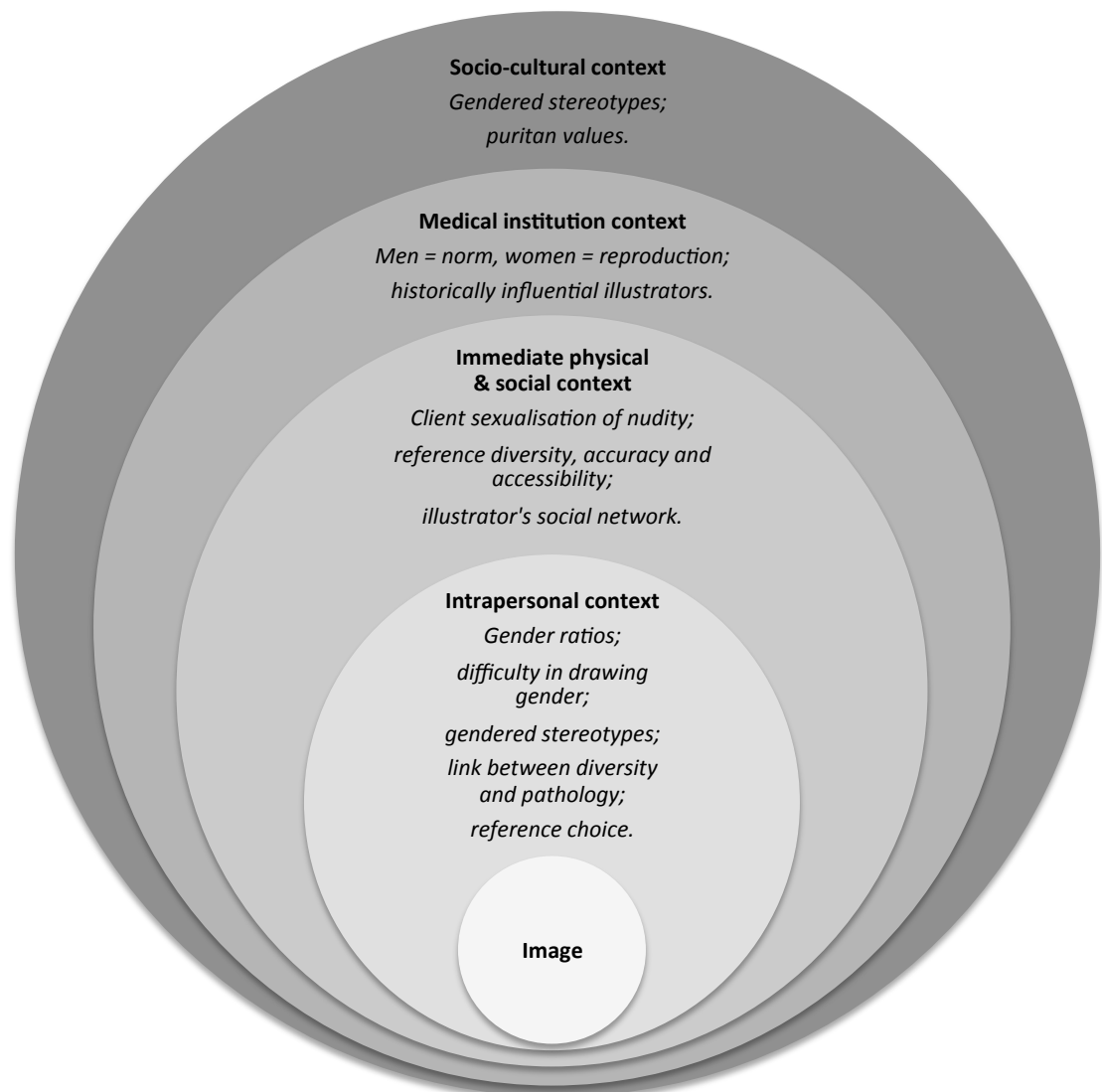


Figure 8. A revised multilevel contextual influences model that is specific to the development of a medical illustration.

6.8.1.1 Intrapersonal context

The results showed that a number of influences existed at the intrapersonal level of the illustrator. To begin with, more than half of the participants reported that their work was either equally (30.1%) or mostly (23.7%) controlled by themselves rather than by their clients/employers. These reports likely reflected the direct rather than indirect influences of clients. However, this nevertheless indicates the strong influence that the intrapersonal context would have on the development of a medical image. Other intrapersonal influences specifically related to gender included illustrators' decisions about gender ratios, difficulties in illustrating one gender over another, stereotypical attitudes towards gendered bodies and the body in general, a linking between diversity and pathology and the choice of either accessible or accurate references.

Gender ratios. Of those illustrators who reported the gender ratio in their work, the relative majority (43.8%) reported that it was equal. However, 38.3% reported a higher ratio of males in their work. The approximate equality in the size of these groups reflects both the normative tendency of male dominance in medical illustrations, as well as a slight shift towards equal representation (Alexanderson et al. 1998; Zimmerman 2000). Only a small percentage of participants (15%) reported that they illustrated more female figures and, of these, almost half were attributed to female-specific publications such as women's health magazines and midwifery textbooks. Further, 24% of participants reported that the majority of their female figures were used to represent reproductive systems. Though in the minority, this behaviour nevertheless indicates that the historically archaic trend of relegating women to reproductive and maternal conditions still prevails to some degree (Braun & Wilkinson 2001; Doyle 2006). These results suggest that some illustrators hold historically out-dated views that value men as the norm and reduce women to their reproductive abilities. They also reflect the results of Study 1, which showed that only 36% of gendered images from a range of anatomical textbooks are female. The current study adds to the results of Study 1 by identifying the sometimes subtle and

complex pathways that may explain the lack of female representation in medical illustrations.

Difficulty in illustrating gender. The majority of participants (58.9%) found that both female and male bodies were equally easy to draw, while 29.5% found the female figures easier to illustrate and 11.5% said that males were easier. The fact that more participants found women easier to draw than men was at odds with the higher number of participants who illustrated more men. Interestingly, when these results were compared, four out of the 28 participants who claimed they drew more males actually found females easier to illustrate. This seeming contradiction is consistent with research that has shown that prejudiced attitudes, such as the view that men are the default, are difficult to overcome without the intervention of certain strategies or conditions (Blair 2002).

The application of stereotypes. One of the main reasons provided by participants for why the female body is easier to illustrate was that females are considered to be 'soft', 'smooth' and/or 'curvy' while men are identified as more difficult due to their 'angles' and/or 'muscle'. The restrictive and narrow use of 'angular' and 'muscular' to describe male bodies, and 'soft' and 'curvy' to describe female bodies, indicates how the physical appearance of gender is still dominated by stereotypes. Differences between female and male physiques are not just genetic but are often socially constructed. Indeed, physical attributes that have been considered by society to be quintessentially female have differed across both time and place (Haslanger 2000; Howson 2004; Lorber & Martin 2011). Thus, the application of stereotypical views of the body reflects the influence of the socio-cultural context on the development of the image mediated through the perspective of the illustrator. Further problematising this is a tendency within Western culture to view aspects of nature in terms of mutually exclusive binary oppositions (Pooke & Newall 2008). In the current research, the values that emerged for the feminine/masculine binary were curvy/angular and smooth/muscular. Further, a normal/abnormal binary emerged for physical representations of both genders, which is discussed below. It is true that males and females do differ on average in a number of physical attributes; however, the reduction to binary opposites can vastly restrict the diversity of the bodies

represented, over-emphasise differences where there is often overlap and ignore the considerable variations that occurs within genders.

Stereotypical representations can be problematic as they often promote restrictive boundaries for what are socially acceptable feminine and masculine traits and behaviours (Byerly & Ross 2006). Stereotypical representations of men and women act as instruments of socialisation that affect gender stereotyped attitudes, beliefs, values and behaviours (Kang 1997; Tuchman 1978; Yusof et al. 2014). The belief in, and repeated use of, gendered stereotypes by illustrators therefore contributes to the construction of homogeneous and normative bodies in medical discourse that perpetuate gender differences and inequalities (Bassett & Ginis 2011; Berg 2002). This in turn plays a part in how audiences, often health practitioners and medical students, perceive what a healthy, normal body should look like and, more broadly, to the increasing social standardisation and normalisation of the criteria for male and female beauty.

Further contributing to the theme of stereotyping were the statements made by participants that they aimed to illustrate a 'normal' or 'average' body. Only a few participants clarified what was meant by 'average' and those who did associated the concept with socially normative ideals (such as being male and/or White), with bodies that represented the middle of the extremes (such as between underweight and overweight) or with what they assumed to be the physical average of the population. In other words, these averages did not always appear to represent statistical data of the population but rather an illustrator's interpretation of social conventions. Associating 'average' bodies with stereotypically ideal bodies is clearly problematic in that it sets up a norm that does not reflect reality. However, the aim of creating an 'average' body that more closely reflects the physical appearance realities of our society is also imperfect. By considering only one specific type of body as average, even if it appears to lie outside of normative ideals, illustrators are still only constructing a limited range of the demographic. Indeed, according to the Australian Bureau of Statistics (2013), no one person actual fits all the criteria of what is 'average'. A true representation of our society's physical appearance would therefore need to reflect its diversity. This shows how the intrapersonal context of the illustrator is shaped by the wider socio-cultural context. Significantly, some

illustrators did indicate that they were sometimes aware of the limiting view that 'normal' bodies were, for example, 'White' and 'skinny', and adjusted their use of diversity accordingly.

The limitations with diversity and pathology. Several illustrators reported that they would only include diverse ages, ethnicities and body types if the pathology being represented dictated it. This was due to their concern that diversity would be incorrectly connected to pathology. This issue further illustrates the multilevel nature of image creation. In particular, it shows that even when illustrators want to address issues of diversity they may be restricted by attitudes toward normative body types in the medical institution or even the wider socio-cultural context. The overrepresentation of male, White, young and fit bodies in medical discourse (Lupton 2012) has meant that diverse bodies that exist outside of this strict boundary have become non-normative. It also contributes to the marginalisation of diverse people in that their representation associates them with diseased rather than healthy bodies (Berg 2002; Oh et al. 2015). Further, because an image is created within a nested set of contexts, any attempts to resolve a lack of diversity that focuses on only the intrapersonal contextual level is likely to be unsuccessful and, as participants noted, may even be counterproductive. Put simply, illustrators were concerned that the mere presence of a non-normative body would be interpreted by audiences as indicative of pathology rather than as an attempt to represent diversity. From this perspective, diverse representation could potentially further perpetuate negative stereotypes. This reveals the possible constraints of expecting illustrators to combat biased representation on their own.

The choice between accurate and accessible references. Illustrators indicated that they often made a trade off between references that were accurate and those that were simply more accessible. Accuracy is one of the main aims of all illustrators; however, time and budget constraints have a huge impact on this objective (Hodges 2003). The results indicated that references lie along a continuum between accuracy and accessibility (i.e. the more accessible an image is, the less accurate it is likely to be). Live models were seen by the illustrators as facilitating accuracy but costing the most; existing texts were the most accessible but also ran the risk of reproducing existing errors; and photographs were seen as a middle ground between these two points.

Indeed, the highest referenced resource was photographs, with a total of 58 participants (70%) naming this resource. This may indicate that illustrators mostly make a compromise between accuracy and accessibility.

Photographs are considered to be more accurate depictions of reality than illustrations, which are entirely at the discretion of the illustrator. However, they still have the potential, through elements such as lighting, angle, framing, editing and cropping, to alter reality. Indeed, Marie Barry (1997, p.151) has cautioned that photographs can be “loaded with deliberately exploitive emotional connotations while still retaining the crucial sense of credibility that has come to be associated historically with the ‘objective’ photograph”. Some participants reported using their own photographs as references; however, many also used photographs taken by others. In using others’ photographs, certain elements could disrupt the reality of what is being photographed in a way that leads to gender-biased imagery outside the conscious awareness or knowledge of the illustrator. Indeed, without education on how elements such as lighting or editing can be used to change the reality of a photograph, illustrators may unintentionally present a certain viewpoint of the gendered body while believing they are presenting an objective perspective.

The second most commonly used reference was medical texts, which include a combination of illustrations and photographs. Using existing illustrations as a resource increases the chance that any instances of past bias are duplicated (Meynell 2008). To quote Kress (1985, p.6), discourses “define, describe and delimit what it is possible to say and not possible to say (and by extension – what it is possible to do and not possible to do)”. The limits of existing discourse are highlighted by P78’s identification that the existence of more male than female references meant that there was “perhaps easier access to male primary references”. P24 also reported that a reliance on historical references could be one of the ways in which gender bias would be perpetuated in future discourse:

... a great deal of reference material (anatomical reference books) that contemporary illustrators are using (myself included) are older publications where the references are almost exclusively male for general anatomy and

female only for reproductive; I would imagine that this may influence (likely unconsciously) which sex a contemporary artist might depict.

Importantly, as participant 24 noted, the influence of normative ideas about gender are not necessarily consciously identified and are for that reason even more insidious.

The implications of using illustrations as a reference was also concerning given that the illustrator most highly referenced as inspiring was Frank Netter, whose anatomical textbook was found to be one of the most biased anatomical textbooks analysed in Study 1. Not only were nearly all the illustrations male, but they were also all young, White and fit bodies. This is also true of the second most referenced medical illustrator, Max Brödel. Thus, by relying on existing anatomy material, illustrators run the risk of unwittingly propagating biased perspectives. Even more problematic is that, by using dated references, illustrators may be inheriting biased perspectives from the past and presenting them as if they are consistent with modern perspectives. In using dated material they may therefore be reproducing historical bias without providing the historical context that allows readers to shape an informed perspective of what is being presented.

The third most referenced resource was live models. Access to a primary source such as live models not only provides an illustrator with the most accurate reference but also has the potential to limit the influence of historical bias. Participants noted that the limitations of using live models were availability and cost. Few participants clarified whether the models they used were professional or not. Among those who did use models, some referenced using paid models while others mentioned using their social network as models. The production of diversity in medical illustrations could be dependent on the diversity of the models that illustrators used. This is particularly pertinent in relation to the use of one's social network as a source of references, which is discussed below.

6.8.1.2 Immediate physical and social context

Illustrator's social network. As noted above, live models were seen by participants as the most accurate reference type where “what I see does not lie” (P19). Live

models potentially remove the risk of reproducing existing errors in medical discourse and of reducing issues relating to using photography such as selective framing. However, they may still have an influence on the inclusion of gender bias in medical illustrations. One of the themes identified in the data was that being part of, or having access to, marginalised or minority groups through one's social network had the potential to impact the diversity in an illustrator's work. Due to the ease of accessing family and friends and the preference for using a live model in order to allow for greater flexibility, some participants identified using people from their social network as references. The diversity of a social network therefore has the potential to impact representations of diversity in medical illustrations. The 2013 American Values Survey (AVS) revealed that 91% of the people in a White Americans' social network were also White (Jones et al. 2013). Indeed, a broad range of network studies have shown that the process of homophily, that is, an individual's propensity to make homogeneous social associations, is a natural human tendency in society (McPherson et al. 2001). Considering this, it is likely that relying only on one's social network to provide references could also limit the level of diversity in a medical illustrator's work.

Reference diversity. When directly asked about the ratio of gender representation in the references they used, the majority of participants (73%) reported that it was equal and only 17% indicated that it was male dominated. However, in open-ended responses, 31.3% of participants reported that the references were male dominated. This discrepancy indicates that, when presented with an opportunity to provide unsolicited anecdotes about their experiences, participants often acknowledged bias in less explicit ways. This suggests that reports of gender bias using purely quantitative survey methods may underrepresent the extent to which individuals identify gender bias. Indeed, an individual's ability to self-report can be influenced by multiple factors including their conscious awareness of their attitudes and their desire to share them (Blair 2002; Hoffman 2005).

The majority of participants who responded found that there was also a lack of ethnic, body type and age diversity in the references. This absence of diversity is the primary way in which the reality of minority or marginalised peoples' lives and bodies are distorted. Indeed, sociologist Gaye Tuchman (1978, p.8) identified the

omission of women and other marginalised groups as an act of symbolic annihilation that promotes stereotypes and denies legitimate identities. From an intersectional perspective, the experiences of women who are also part of other marginalised and minority groups are qualitatively worse (HREOC 2001). The representation of women as primarily young, thin and White reflects traditional media stereotypes about gender that fail to accurately represent demographic realities (Brooks & Hébert 2006). Such representations contribute to myths about what a normative female body should look like and position women from minority and marginalised groups as abnormal. Thus, when medical illustrations limit the diversity in their representations, they can play an instrumental and negative role in influencing how readers (many of whom are health practitioners or medical students) define a healthy, normal body.

Client influence and the sexualisation of nudity. The results indicated that clients could have a significant influence on the production of a medical image. Indeed, illustrators reported that their work was entirely (7.2%), mostly (33.7%) or equally (30.1%) directed by their clients. Further, 57.8% of illustrators noted that clients had at least some influence on their choice of reference. One of the most significant outcomes of client influence was found in their attitudes towards, and the consequent restrictions placed on, representations of the nude body. Participants indicated that clients' attitudes towards nudity were puritanical. As a result, many felt that nudity needed to be constrained within their work. This was particularly the case with the female body, and especially female breasts, which were viewed as sexual objects by some clients. Specifically, female bodies were often viewed as 'sexual' and, therefore, as a 'distraction'. As some clients viewed women as sexual objects, they often requested that females be excluded from illustrations. Interestingly, some participants noted that, while breasts were taboo in chest illustrations, male genitalia were equally unwelcome when it came to groin illustrations. Sociologist Ann Oakley (2015, p.88) has argued that "the equivalent of the exhibited penis is not the exhibited labia, but the naked breast", also stating that "the breast is considered by both sexes to be as much a symbol of female sexuality as is the erect penis of the male sexuality". Anthropologist Shirley Ardener (1996, p.135) further identified the possible reasons for the symbolic connection between, and social ostracism of, the

penis and female breast: “The pair of breast and penis, unlike the vagina and penis combination, are both external and easily visible on the unclothed body. Both produce (different) life-giving flows”.

No matter which part of the body was thought to be too sexual, the outcome noted by participants was generally a request by clients to remove or de-emphasise it. In limiting representations of nudity in what should be an acceptable context, the ‘forbidden’ nature of breasts and genitalia is emphasised which in turn implicitly confirms their sexualisation. This acts to restrict knowledge about breasts and genitalia that medical students and practitioners need in order to provide comprehensive and inclusive healthcare. Limiting knowledge about women’s health in particular contributes to existing health inequalities (Verdonk et al. 2009). Further, the expression of such attitudes within medical discourse legitimates broader social attitudes that impact women’s lives, such as perceptions of breastfeeding as being indecent (McConville 1994; Ussher 1989).

It is important to note that clients’ issues with nudity did not necessarily reflect their own views. Indeed, clients have commercial concerns that require them to adhere to social and cultural constraints within a given society (Kress & van Leeuwen 1996). Put simply, concerns about nudity likely reflected the wider contexts of the medical institution and society in which both illustrators and their clients operate.

6.8.1.3 Institutional context

As the current study asked illustrators about their experiences, most of the results spoke to the illustrators’ direct context (i.e. their intrapersonal and immediate physical and social context). Nevertheless the social and institutional contexts came up in two ways. First, participants reported how these macrolevel contexts influenced their own work. For example, medical institutions have persistently represented males as the anatomical norm with females being primarily of interest for their reproductive role and some illustrators commented on how this affected their work. Second, participants’ responses reflected the way in which their work was shaped by a shared history and culture within the medical institution. This shared history was

reflected, for example, in the historical illustrators that participants reported were their major influences.

Historically influential illustrators. Many illustrators referenced historically influential illustrators as inspirational to their work. This is unsurprising considering that the techniques used and time spent on some older illustrations has been viewed as contributing to a higher quality of image than can be achieved in contemporary illustrations (Tsafrir & Ohry 2001). Indeed, in trying to create affordable illustrations, the detail and accuracy provided by historical references would be difficult to replicate given the limited time and budget that contemporary illustrators experience. This may account for why new editions of relatively older texts such as Gray's anatomy (1858; 1918), Grant's Atlas of Anatomy (1943) and Netter's Atlas of Human Anatomy (1989) remain in publication today. Further, illustrators may use these references as a shortcut to trying to reproduce some of the high-quality artistic detail in their own work. However, the implication of using these historical illustrations as references are particularly concerning considering that visual gender bias exists in these textbooks (Study 1 in this thesis provides an example of this). As noted above, the illustrations of Frank Netter and Max Brödel were identified as the most inspiring for illustrators but also contained male, young, fit body and White biases. These are the kinds of biases that illustrators may potentially reproduce if they are unaware of the need to adjust and diversify their own work.

6.8.1.4 Socio-cultural context

At the intrapersonal level, the results revealed that some illustrators used gendered stereotypes of smooth, curvy women and angular, muscular men in their illustrations. Interestingly, these stereotypes resemble Bassett & Ginis's (2011, pp.245-246) research that the cultural physical ideal for women "is an ultra-thin, curvy, lean, and toned physique" while for men it "is a V-shaped physique with broad, muscular shoulders, lean and toned abdominals, and muscular legs". This indicates the way in which dominant perspectives within the socio-cultural context can filter through to influence the attitudes and beliefs of individual illustrators.

Puritan values. In addition to gendered stereotypes, the results indicated the influence of puritan social values. The lack of female representation and clients' concerns with the inclusion of the nude female figure can be linked to the puritanical values dominant in the social context: "I think society frowns upon showing the female form in compromising position because the eyes may naturally be drawn to breasts and genitalia ... the male form is easier to make androgynous" (P4). Within Western society, nudity "has been inseparable from sex and sexuality, and has hence been located adjacent to the indecent, the obscene and the immoral" (Cover 2003, p.55). The hypersexualisation of the female body in particular has meant that female nudity is only socially acceptable at sites that are inherently sexual, such as pornography or advertising where 'sex sells' (Sheehan 2014; Tolman et al. 2014; Weinberg & Williams 2010). Societal views of the female breasts, for example, have contributed to their objectification and commodification in order to appeal to the male gaze while simultaneously marginalising their primary function of breastfeeding (Dettwyler 1995; Palmer 2009).

The sexualisation of the nude body, particularly the nude female body, is concerning when it comes to contexts in which nudity should be legitimately represented. The medical institution in particular is a site at which nudity should be viewed through a clinical rather than a voyeuristic lens (Grosz 2003). However, participants noted that they either made choices in their illustrations, or that clients requested changes to images, to de-emphasise or remove nudity. This association of the female body with sexuality in medical texts mirrors the antiquated views of the 19th century when "Medical illustrations were becoming increasingly problematic for a society obsessed with sex" (McGrath 2002, p.59). As a result, many images became "vague in anatomical and functional detail" (Bristow 1977, p.126). The minimisation or exclusion of the female body due to its sexualisation therefore reflects both historical and contemporary social values. This contributes to gendered health inequalities within the medical institution by limiting necessary medical knowledge about women's bodies and positioning them as inferior and non-normative. Further, framing nudity as taboo in contexts such as medicine acts to further destabilise the legitimacy of nudity and can cause "not only a certain seepage of the sexual or erotic into the privileged sites of non-sexual nudity, but also the ways in which nudity in

those sites is read by others” (Cover 2003, p.58). Thus, these attitudes towards women within medical discourse add legitimacy to broader cultural tendencies to view them in this way.

6.8.2 Implications

The current study revealed a number of implications for the practice of medical illustration. First, there is a dearth of diverse, unbiased and yet affordable resources for medical illustrators to use as references. This issue is difficult to resolve; however, research such as presented in Study 1 of this thesis can be used to identify which existing resources offer the greatest diversity. A second major implication of this study is the need for those in the medical illustration industry to be educated about how bias is visually represented and of the implications of producing work, which lacks diversity and reflects normative ideas about gender. Despite the fact that the majority of medical illustrators aimed to represent men and women equally, a relatively large number continue to produce male dominated work. There were also indications that some illustrators held gender stereotypes about female and male bodies that reflected a homogeneous and normative social ideal. As the majority of illustrators reported having a degree in medical illustration, educators in this field could implement a curriculum that teaches students to identify how bias is visually represented and understand the impact that biased imagery could have on the attitudes and knowledge of health practitioners. Lastly, accredited medical illustration associations and societies could outline ethical guidelines for creating diverse and unbiased work. This collective action could help illustrators resist and counteract the biased influences of their clients, the medical institution and society that the current study revealed was a major cause of gender-biased imagery.

6.8.3 Limitations and future research

It is important from a critical theory perspective to acknowledge the impact that both participants and researchers have on a study. The influence of participants’ views on the construction of data and of the researcher’s views on the examination and interpretation of the data is inevitable, especially in qualitative research. Indeed, from a social constructionist perspective, the data constructed by participants is influenced

by their own social position, knowledge and personal experiences. It is also important to acknowledge that, although a large number of illustrators from the Association of Medical Illustrators and the Medical Illustration Sourcebook responded to this study, their responses are not necessarily representative of these associations or of the rest of their members.

It is vital to also acknowledge that, while multiple issues were shown to exist in some illustrators' gender-attitudes, it is impossible to tell how these originated. Negative experiences with clients would potentially have an impact on their own attitudes towards gender and diversity. Likewise, the experience of clients with their audiences could also have the same effect, making clients shy of working to diversify their products beyond already familiar conventions.

In later iterations of Bronfenbrenner's (1986) ecology model he included a fifth environmental system, called the chronosystem, which notes that systems do not remain stable over time. Rather, the passage of time reshapes both the influences within each sphere and the relationship between spheres. This research has only been able to examine participants at a snapshot in time and so is unaware of and unable to bring in a temporal context. For this reason it cannot be known how the issues presented in this chapter have developed over time or how they might progress in the future. Although the former would be difficult to address, future research could examine whether the context of medical image production continues to shift and change and how this affects representations of gender.

Lastly, in order to increase participants' privacy, limited demographic information was collected. However, in light of the findings of this study, including the potential influence that social networks have on the diversity of medical illustrators' work, it would be beneficial in future research to explore this issue in more detail, including additional demographic information (beyond gender and age) about participants such as ethnicity. It would also be helpful to directly ask participants the extent to which they sympathised with gender issues and gender politics.

6.9 Conclusion

In conclusion, this study has revealed a range of contextual influences that can affect the representation of gender bias in medical illustrations. First, illustrators' intrapersonal context has been shown to influence gender bias in their work in a number of ways. Illustrators' concern with representing diversity in their work was connected to the limits imposed by representing pathology, which also pointed to issues in the broader context of the medical institution and society in general. Further, illustrators experience a tension between their need for accurate and easily accessible references, which has the potential to negatively impact their work. Second, the immediate physical and social contexts in which images are produced play a significant role in affecting the gender, ethnicity, body type and age diversity in medical illustrations. Clients' sexualised perspectives of women were shown to have an impact by limiting the representation of females. The lack of diversity in references, especially when it comes to ethnicity, body type and age, also had the potential to influence the diversity in illustrators' work. Lastly, the influence of the broader institutional and socio-cultural contexts in general was also evident. Indeed, the impact of macro-contextual concerns on the production of an image, while distal, are nevertheless significant and still need to be considered in attempts to resolve issues of bias.

7 STUDY 3: THE SITE OF THE AUDIENCE

Abstract

Background: Research has shown the prevalence of gender bias in the medical domain and its association with healthcare disparities. The factors that influence such bias are numerous and yet no research has investigated the influence that images may play in this process. Furthermore, no research has explored the effects of gender-biased images in medical education on the implicit and explicit gendered attitudes of students.

Objective: This study aimed to investigate whether gender-biased imagery from medical textbooks had an effect on the implicit and explicit gender attitudes of anatomy students.

Methods: This study used a randomised control trial experimental design in which undergraduate and graduate students studying anatomy were randomly assigned to two visual priming tasks: a control condition and a gender-biased treatment condition. The impact of this experiment on implicit and explicit gender-based attitudes was assessed using the Implicit Association Test (IAT) and a questionnaire. The IAT evaluated the effects of the treatment condition on implicit attitudes by measuring response times when associating female and male pronouns under the category of either sports health or reproductive health. The questionnaire used the Gender Bias in Medical Education Scale and open-response questions to measure the impact of the priming task on explicit gender attitudes.

Results: In total 456 participants out of 573 (80%) completed the study. IAT results revealed that viewing gender-biased images significantly increased implicit gender bias. Specifically, students who viewed biased images rather than control images in the priming task were significantly slower at associating women with sports health and men with reproductive health than when those categories were reversed (mean IAT difference = 43 milliseconds; Cohen's $d = .33$). In contrast, there was almost no evidence that the priming task impacted explicit gender attitudes except that it made participants less likely to share their own experiences of bias in open-ended responses.

Conclusions: This study represents the first evidence of the impact of gender-biased images on the implicit gender attitudes of medical students. This highlights the importance of understanding how gender bias exists within visual images so that this can be avoided when designing medical curricula.

Keywords: Gender bias, implicit attitudes, explicit attitudes

7.1 Introduction

Over the last few decades, numerous studies have brought to light the existence of gender bias in medical practice, research and education (Balsa & McGuire 2003; Chiaramonte 2008; Hamberg 2008; Kim et al. 2010; Verdonk et al. 2009; Zimmerman 2000). Though there have been steps within the medical community to identify and reform issues related to gender bias, the results found in this thesis indicate that it continues to be an endemic problem. Indeed, Study 1 revealed that, while the ratio of males to females represented in anatomical textbooks has improved somewhat (a decrease from 85% male representation in a study by Giacomini and colleagues (1986) to 64% in Study 1), a significant gender gap nevertheless continues to exist. In addition, strategies aimed at reducing gender bias have been limited in medical education and often ignore the socially constructed biases such as gender stereotypes that can negatively impact physicians' underlying gender ideologies (Verdonk et al. 2006; Verdonk et al. 2009; Weisman 2000). The potential consequences of this bias include limitations in the roles that women hold in medical practice, as well as negative implications for the health of patients (Lenhart 1993). One of the primary arenas where gender bias in medicine is acquired is during medical education where the curriculum and teaching practices play a critical role in developing and maintaining gender ideologies (Bickel 2001; Rezler & Haken 1984; Stromquist et al. 2013; Zimmerman 2000). Indeed, numerous experts have argued that strategies aimed at preventing gender bias in healthcare need to start at the educational level (Dixon et al. 2003; Hamberg 2008; Keitt et al. 2003; Risberg et al. 2003a; Risberg et al. 2009; Teal et al. 2010; Verdonk et al. 2006; Verdonk et al. 2009). Therefore, there is a need to examine the role that medical education plays in the formation of gender-biased attitudes. The current study explores how gender-biased images from medical textbooks shape both the explicit and implicit gender attitudes of students studying anatomy.

7.2 Background

Predicting human behaviour is a difficult and complex task. Despite these difficulties, social attitudes have been shown to be consistent and important predictors of behaviour (Ajzen 1991; Ajzen & Fishbein 2005; Manstead 1996;

Greenwald 1989). According to Manstead (1996, p.3), an attitude is defined as “a relatively enduring tendency to respond to someone or something in a way that reflects a positive or negative evaluation of that person or thing”. Social psychologists have demonstrated the importance of attitudes by identifying the way in which they manifest themselves through behaviour and can therefore be used as predictors of behaviour (Ajzen 1991; Eagly & Chaiken 1993; Greenwald 1989; Maio & Haddock 2009; Smith et al. 2015; Vaughan & Hogg 2008). For example, multiple studies have shown that the attitudes of medical students and practitioners have an impact on their behaviour (Levinson & Roter 1995; Novack et al. 1999; Rogers & Coutts 2000; Woloschuk et al. 2004).

Social psychology has identified that attitudes are understood as existing at both an explicit and implicit level (Greenwald & Banaji 1995). Specifically, explicit attitudes exist at the conscious level and require intentional effort to be activated, while implicit attitudes exist outside of conscious awareness and control and are activated automatically (Gawronski & Payne 2010; Hofmann et al. 2005). It has long been understood that explicit attitudes have a significant influence on behaviour. However, more recent studies have found that implicit attitudes also exert a powerful influence on behaviour (Gawronski & Payne 2010; McConnell & Leibold 2001; O'Brien et al. 2008; Perugini 2005). Further, individuals can hold implicit attitudes that conflict with their consciously approved beliefs (Wilson et al. 2000). This is especially true of attitudes of stereotyping and prejudice, which may be held implicitly but contrast with reported (explicit) attitudes (Fiske 1998). Research in this area has shown that while reports of prejudiced attitudes have rapidly decreased over the last decade (Dovidio et al. 1986; Dovidio 2001), discrimination against marginalised groups persists in all aspects of our society (Bushway & Piehal 2001; Daniels 2000; Ellis & Riggle 1996; Hacker 1995; Herek 2000; Huddy et al. 2000; Ridgeway 1997). For example, Greenwald & Banaji (1995) found that implicit biases were associated with discriminatory behaviour despite explicit denials of prejudice. This disparity between explicit and implicit attitudes has been attributed to either a reluctance to report on prejudiced attitudes due to a concern for social desirability (Blair 2001; Dovidio et al. 2001; Fazio & Olson 2003) or to the existence of

uncontrolled (implicit) attitudes that individuals are unaware of having (Ajzen & Fishbein 2005; Wilson et al. 2000).

Significantly, McConnell and Leibold (2001) established that implicit attitudes were much more likely to predict discriminatory behaviour than explicit reports. Research on prejudice has consequently begun to focus on implicit attitudes, including an understanding of how they are formed and how they impact behaviour. Although implicit attitudes operate outside conscious awareness, empirical research suggests that they can be examined by appropriate methodology, such as through indirect measures of attitudes, and that their effects on behaviours are measurable (Greenwald & Banaji 1995). One of the most common and well-validated methods for quantifying implicit attitudes is the Implicit Association Test (IAT; Egloff & Schmukle 2002; Greenwald et al. 1998). The IAT has been used to examine implicit prejudices such as sexism (Rudman & Glick 2001), racism (Dasgupta et al. 2000; McConnell & Leibold 2001) and homophobia (Steffens & Buchner 2003). Further, studies using the IAT have shown that implicit attitudes can predict discriminatory behaviour (McConnell & Leibold 2001; O'Brien et al. 2008).

Unlike early beliefs that implicit attitudes were stable traits, recent theory has identified that they are contextually sensitive (Barden et al. 2004; Dasgupta and Greenwald 2001; Ferguson & Bargh 2004; Wittenbrink 2007). The idea that implicit attitudes can be affected by their context comes from Relational Frame Theory (RFT), which was developed in the field of behavioural analysis and is a behavioural account of human language and cognition (Hayes et al. 2001). RFT proposes that an individual's attitudes are context sensitive and therefore open to change (Blackledge 2003). From this perspective, attitudes are not innate traits but are responsive to context and can therefore be subtly influenced by the nuances of a given environment. For example, a study by Oancia and colleagues (2001, p.250) found that "female surgical residents and medical students undergo a process of acclimatisation to the patriarchal surgical culture" that makes them, unconsciously, less likely to report abuse and discrimination. In this case, repeated exposure to an environment that normalised discriminatory attitudes and behaviours had an influence on female implicit attitudes.

7.2.1 Implicit bias research in medicine and medical education

Research has shown that while overt and explicit gender bias has declined in medical contexts, subtler and more implicit bias still exists (Verdonk et al. 2009). Moreover, several researchers suggested that implicit bias is more likely to underlie and predict disparities in medical diagnosis and treatment than explicit prejudice (Blair et al. 2011; Bogart et al. 2001; Devine 1989; Einbinder & Schulman 2000; Sabin et al. 2008; Sabin et al. 2009; Schulman et al. 1999). As a result, a number of studies have begun to examine the ways in which healthcare practitioners' implicit bias contributes to health disparities and evidence has been found that implicit attitudes affect decisions made in the diagnosis and treatment of minority and marginalised groups (Cooper et al. 2012; Green et al. 2007; Smedley et al. 2003; van Ryn & Fu 2003; White III 2011). For example, research by van Ryn and Burke (2000) found that physicians frequently held implicit biases against Black Americans and suggested that this resulted in low-quality healthcare for those within this ethnic group. Cooper and colleagues (2012) also revealed that physicians' implicit racial bias was associated with lower interpersonal care for non-White patients and Green and colleagues (2007) reported that physicians' implicit racial bias had a significantly negative effect on decisions to treat Black patients with thrombolysis.

Biased attitudes may reflect wider social values; however, recent studies have suggested that medical education plays a unique role in shaping the implicit biases of medical students (Burke et al. 2015; van Ryn et al. 2015). For example, research by van Ryn and Fu (2003) found that students who were exposed to physicians' negative remarks about Black American patients had increased levels of implicit bias. A study by Phelan and colleagues (2015) similarly found that medical educators' discriminatory behaviour towards obese patients increased students' implicit and explicit biases. These studies reveal that the attitudes of medical educators and physicians can play a significant role in shaping biased attitudes in students. However, to date, no studies were identified that examined whether the images in medical curricula have an influence on gender-related attitudes and biases. Given the potential impact of a physician's biased implicit attitudes on patient health, it is imperative to consider all the ways in which attitudes can be negatively influenced. Textbooks play a central and pervasive role in medical education and, as

many of them are highly visual (Gunderman 2011), so do images. Further, as shown in a number of studies, including Study 1 of this thesis, these images are frequently gender-biased (Giacomini et al. 1986; Lawrence & Bendixen 1992; Mendelsohn et al. 1994). It is therefore important to examine the impact that textbook images have on the attitudes of students studying anatomy. The current study investigated the effects of gender-biased imagery, taken from medical textbooks, on both the implicit and explicit gender attitudes of anatomy students. The IAT was used to measure implicit attitudes and a questionnaire was used to measure explicit attitudes.

7.3 Hypotheses

The aim of this study was to investigate whether visual representations of gender bias impact the implicit and explicit gender attitudes of audiences. In order to do this the following hypotheses were explored:

H3.1. Exposure to gender-biased imagery will increase implicit gender bias.

H3.2. Exposure to gender-biased imagery will increase explicit gender bias.

H3.3. The effects of gender-biased images will operate more strongly on implicit rather than explicit attitudes.

7.4 Methods

7.4.1 Participants

Participants were students from two different strands of study within the School of Medicine at the University of Wollongong, Australia: undergraduate medical and health science students enrolled in a first year anatomy subject (SHS111) and graduate-entry medical students in the first year of their integrated degree (MEDI601). There were 491 students enrolled in MEDI601 and 82 students enrolled in SHS111, making a total of 573 possible participants.

7.4.2 Study design and implementation

The study was conducted during anatomy laboratory classes over a period of 2 weeks (between April and May 2015) after ethics approval was obtained from the University of Wollongong Human Research Ethics Committee (ethics approval number HE14/130; Appendix C). Students enrolled in and attending these classes were invited to participate in the study. Participation was voluntary and all data collected was anonymous. To reduce distractions and provide students with a convenient way to complete the study, the online task was set up in a private computer room adjacent to the anatomy laboratory. Groups of up to 8 students at a time participated and the task took approximately 10 minutes to complete. The researcher remained in the room during all data collection times so that any questions or concerns could be directly addressed.

The study used a randomised control trial (RCT) in the form of an online task that was specifically developed for the current study (Appendix E). The online task consisted of four parts: 1) a short introduction that described the study and provided instructions for how to complete the study; 2) a priming task during which participants were randomly assigned to view either gender-biased images for the treatment group or gender-neutral images for the control group; 3) the Implicit Association Test (IAT) and; 4) a brief questionnaire.

7.4.3 Materials

Priming Task. For the priming task, gender-biased images for the treatment group and gender-neutral images for the control group were selected from existing anatomical textbooks (sources and images are presented in Appendix E). The treatment group included narrative images that reflected the over-representation of genders in traditionally masculine (in this case sports-related roles) or feminine (in this case reproductive-related roles) roles (Figure 9 shows example images). The narrative images of males in sports-related roles and females in reproductive-related roles were selected as these spheres clearly represent traditional gender roles (Collins 2011; Haines et al. 2016; Hardin & Greer 2009; Sabo & Snyder 2013). The control images were comprised of images of internal anatomy in which the gender could not

be determined, including isolated organs such as the lung, heart and brain, and musculoskeletal structures such as the vertebral column and muscles. A total of 24 images were displayed on screen in automatic succession for four seconds each. To increase participants' engagement with the priming task, the question "What anatomy chapter would this image appear in?" appeared below each image.



Figure 9. A sample of images from the gender-biased priming task (clockwise from top left: Marieb & Hoehn 2013, p.199; p.524; p.945; Saladin 2012, p.24; Tortora & Derrickson 2012, p.650; Martini 2012b, p.108;).

Implicit measures: Implicit Association Test. Following the visual priming task, participants completed an Implicit Association Test (IAT) adapted from <https://github.com/winteram/IAT>. The IAT was used to measure the effects of each set of images on the implicit gender attitudes of participants. The IAT is a computer-based measure created in 1998 that has been widely used to assess unconscious social biases by measuring participants' automatic responses (Greenwald et al. 1998). Specifically, it measures how quickly participants associate social groups (such as ethnicity or gender) with an evaluation (such as good or bad) or stereotype (such as lazy or industrious). Reaction times indicate how strongly a participant automatically associates a group with a term that

indicates an evaluation or stereotype. For example, if a participant implicitly connects a White ethnic group with positive evaluations and a Black ethnic group with negative evaluations, they will categorise White ethnicity with positive evaluations quicker than they would if the case was reversed.

The IAT required a set of words to represent each category of interest. The social group contained pronouns related to the categories Female and Male. The stereotype group contained terms that participants would find solely consistent with either Reproductive Health or Sports Health (i.e. non-overlapping sets of words). A full set of terms can be found in Table 17.

Table 17
IAT Groups and Terms

Groups	Terms
Reproductive Health	Postnatal, Infertility, Fertility, Conception, Reproduction, Genitalia, Puberty
Sports Health	Bodybuilding, Sprain, Dislocation, Concussion, Exercise, Fitness, Musculoskeletal
Female	She, Woman, Her, Girl, Hers, Lady
Male	He, Man, Him, Boy, His, Gent

When there was a match between terms related to the group Female and the group Reproductive Health, or when terms related to the group Male where matched with Sports Health, this was considered to be a stereotypically similar condition. When there was a match between terms related to the group Female and the group Sports Health, or between male terms and Reproductive Health terms, this was considered to be a stereotypically dissimilar condition.

Category titles were on the left or right of the screen and the terms requiring categorisation appeared in the centre of the screen (Figure 10). Colour was used to distinguish between gender terms (green) and medical terms (black). Participants categorised each word by pressing the letter ‘E’ when the target term matched categories on the left of the screen and ‘I’ when the target term matched the category on the right (Figure 11).

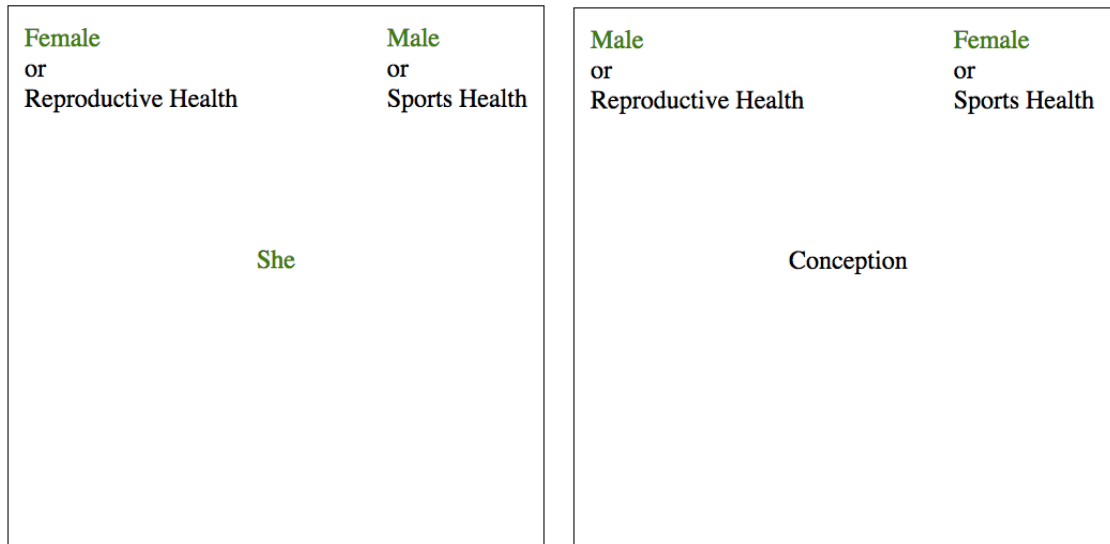


Figure 10. Two examples of the categorisation task from the IAT.

Terms in green are related to gender and terms in black are related to medicine. Thus, terms in the centre of the screen need to be categorised into the relevant term in either the left or right hand corners.



Figure 11. Finger placement for categorisation task.

Participants were instructed to place their index fingers on the letters 'E' and 'I' and their thumbs on the space bar for maximum speed. Participants pressed 'E' to categorise terms to the left and 'I' to categorise terms to the right.

After instructions, participants conducted one familiarisation round with just the gender pronouns (Round 1), two practice rounds of the IAT under stereotypically similar conditions (Rounds 2-3), and then a round in which data were recorded

(Round 4). This was followed by two practice rounds under stereotypically dissimilar conditions (Rounds 5-6), and then another round in which data were recorded (Round 7; Table 18). The information of interest was the differences in reaction times between the fourth (stereotypical similar) and seventh (stereotypical dissimilar) rounds. Participants were presented with 20 terms per round. Responses less than 300 or greater than 3000 milliseconds long were excluded as invalid responses. Both the average reaction time and the standard deviation in reaction time per trial were collected. Difference in reaction time between assigning terms to parts of the screen sharing stereotypically similar categories (e.g. Female and Reproductive Health groups) compared with assigning stereotypically dissimilar categories (e.g. Female and Sports Health groups) were considered to be an indicator of the implicit social biases held by participants. The difference in the average categorising speed for stereotypically similar and dissimilar conditions determines the IAT score. The average response time in milliseconds and the average response time in milliseconds corrected by the standard deviation of participants' responses were measured. The latter resulted in a slightly bigger effect size for the treatment group. However, given that this participant-specific standardisation procedure resulted in estimates on a more arbitrary scale, the average categorising speed in milliseconds was retained as the primary scaling of the dependent variable.

Table 18
IAT Rounds

Round	Round Type	Terms		Stereotype		Recorded
		Gender	Health	Similar	Dissimilar	
1	Familiarisation	✓				
2	Practice		✓	✓		
3	Practice	✓	✓	✓		
4	Recorded	✓	✓	✓		✓
5	Practice	✓			✓	
6	Practice	✓	✓		✓	
7	Recorded	✓	✓		✓	✓

Explicit measures. Explicit attitudes were measured using a) the *Gender Bias in Medical Education Scale* (GBMES; a three-factor measure of participants' explicit

attitudes towards gender bias in medical education; Parker et al. 2016) and b) a single Likert response-type item asking participants to rate their agreement with the statement “I am supportive of gender equality”. The GBMES consisted of 10 items measuring three factors: a) awareness, e.g. In anatomical textbooks, reproductive chapters have more images of females than males, b) beliefs, e.g. I believe educators should raise awareness of the risks of gender bias in medicine, and c) experiences, e.g. I have seen evidence of gender bias in anatomy class activities. The coefficient of reliability for the GBMES ranged from .72 to .91. Analysis of the GBMES used factor scores for awareness beliefs and experiences that were derived from an extensive psychometric evaluation (Parker et al. 2016). Both the GBMES and the single item measuring support for gender equality used a 6-point Likert scale, ranging from 0 (strongly disagree) to 5 (strongly agree)². Table 19 displays item descriptives.

Open-ended responses. Following the GBMES, participants were provided with a space in which to provide written examples of their experiences of gender bias during their education (If you have encountered gender bias during your medical science education, can you give an example?) and in their medical textbooks (If you have encountered evidence of gender bias in anatomy textbooks, can you give an example?).

7.4.4 Data and statistical analysis

All data were analysed using ordinary least squares regression in R (R Core Development Team 2014). The treatment grouping was regressed on the IAT scores and the questionnaire data. Multiple regression models were also run, controlling for key covariates such as gender, year or phase of study and undergraduate or postgraduate program, as a double robust procedure against

² The use of attitudinal Likert scales, which provide positive statements and ask participants to rate their relative agreement to them, is common for social psychological research. As responses to Likert scales are based on the degree of agreement or disagreement rather than on a simple yes or no, participants are not restricted to a particular viewpoint or belief. Further, as participation is anonymous, responses are more likely to be accurate. Lastly, the constructs from the GBMES (i.e. awareness, belief and experience) were represented by more than one item in order to overcome any unreliability in a single item. Thus, the primary results are based on the construct score, which consists of responses to multiple items about one construct.

violations of balance that may occur despite random assignment. In addition to estimating the average treatment effect of the priming task, moderator analysis was used to determine whether the treatment effect differed by gender and/or program of study. Open-ended responses to questions relating to students' experience of gender bias were also examined. Specifically, if an individual responded to these questions then this was used as a measure of whether the priming task had made such experiences more salient. The questions were coded as 1 if participants provided a response and as 0 otherwise. A chi-square test on the cross tabulation of the experiment condition (treatment and control) and open-ended responses (response and no-response) was conducted to ascertain whether a relationship existed between them. P-values were derived from Monte-Carlo simulation (Hope 1968). All data can be viewed at:

https://figshare.com/articles/Study3_Data/3798228

7.5 Results

7.5.1 Demographics

Out of a total of 573 students invited to participate, 456 voluntarily participated in this study (response rate 79.6%). This included 252 females (55%) and 190 males (42%) with a mean age of 20.7 years (SD = 4.5, median = 19). From the undergraduate cohort, 380 out of 491 students participated, 76% of whom were female, with a mean age of 19.9 years (SD = 4.1, median = 18) and 91% were in their first year of university. Among the graduate-entry medical students, 70 out of 82 participants completed the study, 37% of whom were female and with a mean age of 24.9 years (SD = 4.1, median = 23). Random assignment of participants to the treatment and control groups for the priming task resulted in 249 in the treatment (56% female) and 208 in the control (54% female) condition. Scores on the GBMES were represented by factor scores taken from a psychometric study (Parker et al. 2016). Descriptive statistics for these measures for the total sample and by treatment group are presented in Table 19.

Table 19
Demographics of Responses to Questionnaire Items

Scales	Item	Total Sample		Gender				<i>p</i>	Experiment Group					Program of Study				
		Mean	SD	Females		Males			Treatment		Control			Undergrad		Postgrad		
				Mean	SD	Mean	SD		Mean	SD	Mean	SD	<i>p</i>	Mean	SD	Mean	SD	<i>p</i>
Gender politics	I am supportive of gender equality.	4.61	.65	4.65	.67	4.56	.62	NS	4.58	.66	4.64	.64	NS	4.59	0.65	4.71	0.66	NS
Gender bias awareness	I believe that medicine is male dominated.	2.52	1.24	2.65	1.24	2.34	1.22	*	2.56	1.20	2.46	1.30	NS	2.44	1.24	2.93	1.18	**
	Male bodies are treated as the default in medical education.	2.81	1.29	2.83	1.38	2.80	1.16	NS	2.83	1.18	2.79	1.41	NS	2.77	1.29	3.04	1.27	NS
	In anatomy textbooks, reproductive chapters have more images of females than males.	3.05	1.32	3.30	1.31	2.71	1.29	***	3.19	1.28	2.90	1.36	*	3.06	1.34	3.00	1.25	NS
	Medical studies are mainly done on males.	2.04	1.13	2.13	1.15	1.90	1.10	*	2.11	1.14	1.94	1.12	NS	2.04	1.12	2.00	1.22	NS
Gender bias beliefs	I believe educators should raise awareness of the risks of gender bias in medicine.	3.35	1.13	3.49	1.07	3.16	1.18	**	3.35	1.13	3.34	1.14	NS	3.28	1.15	3.69	1.00	**
	I believe educators should raise awareness of the risks of gender bias in anatomical textbooks.	3.02	1.20	3.15	1.17	2.88	1.20	*	3.07	1.18	2.97	1.21	NS	3.03	1.21	2.97	1.11	NS
	I believe anatomy educators should challenge gender-biased attitudes in the classroom.	3.37	1.21	3.52	1.19	3.17	1.21	**	3.34	1.25	3.40	1.17	NS	3.32	1.24	3.63	1.02	*
Gender bias experience	I have seen evidence of gender bias in anatomy class activities.	1.39	1.14	1.53	1.19	1.20	1.06	**	1.39	1.09	1.38	1.20	NS	1.33	1.15	1.68	1.06	*
	I have encountered gender-biased <i>behaviours</i> among other students.	1.55	1.32	1.72	1.38	1.34	1.21	**	1.51	1.28	1.60	1.37	NS	1.43	1.30	2.15	1.26	***
	I have encountered gender-biased <i>attitudes</i> among other students.	1.66	1.39	1.83	1.47	1.44	1.27	**	1.61	1.33	1.73	1.46	NS	1.54	1.37	2.31	1.36	***

Notes. Items were measured on a 6-point Likert scale, ranging from 0 (strongly disagree) to 5 (strongly agree). Higher scores equal more agreement. NS >.05, * $p < .05$, ** $p < .01$, *** $p < .001$. NS = not significant, p = p value, SD = standard deviation.

7.5.2 Randomised control trial results: IAT and questionnaire responses

Mean scores for all dependent variables overall and by the treatment and control group are provided in Table 20. To explore whether differences between groups were significant, three linear regression models were run for each dependent variable. In Model 1 the dependent variable \hat{Y} was predicted only by treatment group membership (biased coded as 1 and control coded as 0; see equation 1).

$$\hat{Y} = \alpha + \beta_1 treatment \quad (1)$$

Model 2 tested the robustness of these results by including gender (coded as 1 for male and 0 for female), age and program of study (coded as 1 for graduate and 0 for undergraduate) as covariates (see equation 2).

$$\hat{Y} = \alpha + \beta_1 treatment + \beta_2 male + \beta_3 age + \beta_4 graduate \quad (2)$$

Model 3 aimed to explore whether the treatment effect was moderated by gender, age and/or program of study (see equation 3).

$$\hat{Y} = \alpha + \beta_1 treatment + \beta_2 male + \beta_3 age + \beta_4 graduate + \beta_5 treatment \times male + \beta_6 treatment \times age + \beta_7 treatment \times graduate \quad (3)$$

Table 20
Descriptives

Dependent Variables	Total Sample		Treatment		Control		Group difference ¹	
	Mean	SD	Mean	SD	Mean	SD	Diff	Cohen's <i>d</i>
IAT	167	132	184	134	148	127	36**	.28**
Gender bias awareness	2.60	0.91	2.67	0.83	2.52	0.99	.15^	.16^
Gender bias beliefs	3.24	1.03	3.25	1.04	3.23	1.02	.02	.02
Gender bias experience	1.53	1.14	1.50	1.10	1.57	1.19	.07	.10
Gender politics	4.61	0.65	4.58	0.66	4.64	0.64	.06	.09

Notes. IAT responses are given in milliseconds. All other variables were measured on a 6-point Likert scale with poles of strongly disagree (0) to strongly agree (5).

¹ Estimates taken from a regression model. SD = Standard deviation,

Diff = difference, ^ $p < .10$, ** $p < .01$.

Model 1 indicated that the difference in the average categorisation speed for the IAT between the treatment and control groups was significant (Table 20). Participants who were exposed to gender-biased images were slower in the categorisation tasks for stereotypically dissimilar groups than similar groups compared with those exposed to control images, consistent with hypothesis H3.1. For the explicit measures of gender bias, there was no significant difference between the treatment and control group on attitudes towards gender politics or any of the three gender bias factors from the GBMES (Table 20). There was a near significant effect was found for gender bias awareness. However, it was the treatment group rather than the control group who displayed higher levels of agreement with the awareness scale.

Model 2 was an extension of Model 1 and included controls for gender, age and program of study as a means of ensuring the robustness of the results (Table 21 gives the results for Model 2 for the treatment, as well as for the covariates). The effect of the priming treatment on the IAT categorisation task was larger when controlling for these covariates (unconditioned $d = .28$; conditioned on covariates $d = .33$). As before, the priming treatment had no significant effect on attitudes towards gender politics or on the GBMES. Indeed, even the near significant effect reduced in size and was no longer below the 10% significance threshold.

When gender was compared, it was found that males were more biased on both implicit and explicit measures, with the exception of gender politics where no significant difference was observed (Table 21). Younger people had significantly lower scores for awareness of gender bias (Table 21). This corresponded to the results for program of study as graduate-entry medical students were significantly more likely to indicate a higher awareness and experience of gender bias than undergraduate participants. The similar results for age and program of study were unsurprising as the postgraduate group was significantly older than the undergraduate group ($t [97] = 9.43, p < .001$). Finally, in Model 3, the results were not moderated by gender, age and/or program of study using linear regression.

Table 21
Randomised Control Trial Results: Robust Results

Dependent Variable	B				β			
	Biased	Male	Age	UG	Biased	Male	Age	UG
IAT	43.39***	25.72*	-1.03	-29.65	.33***	.20*	-.04	-.23
Gender bias awareness	.13	-.24**	-.03**	-.32*	.14	-.26**	-.15**	-.35*
Gender bias beliefs	-.01	-.28**	-.02	-.26	-.01	-.28**	-.09	-.26
Gender bias experience	-.12	-.34**	-.03*	-.68***	-.10	-.30**	-.11*	-.59***
Gender bias politics	.04	-.09	-0.01	-.12	.06	-.14	-.03	-.18

Notes. $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$. B = Unstandardised coefficient; β = Standardised coefficient from multiple regression. UG = Undergraduate.

7.5.3 Randomised control trial results: qualitative responses

Differences in the qualitative responses by treatment group were explored. Given the small sample size for some of the combinations of variables, the simulated p-value option for chi-square tests was used (Hope 1968). For the qualitative reports of gender bias in participants' education there was evidence of a significant effect by treatment group: $\chi^2 = 4.59, p < .05$. Consistent with the IAT scores, the control group were 1.83 times more likely to indicate that they had explicitly noticed gender bias than the treatment group (9.6% of the treatment group provided responses compared to 16% of the control group). This possibly indicates that the priming treatment normalised gender bias experiences. However, there was no significant difference between the treatment and control groups in terms of whether they reported observing bias in textbooks.

7.6 Discussion

This experimental study aimed to investigate whether gender-biased imagery had an effect on the implicit and explicit gender attitudes of students studying anatomy. The results indicated that biased images had a significant effect of moderate size on implicit attitudes. Participants who were exposed to gender-biased images took longer to associate female and male pronouns with non-traditional gender roles compared with the control group. There was little evidence of the priming task having an effect on explicit bias, except that it made participants less likely to share

their own experiences of bias. A summary of support for the hypotheses can be found in Table 22.

Table 22
Results of Study 3 Findings by Hypothesis

Hypotheses	Outcomes
H3.1: Exposure to gender-biased imagery will increase implicit gender bias.	Confirmed
H3.2: Exposure to gender-biased imagery will increase explicit gender bias.	Unsupported
H3.3: The effects of gender-biased images on viewers' attitudes will operate most strongly on implicit rather than explicit attitudes.	Confirmed

In addition to these main analyses, results relating to the covariates were also of interest. Males and younger people were more likely to have gender-biased implicit attitudes and were even more likely to have biased implicit attitudes when in the treatment group. Greater gender bias among males for both implicit and explicit measures, with the exception of gender politics, is consistent with research that shows that men are more likely to have gender-biased attitudes than women (Glick & Fiske 1996; Rudman & Glick 2001). Research in medicine has found similar results with male physicians showing higher levels of gender bias by being more likely than females to undertreat women (Baumhake et al. 2009; Berthold et al. 2008; Journath et al. 2008) or view gender as less important to health (Riseberg et al. 2003b). Female participants were also more likely to report experiences of explicit bias during their medical education in qualitative responses. This finding is similar to research showing that female medical students (Stratton et al. 2005; Witte et al. 2006), residents (Li et al. 2010), educators (Risberg et al. 2008), academics (Jagsi et al. 2016) and practitioners (Saalwachter et al. 2005) are more likely than their male counterparts to report observations and/or experiences of gender bias and discrimination.

In contrast to the results on implicit attitudes, there was almost no observed effect of the treatment condition on participants' explicit reports of bias in the GBMES. Two

reasons for this could be tentatively proposed. First, that students' desire for gender equality at the explicit level is sufficient enough to override priming effects, even when there is evidence that the priming images have influenced implicit gender attitudes. Second, as previous research has shown, that explicit attitudes are much easier to disguise than implicit attitudes (Blair et al. 2011; Dovidio et al. 2001).

The present study contributes to existing theories that individuals are able to simultaneously hold disparate implicit and explicit attitudes (Wilson et al. 2000). Participants generally reported very strong agreement with items asking whether they believed in gender equality, which is consistent with suggestions that most explicit gender bias has been removed from medical discourse (Verdonk et al. 2009). However, exposure to biased images had a statistically and practically significant effect on implicit bias. This is important given that the treatment was relatively short, at a little over one and a half minutes. If, as Study 1 of this thesis showed, medical textbooks are replete with visual gender biases, then they may be a mechanism that leads to implicit gender-biased attitudes in healthcare practitioners. Thus, these results give rise to questions about the implications of long-term exposure to gender bias in medical curriculum content. Put simply, if a two-minute exposure to gender-biased images can significantly increase implicit bias, what effect could repeated exposure have on students during the course of their degree? These results suggest that this important question needs further consideration. For example, monitoring medical students' attitudes toward gender bias across their educational career would provide more insight into prolonged effects in a practical setting.

7.6.1 Implications

Previous research has shown the negative impact that implicit bias has on patients (Cooper et al. 2012; Green et al. 2007; Sabin et al. 2009; Sabin et al. 2012). Further, recent studies have shown that this implicit bias may have its genesis in medical education (van Ryn et al. 2015). This research supports the idea that implicit bias can be influenced during medical education, specifically in the case of gender bias. Additionally, it has shown that visual bias in particular can have an impact on implicit attitudes. This suggests that medical education institutions, educational

content producers and medical curriculum developers need to be attuned to how gender is presented in every facet of medical education. It also suggests that research is needed on the context of curriculum production to uncover where gender bias originates. For example, Study 2 in this thesis found that gender bias in images from medical curricula can come from the demands made by those who commission the images, from the image producers themselves, from the references available to medical illustrators or from the perceived or actual demands of image consumers. If the stakeholders were made aware of the current study's results and the impact that implicit bias has on healthcare outcomes, they may be more willing to advocate for more gender equitable images.

7.6.2 Limitations and future directions

The current study has significant implications for both theory and practice; however, there were some limitations to the generalisation of the findings. First, the participants were all from a single university and so their attitudes and experiences may differ from other subsets of the population. Additionally, the longevity of the priming task effects was not investigated. In recognising that the study provides strong evidence for the influence of biased images on implicit attitudes, it must also be noted that it remains unclear how long these effects last. Future research could explore the duration of the effects of a priming task. Further, if this kind of priming is consistently experienced throughout medical education then it is conceivable that the cumulative effect of biased images on implicit attitudes would be much stronger. Future studies could therefore explore the effect of long-term exposure to biased imagery. As participants were randomly assigned to conditions, the results are thus unlikely to be biased by confounding variables. However, a consideration of how results might vary by variables such as personality would be an interesting approach for future research with a much larger data set. This study focused solely on the effects of biased imagery. Future research could explore other curricular and educational experiences that may also contribute to or counteract gender-biased attitudes. Lastly, the specific kinds of behaviour that are influenced by implicit attitudes are unknown and should also be explored. Despite these limitations, the results of this study have implications for understanding how attitudes work and how they can be changed in medical education.

7.7 Conclusion

Building on Study 1's investigation of the ways in which gender bias could be visually represented within anatomical textbooks, the current study demonstrated that gender-biased images can have a significant impact on the implicit gender-biased attitudes of students studying anatomy. This outcome indicates that implicit attitudes are influenced by context and that they can be manipulated via interventions such as visual priming tasks. Further investigation into gender-biased imagery in medical education, including an exploration of how bias can be visually represented and its long-term impact on implicit attitudes, will assist in identifying guidelines that can be used to avoid gender bias in the design of medical curriculum. Identifying these kinds of gender biases early can help medical educators to design bias-reduction interventions that may ultimately improve healthcare outcomes. Studies such as this are therefore important for providing medical educators with information on how to reduce implicit gender bias during medical education.

8 GENERAL DISCUSSION AND CONCLUSION

Abstract

This chapter provides a general discussion of the results of Study 1, 2 and 3 when taken together. After a brief overview of the specific findings of each study, the broader contributions of this thesis to theory and research are considered. The implications of the research outcomes for practice, as pertains to medical education and to the profession of medical illustration, and for methodology, including visual research, are discussed. Finally, a proposal for future research is outlined.

8.1 Introduction

The ultimate goal of this thesis was to determine how gender bias results from a complex interaction between the image, its productions and its audience. To do this, the research addressed three aims:

1. To examine whether visual gender bias found in previous research persists in anatomical textbooks and whether additional visual gender biases that have not previously been reported also exist.
2. To identify the multilayered contextual factors that influence the biased representation of gender during medical image production via the perspective of medical illustrators.
3. To investigate whether visual representations of gender bias have an effect on the implicit and explicit gender attitudes of students studying anatomy.

Each aim was investigated within three separate but related studies detailed in Chapters 5, 6 and 7. A discussion of each study's findings has been provided in these chapters and will therefore not be repeated here. Instead, this last chapter presents a short summary of each study and a discussion of the broader implications of the research including the ramifications of these studies when taken together. Lastly, a road map for future research is laid out.

8.2 Summary of Research Findings

8.2.1 Study 1 summary

Study 1 presented in this thesis (Chapter 5) investigated how gender bias was visually represented within the primary anatomical textbooks used at Australian Medical Schools. Despite the ample research identifying unequal visual representations of women in anatomical textbooks, these studies occurred over two decades ago and concentrated their analysis on providing quantitative results on the ratio of female and male images only (Giacomini et al. 1986; Lawrence & Bendixen 1992; Mendelsohn et al. 1994). As such, none of these studies included a clear exposition of the additional ways in which gender bias visually manifests itself within anatomical textbooks. The aim of Study 1 was to therefore provide an updated

examination of gender ratios and to investigate the alternate ways that gender bias has been visually represented. This was addressed by performing a systematic visual content analysis on all images in which sex/gender could be identified within anatomical textbooks, followed by an additional content analysis on all the narrative images found within these textbooks. The results of these analyses revealed that, although the unequal representation of women and men in anatomical textbooks has improved somewhat, men still outnumber women except for in sex-specific images, which mostly relate to reproduction. As expected, additional forms of visual gender bias were also found to exist. Other than a general lack of ethnic diversity, women in particular were more likely to be White than men. There was a general lack of age diversity but women in particular were more likely to be represented as young than men. Female and male bodies were restricted to normative body types with most women represented as having toned bodies and most men represented as having muscular bodies. Although not hypothesised, there was a clear instance of gender bias in the almost complete lack of sex and gender variant individuals. Further, gender bias was also found in narrative images. Significantly, men were more likely than women to be represented in traditional gender roles. Likewise, both men and women tended to be represented in settings stereotypic of their gender. Women were also more likely to display positive emotions and men were more likely to display neutral and negative emotions. Interestingly, there was no significant gender difference in the portrayal of women and men in either active or passive roles or in possessing a direct or indirect gaze. Thus, Study 1 identified gender bias in anatomical textbooks images through the lack of gender, ethnicity, age and body type diversity, in the adherence to a strict sex/gender binary and through the narrative visualisation of stereotypical gendered emotions, roles and settings.

8.2.2 Study 2 summary

Study 2 (Chapter 6) investigated how the context of illustration production influenced the inclusion of gender bias in medical images. Existing studies on the representation of gender in medical images have focused on the site of the image but, to date, none have examined in detail what influence the site of production has on the visual production of gender bias. This study therefore aimed to identify which contextual factors had an impact on the biased representation of gender in medical

images through the perspectives of medical illustrators. This was achieved via a 28 question computer-assisted self-interview (CASI), which was completed by 83 medical illustrators. The data from the CASI were then analysed using a mix of quantitative and thematic analysis. The results of these analyses revealed that multiple levels of proximal and distal context had an influence on how gender was represented in medical images including the content creator, the references they used, their clients and the ideologies present in broader medical and social discourse.

During the thematic analysis, six major themes were also identified. First, some illustrators reported that their clients viewed the nude body, particularly that of the female, as too sexual. This highlighted the strong influence that puritanical social ideologies had on clients and medical discourse. The influence of the social context was further emphasised by the second theme where illustrators utilised gender stereotypes that reflected social norms. The influence of an illustrator's immediate context was highlighted by the third theme where illustrators' social networks were identified as having an impact on the diversity in their work. The fourth theme included illustrators' concerns that diversity in their work would wrongly be associated with the pathology they were illustrating. This theme highlighted the influence of not only the intrapersonal context but also the way in which diversity is viewed within the broader context of medical discourse. The fifth theme was similarly situated within the intrapersonal context with some illustrators reporting that they represented 'average' (which was often in reality idealised) bodies. This action in itself would normalise one body over the diverse range of other possibilities. Finally, the tension between resource accuracy and accessibility that existed in illustrators' immediate context was identified as a dominant issue that often affected their work.

8.2.3 Study 3 summary

Study 3 (Chapter 7) investigated the effect that gender-biased images had on the implicit and explicit attitudes of students studying anatomy. Multiple studies have shown that gender bias exists within medical education and, while some research has examined the influence of this bias on medical students, none have analysed the impact of biased images from medical textbooks on students' attitudes (Lagro-

Janssen 2010; Verdonk et al. 2009). Therefore, Study 3 used an experimental, randomised control trial to investigate whether gender-biased imagery had an effect on the implicit and explicit gender attitudes of students studying anatomy. Specifically, participants were randomly assigned to view either gender-biased images for the treatment group or gender-neutral images for the control group and the effects of these were measured using the Implicit Association Test (IAT) and a questionnaire. A total 456 first year undergraduate and graduate students of medicine completed the study. The results of the IAT revealed that viewing gender-biased images significantly increased students' implicit gender bias. That is, those who viewed gender-biased images were shown to be significantly slower at associating women with sports health and men with reproductive health. In contrast, there was no evidence that the gender-biased images from the treatment group had an impact on explicit gender bias although it did make participants significantly less likely to report their own experiences of bias.

8.3 Contributions to Theory and Research

The findings in this thesis have theoretical implications for research on gender in medicine. The current research used an eclectic mix of theoretical sources that best suited the aims of each study. This included 1) Rose's (2001) three-site framework for analysing images; 2) intersecting theory from social constructionism, Foucault, and feminism; 3) Bronfenbrenner's (1979) ecology model; and 4) intersectionality. Taken together, these theories provided a means for investigating how gendered meanings in images work in multileveled and complex ways.

8.3.1 Three sites of meaning production

The focus of this thesis has been on the role that visual culture plays in the communication of gendered ideologies in medical discourse. Interpretations of visual communication more often focus on one site rather than all three sites in which meaning is produced as proposed by Gillian Rose (2001). This thesis is part of a small but growing research base that utilises this framework in the examination of visual culture (example of studies include Higgins et al. 2009; Huang 2012; Kendrick et al. 2010; Kwan 2002; Ownby 2015; Rogers et al. 2010; Strüver 2007). However,

the research here represents the first attempt to analyse meaning in medical images from the site of the image, its production and its audience.

The importance of focusing on all three sites has been reinforced by the current research, which has not only provided a critical examination of what kinds of gender bias exist, but also an understanding of how the production of gender-biased images is complex and multileveled. In particular, the research has shown how systems emerge from the interaction of these three sites, which allow for multiple paths that give rise to gender bias. This includes both explicit and incidental paths. For example, Study 2 identified that medical illustrators often rely on existing imagery from medical texts as reference material as these resources are the cheapest and easiest to access. As one participant noted:

I think the male is still the fall back for most general illustrations – perhaps as the male representation has been used since the beginning of representational illustrations – it’s the easy fall back for reference and most new illustrators start by looking at existing work. It’s hard to break out of the existing structure of styles without dedicated motivation (P77).

The use of existing medical texts such as those examined during Study 1 can potentially increase the chance that existing gender bias will be perpetuated (Meynell 2008). Thus, decisions designed to save on costs can lead to the kind of gender-biased imagery identified in Study 1 and that Study 3 suggested impact the attitudes that future healthcare practitioners have towards gender. The surprising implication of this is how social values and norms can be reproduced due to such seemingly innocent decisions. Indeed, the current research has shown the often obscure and sometimes surprising ways in which gender bias can emerge. For example, while Study 1 replicated a common finding that women are unequally represented when compared to men, it also revealed a number of less obvious ways in which gender bias can be represented, especially in non-narrative, or conceptual, images. The higher representation of women as White in conceptual images was an example of the less overt ways in which gender bias has been perpetuated. Nevertheless, this form of bias contributes to normative ideas about what femininity should look like

(Dyer 1997). Further, due to the fact that conceptual images are viewed as more scientific in nature than narrative images, this bias was even more insidious. The multilevel contextual influences model for the production of images that was developed during Study 2 identified both the direct and indirect factors that influenced the inclusion of bias in medical illustrations in far more detail.

8.3.2 A contextual model of the image

One of the most unique theoretical contributions of this thesis has been the multilevel contextual influences model inspired by Urie Bronfenbrenner's (1979) work on human ecology. Bronfenbrenner (1979) proposed a theoretical model in which individuals exist within a nested set of contexts, all of which have a number of direct or indirect effects on the individual. This model of the individual was adapted in the current research to provide a multilevel contextual influences model of the development of an image (Figure 9). This thesis is, to date, the first research to identify some of the nested contextual structures and processes that influence how gender is presented in medical illustrations. For instance, medical illustrators reported in Study 2 that the proximate influence of their client's gender-biased attitudes often had an impact on their work. Further, these attitudes could often be attributed to the concerns that client had about how consumers, such as teachers and students, would perceive and react to certain aspects of an image. An example found in the study was the way in which clients viewed the nude female body as an icon of sexuality and were consequently averse to visually representing women's bodies. As one participant from Study 2 noted, "Male bodies are almost a default form, as many clients prefer to minimize 'sexual' appearances. Even if we blur in the genitals, the female body outline with the breasts, etc. is something many clients perceive as gender defining" (P13).

As the contextual model shows, the ideas expressed by clients were linked to the more distal influence of the normative and puritan values that society held towards nudity and the female body. The model also highlighted the complex way in which many of the structures and processes that influence how gender is represented are not obvious. A central example of the ways in which bias can be indirectly introduced into images was found when medical illustrators relied on the immediate context of

their social network from which to find subjects for their illustrations due to their need for easily accessible and affordable models. This was concerning as research on social networks has shown that people are naturally prone to homophily and their networks are therefore often limited in diversity (McPherson et al. 2001). The use of social networks that lack diversity can consequently limit the diversity in an illustrator's work. This example highlights how the influence of the immediate context, such as economic restrictions, and the intrapersonal contexts, such as an illustrator's personal choice of reference, were linked. Each level of context, from the proximate to the most distal, had a clear impact on how gender was represented in medical images.

8.3.3 Discourse, social constructionism and feminist theory

When images are embedded within dominant and authoritative discourses such as medicine they have the power to either maintain or reconstruct meaning and knowledge as truth within society (Baxter 2003). From a social constructionist perspective, knowledge can construct or reproduce hegemonic power interests that situate individuals in positions of either privilege or marginalisation (Crawford & Marecek 1989). The analysis of images from anatomical textbooks in this thesis has provided an opportunity to critically reflect on the way in which gender ideologies have been constructed in contemporary medical discourse. By adopting a feminist approach to social constructionism, this research theorised that visual conceptions of gender in anatomical textbooks are themselves social constructions that are also actively involved in reproducing or constructing social knowledge and ideologies about gender in medical discourse. The visual conceptualisation of gender in anatomical images revealed a set of normative ideals that reinforced specific power positions. For example, Study 1 found that males represented in narrative images were more likely to be cast in traditional gender roles that prioritised power and status such as being represented as a physician rather than a patient. Additionally, the White, muscular, male body was the dominant body represented in these anatomical textbooks. In this way, anatomical images reinforced and contributed to the naturalisation of the White, strong, male body as the normative standard in medical discourse (Lupton 2012). A participant from Study 2 also noted the way in which clients would perpetuate norms that promoted their own power positions stating, "It

would be nice to produce more female illustrations, but I think a lot of scientific researchers are male and thus they would lean towards a male illustration naturally” (P18). The fact that the knowledge provided in anatomical images was based on socially normative ideas about gender, often by privileged groups, and which additionally lacked objectivity and reflected social power interests, highlighted that these images are indeed social constructions.

A social constructionist framework, which acknowledges the complex social modality of images, has long been a framework for exploring what meaning is constructed in images (Dikovitskaya 2012). However, this thesis also provides evidence that images themselves contribute to the construction of reality by revealing the impact they have on their audiences’ gender ideologies. In particular, Study 3 provided evidence of the role that visual representations play in shaping the gender attitudes of future healthcare practitioners and thus in constructing or perpetuating certain social norms. The impact that biased images have on implicit attitudes has demonstrated the powerful and persuasive influence of visual images in producing discourse and constructing normative beliefs about gender. Study 3 therefore reinforced the theory that meanings found in images “have real effects, they help to set values and norms that organise and regulate social practice and life” and they “do not simply depict, but actually make and shape the world in visual and narrative terms” (Strüver 2007, p.685).

The norms and power relations identified in Study 1 revealed that the historical legacy of a White patriarchal system in which the gender binary is prioritised is still at work within medical discourse today. The seemingly glacial pace at which hegemonic ideologies shift within medical discourse highlights the difficulties associated with resisting normative messages. Indeed, Study 1 revealed that, while there have been improvements in the representation of women over time, this progress has been rather limited. Thirty years ago, female representation in anatomical textbooks made up only 15% of all gendered images (Giacomini et al. 1986). Based on the finding in Study 1 that this proportion is now 36%, female representation has only increased by 21 percentage points and is still far from equal. These quantitative results, notwithstanding the moderate improvement, can be taken

as evidence that male dominance in medical imagery remains stubbornly resistant to change. Study 2 provides critical insights into why gender bias might remain so entrenched in medical images. For example, the need for illustrators to rely on cost-effective and easily accessible historical texts as references has meant that many traditional gender biases are being reproduced. An additional example found in Study 2 was the way in which socially normative gender stereotypes remained unchecked in some illustrators who unconsciously perpetuate these by, for example, illustrating women as soft and curvy and men as strong and angular. Overall, the examination of the context in which medical images are created has shown that normative ideas about gender exist at multiple levels of medical discourse and practice, from the attitudes of clients to the resources and references that are available to medical illustrators. The numerous levels at which these norms are reinforced makes them difficult to resist, especially if medical illustrators are unaware of them occurring. As summarised in Study 2's multilevel contextual influences model, gendered meaning is multileveled and develops through both proximate and distal channels.

Resistance to hegemonic discourses. Despite the strong influence and limitations of discourse, resistance to hegemonic messages is still possible. The examination of image, image construction and image audience has provided evidence of a complex and multilayered system, which makes challenging gender norms difficult. However, as power is validated by authoritative knowledge, updated knowledge that is produced through these socially legitimatised structures can provide an avenue for new power relations to emerge. By utilising authoritative structures in society, existing normative knowledges can therefore be interrupted and power relations can be challenged. Therefore, if medical discourse promoted unbiased views of gender, whether through images or any other method, it could have a significant impact on social attitudes. Despite how slowly changes in gender equality within medical textbooks over the last few decades has occurred, it is important to note that some improvement has been made. Study 2 provided an unexpected example of how simply increasing one's awareness of bias can be effective in reducing this as one illustrator noted that after completing the CASI that they intended "to 'shake things up' by using more women models" (P58). If the minimal interference of an interview

was able to positively influence the attitude of an image creator, then more direct strategies could have a significant impact. The fact that 61 participants from Study 2 perceived that male and female representation in medical resources was equal, when Study 1 revealed this was not the case, highlights the lack of awareness that many medical illustrators have about the visual gender inequality in anatomical textbooks. Highlighting the way in which gender is visually constructed in these texts, including the way in which such images promote gender stereotypes and/or exclude other women and marginalised groups, therefore provides knowledge for future innovations in gender portrayals. It is hoped that by drawing attention to existing gender biases in the study of medicine, the research in this thesis will play a part in acculturating normative power relations. This will hopefully allow for alternative representations of gender by encouraging medical content producers to portray diverse and complex social relations and subject positions.

Centralising intersectional theory in medical discourse. Our society is made up of complex systems that marginalise groups based on gender, race, age and other modes of social stratification. Intersectionality posits that social differences, such as gender, race, class and sexuality, are not mutually exclusive identities (Crenshaw 1991). Rather, these social divisions intersect and result in multilayered systems of oppression and marginalisation (Dhamoon 2010). This thesis has shown that intersectional theory has been neglected within medical discourse. Study 1 revealed that attempts have been made in some textbooks to increase racial diversity (Table 14). However, not only did most texts still primarily include images of White individuals but there was also a staggering neglect of other identities such as the fat body, the disabled body and the intersex and trans bodies. Indeed, one of the biggest issues that an intersectional framework identified in this research was the neglect of intersex and trans people in anatomical textbooks. With only four representations of intersex individuals in total, their representation was so limited that there were not enough images for analysis during Study 1. As such, the results were limited to the gender binary. The uncompromising representation of male and female bodies in anatomical textbooks is, as Braun and Wilkinson (2001) have stated, a reflection of our society's unceasing obsession with conforming to the two-sex model. The lack of intersectional examinations in the visual analysis of medical imagery (discussed

below) also points towards the theoretical and methodological shortcomings of much visual research.

8.4 Implications for Practice and Methodology

8.4.1 Implications for practice

This multidisciplinary thesis provides implications for practice and methodology in the fields of visual design, medical education and gender research. This research also provides significant insight into some of the specific ways that gender bias could be addressed by medical education content producers and institutions.

Implications for medical education. As the analysis of anatomical textbooks in Study 1 has shown, at least one aspect of medical discourse continues to deliver a biased account of gender. This is concerning when considered together with the evidence provided in Study 3 that gender-biased images have an impact on the implicit attitudes of students studying anatomy. Numerous experts in the field of medicine have identified the significant role that medical education plays in shaping physicians' knowledge, beliefs and practices (Bickel 2001; Dixon et al. 2003; Hamberg 2008; Keitt et al. 2003; Lagro-Janssen 2007; Risberg et al. 2003b; Risberg et al. 2009; Teal et al. 2010; Verdonk et al. 2006; Verdonk et al. 2009). Accordingly, there is a crucial need to incorporate gender-related health issues within educational curricula. Experimental interventions within academic institutions have been shown to provide strategies for targeting the attitudes of future healthcare providers about social issues such as gender (Dielissen et al. 2009; Girod et al. 2016; Verdonk 2008a). However, gender-specific issues have not yet been systematically integrated into medical education (Hochleitner et al. 2013; Verdonk 2009; Wong 2009). The reasons for this include the resistance of educational faculty to such an intervention, an uncertainty about what gender-related issues need to be included in the curriculum and other complexities such as a lack of clear implementation guidelines and the need for funding (Henrich & Viscoli 2006; Lawless et al. 2005; Verdonk 2009).

One of the main obstacles of interventions in this space is that they focus on a few medical schools at a time rather than on addressing broader structural targets.

Identifying and addressing the gender bias in structures that make up medical discourse would therefore cast a wider net. As Kress (1985, p.6) writes, discourses “define, describe and delimit what it is possible to say and not possible to say (and by extension – what it is possible to do and not possible to do)”. By introducing and promoting non-normative representations of gender through discursive tools, new practices become possible within the wider context of medical discourse. In the context of this thesis, educational materials such as medical textbooks and 3D anatomical models could be used to challenge the way in which gender is framed throughout medical education rather than in one institution at a time.

Strategies aimed at integrating gender-specific issues into medical education have also focused on adjusting or adding courses and lectures (Verdonk et al. 2009). Such approaches require the support and participation of educational faculty, which has been shown to be one of the obstacles to this type of intervention (Lawless et al. 2005; Risberg et al. 2011). However, if pressure to decrease gender bias is internally cultivated rather than externally enforced, resistance may be a less likely response. An internal source such as educational material would potentially be less likely to be questioned. Further, the influence of a medical textbook would be more far-reaching and cost effective than other types of extensive interventions. Of course, such an approach is simplistic and other interventions would be necessary in order to counteract gender bias in healthcare. However, by reframing the way in which gender is viewed in one of medical education’s most important tools – the textbook – a subtle, yet no less important shift in the right direction can be made.

From the perspective of this thesis, changes in medical discourse could easily begin at the visual level. Indeed, “the visual is central to the cultural construction of social life in contemporary Western societies” (Rose 2001, p.6). Medical education, and anatomy courses in particular, are highly visual and thus students are constantly bombarded by images. If the effect of a single visual priming task noted in Study 3 turns out to be cumulative in the context of the extensive gender bias noted in Study 1, it would not be difficult to see how strong gender bias would develop in healthcare providers. Importantly, Study 3 supports previous findings about the insidious nature of implicit bias in that one can hold an explicit attitude of equality that contradicts

their implicit attitudes (Wilson et al. 2000). Further, implicit attitudes can have a significant effect on behaviour (Greenwald & Banaji 1995; O'Brien et al. 2008). The analysis of anatomy images in Study 1 therefore offers important tools for those who create or commission medical illustrations. By identifying the numerous ways in which gender bias is visually produced, this research provides an informative guide (discussed below) for medical education content producers looking to address this issue in educational materials.

Despite the benefits of targeting images in medical education, it is important to note that there are a number of implications for implementing a gender intervention in this way. As this thesis has shown, the complex and multiple levels at which gender ideologies are shaped and promoted within medical discourse emphasises the fact that any intervention would not be a straightforward process. Study 2 in particular revealed that gender bias in medical images arises from within a context of a number of interconnected structures and processes. These structures and processes can exist anywhere from the proximate level of the image producer to the distal socio-cultural context. The multiple levels that medical illustrators identified as influencing how gender was represented in their work indicates that an intervention not only needs to target specific practices but also broader systems and policies that support the perpetuation of gender bias. Further, simply asking medical content producers to remove bias from anatomical images would not necessarily be a simple task. Indeed, medical illustrators themselves identified in Study 2 the fact that gender bias can be perpetuated by choices that are unrelated to gender such as choosing historic references rather than using live models in order to decrease costs. However, by identifying some of the reasons behind why certain gendered choices are made, more successful strategies for intervention can be designed with these in mind. Below, several practical suggestions are made for implementing changes based on the research in this thesis. These suggestions are limited to interventions that can be made from within the discipline of visual design.

Implications for the practice of medical illustration. The site of the image's production is the primary location at which meaning in images could be contested. There are a number of ways in which producers of medical education materials can

actively resist perpetuating visual gender bias. First, this can be achieved by utilising the guidelines provided in Study 1. It is clear that illustrators and textbook producers need to make a concerted effort to increase the gender equality in their images. However, it is also clear that simple equality in numbers is not the only way in which to eliminate bias. There are a number of ways in which the message of gender bias can be communicated, including through stereotyping and a lack of intersectionality. As both Study 1 and Study 2 highlighted, views of what diversity entails are often themselves limited in diversity. The increased use of Black and/or Asian individual seems to simultaneously neglect other ethnic groups, especially Indigenous people. Conceptions of gender are similarly often restricted to the two-sex model. Increasing gender diversity does not only mean increasing female representation but it also means the inclusion of those who are sex and gender variant. Likewise, a healthy body does not automatically mean it is a muscled body for men and a toned body for women. Therefore, a guide for what kinds of gender bias can be communicated in medical images visually, such as that provided in Study 1, can be used by illustrators to avoid gender bias.

Study 2 identified a number of obstacles that illustrators face for creating unbiased images. However, at the same time, there are multiple avenues that educational content producers can take advantage of in order to resist a discourse of gender bias in the most effective way. First, the economic and time limits illustrators face often restrict what reference materials illustrators can access. As such, illustrators should be urged to avoid depending on only historical material as references where possible and, where not, should be aware of the bias they may contain. Likewise, illustrators should be cognizant of the lack of diversity in all reference material including professional models and models from their social networks. Study 2 also identified that there are potential risks in making changes to medical images when the social context is not taken into account. For example, illustrators' concerns that audiences might link diversity with pathology highlights the reality of how complex such a change could be. Although such a concern is not easy to dismiss, not all images are illustrations of pathology and so there are still multiple opportunities for the inclusion of diversity. Further, if a context of diversity is normalised in texts such as

anatomical textbooks through non-pathological content, then representations of diversity in pathological illustrations would be less out of place.

Beyond the site of image production, audiences can also resist the promotion of bias. Therefore, this thesis suggests and provides support for actions that medical education institutes could take. First, educational institutions need to be critically aware of the way in which gender is represented within educational material and view gender as a significant factor to take into account when making choices about what content to include in the curriculum. Study 1 provides a breakdown of the ratio of male and female bodies in key textbooks that could be a helpful guide during this process. Second, by allowing students to critique and provide feedback on the ways in which gender is represented in educational content, such as through a short survey, institutions can not only identify issues but can also encourage students to think more critically about gender in health. For example, during the questionnaire from Study 3, some medical students noted that by highlighting the issues of gender bias in a medical education context, they were able to recognise the existence of bias in a range of spheres. As a part of this thesis, a new scale (discussed below) was co-developed which was both psychometrically valid and short and which could be used to monitor students and their experiences over the course of their education.

8.4.2 Methodological implications

The research methods used in this thesis were not new but their combination and use in new fields has not been done previously. As mentioned above, this thesis represents the first attempt to empirically examine all three sites of meaning production in medical images. Further, it is the first to bring this multileveled examination of images into the arena of medical education. The mix-methods approach taken within this thesis and within each of the three studies presents new methodological approaches previously unexplored in research from the areas of visual design, medical education and gender studies.

8.4.2.1 Visual research

Intersectional methodologies. For research into the visual representation of gender bias in educational medical images, Study 1 identified that visual analysis can and should take an explicitly wider view of what constitutes visual gender bias. Previous examinations of visual representations of gender bias in medicine have been limited in their scope, almost exclusively focusing on the ratio of male to females represented in medical textbooks (Giacomini et al. 1986; Lawrence & Bendixen 1992; Mendelsohn et al. 1994). To date, no visual analysis of educational medical images has examined how gender bias is represented through the visualisation of gender stereotypes or through the neglect of intersectional identities. As a part of scientific and medical discourse, medical images are viewed within society as objective providers of truth and the idea that they can communicate a number of gender ideologies is not necessarily apparent (Daston & Galison 1992; Wilholt 2009). Nonetheless, scientific and medical images can still represent stereotypes and limit diverse identities in a way that contributes to ideological gender biases. The fact that such images are viewed as objective tools for communicating scientific knowledge and, as such, occupy a dominant and authoritative position within medical and scientific communication, means that their bias is well hidden (Daston & Galison 1992; Jordanova 1989; Wall 2009). For example, women of colour were the least represented group from within the intersecting dimensions of gender and race in anatomical textbooks and were thus, probably unconsciously, portrayed as non-normative and other. By ignoring the alternate dimension of gendered identities, visual research constructs men and women as homogenous categories (not even accounting for the restriction of a gender binary). This thesis highlights the intersectional complexities of gender images in medical discourse while also highlighting the importance of using intersectional methodologies in visual research.

Analysis of the implicit effects of images. An important methodological contribution to visual research in this thesis has been the use of the IAT in examining the effects of images on implicit attitudes. The influence of the priming task used in Study 3 not only demonstrated the significant impact that images can have on implicit gender attitudes but also revealed the usefulness of this methodological approach that has not, to this researcher's knowledge, been previously used in visual

research. As a visual method, the combination of a visual priming task with the IAT provided a previously unexplored lens for investigating how visual media affects attitudes. The experimental design of Study 3's randomised control trial was taken and adapted from methods used in the field of psychology. As such, this research is one of the first to use the IAT in the areas of visual design and medical education. This study represented not only a new way to determine the influence of images on the attitudes of students studying anatomy but also provides a new method for evaluating the effects of images that contain positive and non-stereotypical messages about gender.

8.4.2.2 Gender Bias in Medical Education Scale

The Gender Bias in Medical Education Scale (GBMES) scale was newly developed in the current research in order to examine the explicit gender attitudes of medical students. The GBMES is a useful tool that allows researchers to examine the extent to which gender bias exists in medical education and the implications of this bias. Given the brevity of the scale, it can easily be incorporated into broader research projects providing greater scope to consider the many predictors and outcomes that gender bias in medical education may have. Likewise, the GBMES could be used to monitor programs designed to address gender bias in medical education. The full validation and reliability analysis, as well as the items and scoring of this scale can be found in the paper by Parker and colleagues (2016).

8.5 A Road Map for Future Research

This thesis provides a foundation from which a critically important program of study could be designed and tested in future research. However, as the focus of this thesis was visual, there were a number of aspects that were beyond the scope of this thesis, but which would have provided a more complex understanding of the issues at hand. Indeed, as an initial and original research endeavour in this area, this thesis has barely probed the implications of the complex way in which multiple sites have an impact on the way gender is represented in medical discourse beyond images form anatomical texts.

To begin with, the focus of this thesis was on how gender is visually represented in medical images. An examination of the multiple other ways in which gender is visualised in medical education specifically, and medicine broadly, would provide a more comprehensive understanding of the way in which gender has been framed in medical discourse. For example, an examination of anatomical texts alone does not necessarily provide a comprehensive understanding of the culture of gender bias in medical education. This would have been achieved if these texts were examined concomitantly with other educational materials (such as posters and 3D models) and incorporated into a larger examination of medical education. Further, visual analyses in other arenas of medicine would provide an even broader understanding of how gender is framed in medical discourse. The projects listed by medical illustrators in Study 2 (Table 15) provide a number of alternative areas for examination including patient education, medical advertisements, academic journals and medical editorials. In addition, an analysis of the text that accompanied images in anatomical textbooks, as well as other forms of written medical discourse, would also contribute a better understanding of gender bias in medicine as a whole.

The focus of Study 2 was to provide a clearer picture of the context in which medical image are constructed via the perspective of illustrators. However, a number of other stakeholders, such as the clients who commissioned the illustrations and publishers of medical texts, could also provide a contextual understanding of the processes that influence the representation of gender. Future research could examine the perspectives and contributions that these individuals and institutions make towards how gender is represented during the production of medical images. Further, an examination of other visualisations of gender in medical discourse could explore not only those involved in the production of images but also the specific audiences they target. For example, an examination of images from patient education brochures and posters could simultaneously investigate the influence of these images on the patients themselves. The current research provides a framework for how such research could be conducted. It would also be beneficial to examine how illustrators could reconcile or remove the obstacles they face when trying to overcome bias in images. For example, consideration of how illustrators themselves, or those in related industries,

might reduce the risk of audiences automatically connecting diverse characteristics in images, such as gender, age or ethnicity, with pathology.

The long-term effects of biased images on the implicit attitudes of students studying anatomy in Study 3 were also unexamined. Despite the strong evidence provided for the influence of the priming task, this influence was only examined immediately after the task had been completed and was only measured once. Future research could explore the duration of the effects of a priming task, as well as the influence that repeated exposure to the priming task could have on participants' attitudes.

A surprising finding from Study 1 was how little visual gender equality in anatomical textbooks had improved over the last 30 years. This suggests difficulty in translating research findings into practice. As Schiebinger and Schraudner (2011, p.158) have argued, "It is crucially important to identify gender bias and understand how it operates in science, medicine, and engineering. But analysis cannot stop there: focusing on bias is not a productive strategy". The outcomes of Study 1 are evidence of the fact that focusing on analysis alone has only a limited impact on practical outcomes. A crucial step in achieving social change is identifying the ways in which bias operates and is perpetuated in order to provide foundational tools for future action. Future research could build on the in-depth knowledge provided in this thesis of the way in which gender bias is visually constructed in medical discourse at the three sites of meaning production to identify and implement gender innovations. For example, despite the seeming simplicity of equalising gender representations and removing gender stereotypes, there are a number of ways in which eliminating visual bias from medicine is not so easily resolved. Indeed, the current research has shown that fat, disabled and intersex bodies are largely absent from anatomical textbooks except when framed as pathological and therefore abnormal. It is hoped that future research will investigate how more diverse bodies could be represented in mainstream and academic medical discourse in a way that normalizes rather than further stigmatizes them.

Lastly, it is important to note that medical constructions of gender not only influence healthcare practices but also permeate everyday existence and can have a profound

impact on societal norms and standards. Indeed, while the norms and power relations perpetuated in medical discourse have the potential to significantly impact health, the authoritative nature of medical discourse in our society has meant that these ideas are not necessarily limited to constructing ideology in healthcare systems. Future research could therefore examine the larger impact that medical images have on broader social audiences such as patients and the influence of gender bias on societal beliefs when coming from authoritative scientific sources. For example, an alteration to Study 3 could be conducted in which the priming task with the same gender-biased message was used, but situated within the context of either an authoritative medical source or an unauthoritative lay source. Under such conditions it could be hypothesised that the authoritative source would have a stronger effect and lead to greater implicit bias during the IAT.

8.6 Conclusion

Updating and expanding previous research, this thesis provides critical evidence of the continued and varied gender bias present in images from anatomical textbooks. By identifying the persistence and complexity of gender bias in medical images, this research emphasises the fact that gender equality is still a significant area requiring attention within medical education. Findings also identified that the visual construction of gender bias is influenced by a number of nested contexts. As such, eliminating gender bias at the site of production is a process that requires multilevel and multi-strategy approaches. The research has also shown that visual gender bias can have a significant impact on the implicit attitudes of medical students. As implicit attitudes can unconsciously guide behaviour, it is critically important that the attitudes of future healthcare providers are protected from the influence of all forms of bias including visual bias. Lastly, this thesis supports the theory that gender bias can emerge from a complex interaction between the site of the image, its production and its audience and highlights the importance of investigating all three sites in order to provide a comprehensive understanding of visual culture.

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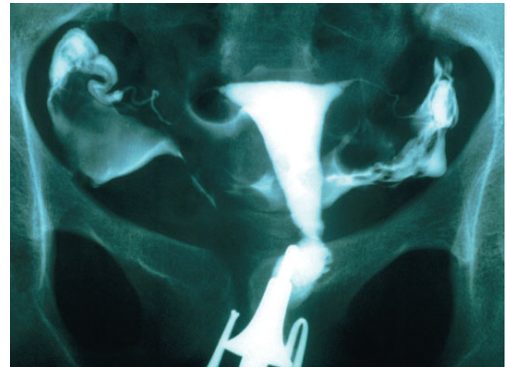
Zimmerman, S 2008, 'The diseased body in premodern Europe: ideology and representation', *Journal of Medieval and Early Modern Studies*, vol.38, no.3, pp.403-412.

APPENDIX A: STUDY 1 CODING SCHEMA

Coding Schema for Content Analysis of All Images

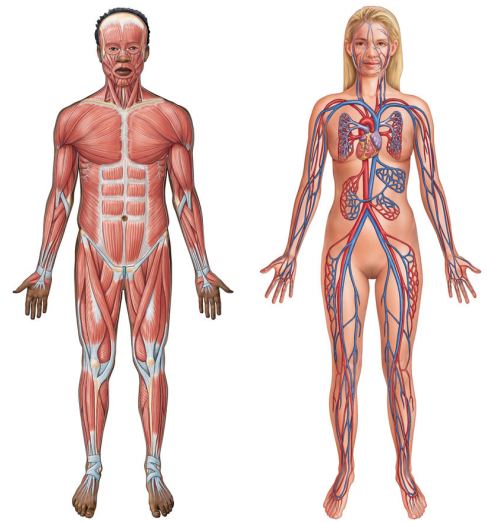
Note: Y = yes, No = no, NA= not applicable

Category	Description	Labels	Notes & Examples
<i>Record no.</i>	Identification number for each individual input		
<i>Book</i>	Book title		
<i>Page</i>	Page number		
<i>Book chapter</i>	Book chapter title		
<i>Figure no.</i>	Figure number		
<i>Image no. within figure</i>	If multiple images exist within a figure what is the image's order number (e.g. image 2 of 5)?		
<i>Method of illustration</i>	What method of illustration was used to produce the image (e.g. photograph)?	P = photograph I = illustration PI = combination photo/illustration Med = Medical Imagery MP = Microscope Photo MI = Microscope Illustration	<ul style="list-style-type: none"> Medical imagery includes X-ray, mammogram, ultrasound:

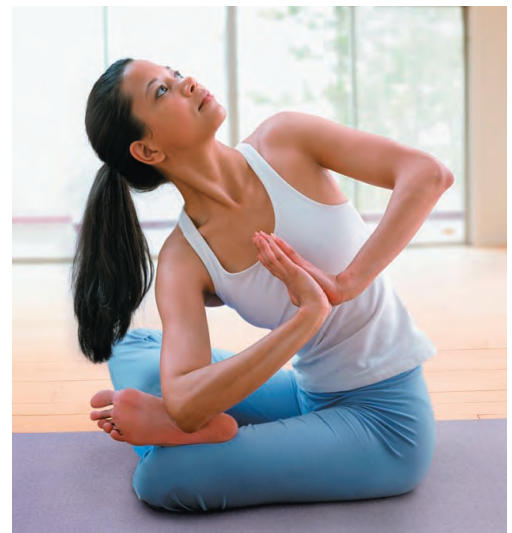


An example of a medical image, i.e. X-ray (Martini et al. 2012a, p.736).

Illustration type Was the image a conceptual (static) image or a narrative (action) image?



Examples of conceptual illustrations (Martini et al. 2012a, p.8, p.10).



An example of a narrative illustration (Marieb & Hoehn 2013, p.1).

Descriptor What description is provided in-text for the image (e.g. cardiovascular system)?

Sex What sex is presented? F = female
M = male
Isxd = Intersex

Sex-specific Was the image sex-specific?

Ethnicity What is the ethnicity/race of the figure in the image (e.g. B = Black
W = White
As = Asian
Hi = Hispanic

• Hispanic is used to denote any ethnicity linked to Spain or Spanish-speaking countries (Stevenson 2010):

Black)?

NAm = Native American
ME = Middle Eastern
IS = Indian subcontinent



An example illustration of a Hispanic individual (Martini et al. 2012b, p.416).



An example illustration of a Middle Eastern individual (Martini et al. 2012b, p.253).

Age

What is the age of the figure in the image (e.g. Middled aged)?

E = elderly
MA = middle aged
A = adult
YA = young adult
Ch = child
Bab = Baby
Fo = foetus

• Elderly bodies show advanced signs of ageing including grey hair and wrinkles:



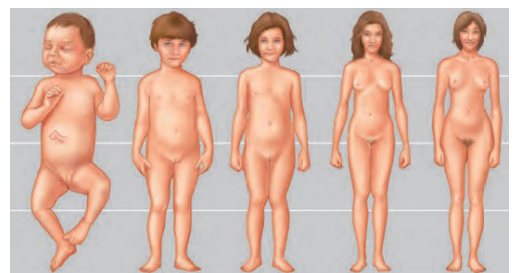
An example illustration of an elderly individual (Martini et al. 2012a, p.435).

- Middle-aged bodies show initial signs of ageing including some wrinkling:



Example illustration of a middle age individual (Marieb & Hoehn 2012, p.257).

- Adult bodies show no age indicators other than full grown.



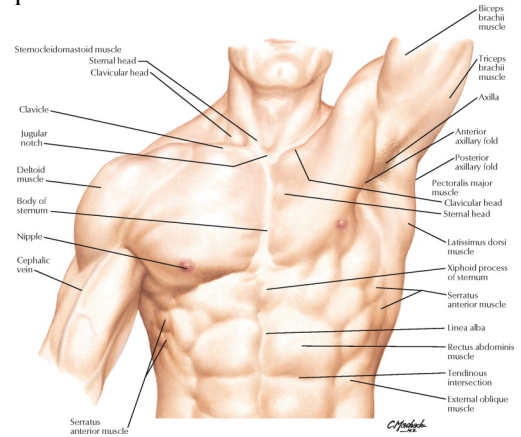
Body type

What is the body type of the figure in the image (e.g. Muscular)?

Mu = muscular
T = toned
UT = untoned
U = underweight
O = overweight
P = pregnant
PD = physical disability

Example illustrations of newborn, 2 year old, 5 year old, 15 year old (young adult) and adult (Marieb & Hoehn 2012, p.245).

- Muscled bodies are clear and pronounced:



An example illustration of a muscular body (Netter 2011, Plate 175).

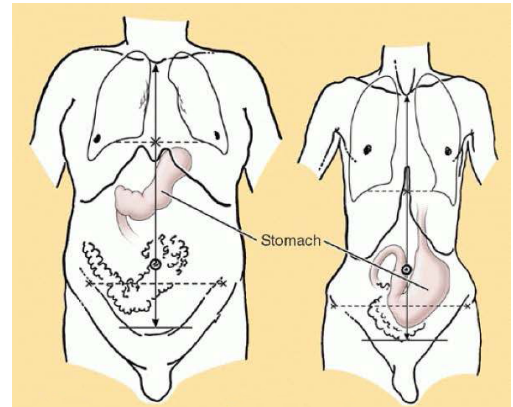
- Toned bodies have no obvious muscle, bone or fat.
- Untoned:



An example illustration of an untoned body (Martini et al. 2012a, p.217).

- Underweight bodies are visibly bony (BMI <18.5; see image below)
- Overweight bodies are based on definitions provided by the Australian Department of Health (2009). Specifically a waist circumference of over 94cm for

men and 80cm for women is considered overweight:



An example illustration of an overweight and underweight body (Moore et al. 2011, p.148).

<i>Health</i>	Is the figure represented as healthy, unhealthy or injured?	H = healthy U = unhealthy In = injured	<ul style="list-style-type: none"> • Unhealthy indicates someone is sick or diseased while injured indicates someone has physically hurt themselves in an incident
---------------	---	--	---

Coding Schema for Content Analysis of Narrative Images

Category	Description	Labels	Notes
<i>Work role</i>	Is the figure represented in an occupational, domestic or leisure role?	Occu = occupational role Dom = domestic role Leisure = leisure role	See traditional and untraditional example images below.
<i>Narrative role</i>	What is the exact narrative role that the figure occupies (e.g. mechanic)?		

Traditional gender role

Is the narrative role the figure occupies traditional to their gender?

Trad = traditional
Untrad = untraditional



An example illustration of an individual in a traditional gender role: women occupying a parental role. This is also an example of a domestic role (see above; Martini et al. 2012a, p.109).



An example illustration of an individual in an untraditional gender role: female physician. This is also an example of an occupational role (see above; Martini et al. 2012a, p.23).

Passive/active

Is the figure occupied in a passive or active role?

Passive = passive
Action = active

- An active figure expresses a sense of action (see below).
- A passive figure performs no action and is often the goal:



An example illustration of both an active and passive figure: the figure on the left is actively looking while the figure on the right is passively being looked at (Martini et al. 2012a, p.108).

Gaze Is the figure's gaze directed to us, the audience, or looking away? Direct = direct gaze
Away = looking away

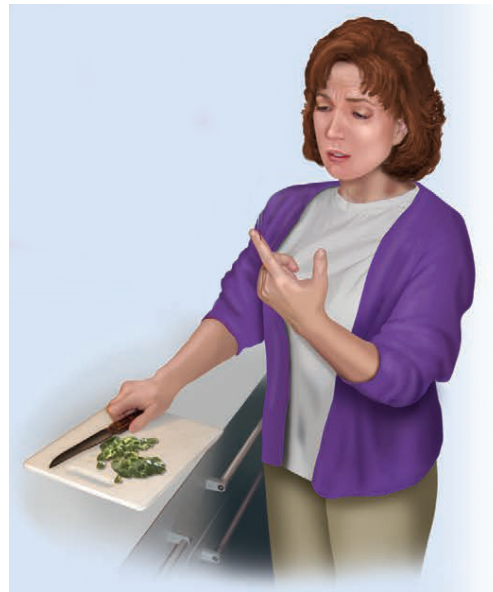
Facial expression What emotion is the figure's facial expression revealing? Pained, Strained, Sad, Cringing = negative emotions
Neutral, Concentrating = neutral emotions
Smiling, Celebratory, Laughing = positive emotions



This image of an individual smiling is an example illustration of a positive emotion (Martini et al. 2012a, p.3).



An example illustration of neutral emotions expressed by both the physician and parent (Martini et al. 2012a, p.601).



This image of an individual in pain is an example illustration of a negative emotion (Saladin 2012, p.174).

APPENDIX B: ANATOMICAL TEXTBOOKS' ETHNIC BREAKDOWN

Relationship Between Sex and Ethnicity

Ethnicity	Frequencies		Standardised Residuals	
	F	M	F	M
Asian	55	84	1.73 [^]	-1.73 [^]
Black	145	505	-6.25***	6.25***
Hispanic	0	4	-1.40	1.40
South Asian	23	24	2.37*	-2.37*
Middle Eastern	0	3	-1.21	1.21
White	1040	1970	4.38***	-4.38***

Notes. F = female, M = male. [^] $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

APPENDIX C: ETHICS, INVITATIONS AND INFORMATION SHEETS

Ethics Approval



In reply please quote: HE14/130

29 April 2014

Ms Rhiannon Parker
42 Dymock St
Balgownie NSW 2519

Dear Ms Parker,

Thank you for your response dated 9 April 2014 and subsequent email on 29 April 2014 to the HREC review of the application detailed below. I am pleased to advise that the application has been approved.

Ethics Number: HE14/130
Project Title: Gender bias in visual representations of the female body in contemporary anatomy textbooks
Researchers: Ms Rhiannon Parker, Dr Jon Cockburn, Dr Theresa Larkin
Approval Date: 24 April 2014
Expiry Date: 23 April 2015

Documents Approved

1. Letter of Invitation to Medical Illustrators (received 02/04/14)
2. Letter of Invitation to Students (received 02/04/14)
3. Participant Information Sheet for Medical Illustrators (received 02/04/14)
4. Participant Information Sheet for Students (received 02/04/14)
5. STUDY 1: Questionnaire for Medical Illustrators (received 02/04/14)
6. STUDY 2: Online task for students (a-e) (received 02/04/14)
7. Participant Information Sheet for Interview of Medical Illustrators (received 22/04/14)
8. Outline of proposed interview questions for Medical Illustrators (received 22/04/14)
9. Email script explaining tacit consent by reply (received 29/04/14)

The University of Wollongong/Illawarra Shoalhaven Local Health District Social Sciences HREC is constituted and functions in accordance with the NHMRC *National Statement on Ethical Conduct in Human Research*. The HREC has reviewed the research proposal for compliance with the *National Statement* and approval of this project is conditional upon your continuing compliance with this document.

A condition of approval by the HREC is the submission of a progress report annually and a final report on completion of your project. The progress report template is available at <http://www.uow.edu.au/research/rso/ethics/UOW009385.html>. This report must be completed, signed by the appropriate Head of School, and returned to the Research Services Office prior to the expiry date.

As evidence of continuing compliance, the Human Research Ethics Committee also requires that researchers immediately report:

- proposed changes to the protocol including changes to investigators involved

Ethics Unit, Research Services Office
University of Wollongong NSW 2522 Australia
Telephone (02) 4221 3386 Facsimile (02) 4221 4338
Email: rso-ethics@uow.edu.au Web: www.uow.edu.au

- serious or unexpected adverse effects on participants
- unforeseen events that might affect continued ethical acceptability of the project.

Please note that approvals are granted for a twelve month period. Further extension will be considered on receipt of a progress report prior to expiry date.

If you have any queries regarding the HREC review process, please contact the Ethics Unit on phone 4221 3386 or email rso-ethics@uow.edu.au.

Yours sincerely

Professor Kathleen Clapham
Chair, Social Sciences
Human Research Ethics Committee

Letter of Invitation to Medical Illustrators

Dear [name],

I am a PhD student from the Faculty of Law, Arts, and Humanities at the University of Wollongong in Australia. My research is exploring the representation of gender in anatomy textbook illustrations.

As part of my research I am inviting medical illustrators to complete a short questionnaire about their work, including their personal criteria for what they produce, the guidelines their clients and/or employees provide for them, and their views on gender representation in anatomy images within the industry. Overall, this will take approximately 15 minutes.

All information provided will be kept confidential and anonymous. Participants will be given an opportunity to take part in a follow-up interview if they choose. For further information on the research, go [here](#) to see the participant information sheet. To participate in the study and access the questionnaire go to the link below:

[Questionnaire on Gender in Medical Illustrations](#)

If you have any enquiries about the research, you can contact the researcher, Rhiannon Parker, at the details below.

This project has been approved by the Human Research Ethics Committee (HREC), University of Wollongong (HE14/130). If you have any concerns about the way the research has been conducted you may contact the Ethics Officer, Office of Research, University of Wollongong via phone: +61 2 4221 3386 or email: rso-ethics@uow.edu.au

Regards,

Rhiannon Parker

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Participant Information Sheet For Medical Illustrators



PARTICIPANT INFORMATION SHEET FOR MEDICAL ILLUSTRATORS

Dear Participant,

You are invited to participate in an anonymous study conducted by Rhiannon Parker as a part of her PhD thesis within the Faculty of Law, Arts, and Humanities at the University of Wollongong under the supervision of Dr Jon Cockburn and Dr Theresa Larkin. The research is called *Gender Bias in Contemporary Anatomy Textbook Imagery*. The purpose of this study is to investigate how medical illustrations are influenced by their creators and their contexts and to explore participants' views on gender representation in anatomy images within the industry.

UNIVERSITY OF WOLLONGONG RESEARCH INVESTIGATORS

Rhiannon Parker
Faculty of Law, Arts,
and Humanities
0422 890 570
rpb774@uowmail.edu.au

Dr Jon Cockburn
Faculty of Law, Arts,
and Humanities
(02) 4221 3048
jon@uow.edu.au

Dr Theresa Larkin
Graduate School of
Medicine
(02) 4221 5132
tlarkin@uow.edu.au

WHAT WE WOULD LIKE YOU TO DO

If you decide to participate you will be asked to complete an online questionnaire. The questionnaire will ask you about your views and experiences with the representation of gender in anatomy images within the industry. Some questions you might be asked are:

- What kinds of clients and audiences do you produce medical images for?
- Are you ever given gender-specific guidelines by your employers or clients?

Overall, this study will take you approximately 15 minutes to complete. If you would like to participate in a follow-up interview you will be given the opportunity to leave contact details for this to be arranged at your convenience. If you decide to participate in an interview you may end this at any time and, if you do not wish to continue, the audio will be erased and the information provided will not be included in the study.

Your involvement in this study is voluntary and you may withdraw your participation at any time. Submitting a completed questionnaire will be taken as an indication of your consent to participate in the study. You can withdraw any time prior to submitting your completed questionnaire. However, once you have submitted your questionnaire anonymously, your responses cannot be withdrawn.

If you are interested in participating in the study please click this link to access the questionnaire: <https://docs.google.com/forms/d/1eicbWv7Eb7LJCqeHzUc4ExcMgJPUiBEDVrtz4yk93aY/viewform>

All aspects of the study, including results, will be strictly confidential and only the researcher will have access to information on participants. A report of the study may be submitted for publication, but individual participants will not be identifiable in such a report. If you have any enquiries about the research, you can contact the researcher, Rhiannon Parker, using the contact details above.

If you have any concerns or complaints regarding the way the research about the way this research has been conducted, you may contact the University of Wollongong's Ethics Officer via phone: +61 2 4221 3386 or email: rso-ethics@uow.edu.au

Thank you for your interest in this study.

Letter of Invitation to University Students

Subject Heading: Gender in Medicine

This SOLSMail has been sent by Dr Theresa Larkin on behalf of Rhiannon Parker. Below is an invitation to participate in a study.

Dear Students,

You are invited to take part in an anonymous online task and questionnaire that aims to investigate visual representations of gender in anatomy textbooks. This research is a part of a PhD being undertaken by Rhiannon Parker within the Faculty of Law, Arts, and Humanities at the University of Wollongong under the supervision of Dr Jon Cockburn and Dr Theresa Larkin.

If you decide to participate you will first be asked to view a range of images taken from anatomy textbooks. This will be followed by a short online task that will involve categorising words quickly and accurately. You will then be directed to a short questionnaire. Overall, this will take approximately 10 minutes to complete.

If you are interested in participating in the study please click [here](#) for more information and follow the link below to access the computer task and questionnaire: genderinmedicine.net

Involvement in this study is entirely voluntary and all information provided will be kept confidential and anonymous. Only aggregated data will be analysed and there will be no way to link responses from any individual student with any of the supervisors.

This project has been approved by the Human Research Ethics Committee (HREC), University of Wollongong (HE14/130). If you have any enquiries about the research, you can contact the researcher, Rhiannon Parker, at the details below. If you have any concerns about the way the research has been conducted you may contact the Ethics Officer, Office of Research, University of Wollongong via phone: +61 2 4221 3386 or email: rso-ethics@uow.edu.au

Rhiannon Parker

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W www.uow.edu.au



Participant Information Sheet For University Students



PARTICIPANT INFORMATION SHEET FOR UNIVERSITY STUDENTS

Dear Student,

You are invited to participate in an anonymous study conducted by Rhiannon Parker as a part of her PhD thesis within the Faculty of Law, Arts, and Humanities at the University of Wollongong under the supervision of Dr Jon Cockburn and Dr Theresa Larkin. The research is called *Gender bias in contemporary anatomy textbook imagery* and its purpose is to investigate representations of gender in anatomy education.

UNIVERSITY OF WOLLONGONG RESEARCH INVESTIGATORS

Rhiannon Parker
Faculty of Law, Arts,
and Humanities
0422 890 570
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Dr Jon Cockburn
Faculty of Law, Arts,
and Humanities
(02) 4221 3048
jon@uow.edu.au

Dr Theresa Larkin
Graduate School of
Medicine
(02) 4221 5132
tlarkin@uow.edu.au

WHAT WE WOULD LIKE YOU TO DO

If you decide to participate you will first be asked to view a range of images online that are taken from anatomy textbooks, some of which may contain nudity. This will be followed by a short online task called the Implicit Association Test (IAT). The IAT involves categorising words quickly and accurately into separate categories. It does not test any anatomical or other knowledge.

After completing the IAT you will be directed to a short questionnaire. The questionnaire will ask you about issues of gender representation within anatomical education based on your experiences and attitudes such as whether you have encountered any evidence of gender bias in anatomy textbooks. Overall, this study will take you approximately 15 minutes to complete.

Your involvement in this study is voluntary and you may withdraw your participation from the study at any time without affecting your relationship with The University of Wollongong. Submitting a completed online task and questionnaire is an indication of your consent to participate in the study. You can withdraw any time prior to submitting your completed task & questionnaire. However, once you have submitted your results anonymously, your responses cannot be withdrawn.

If you are interested in participating in the study please click this link to access the computer task and questionnaire: genderinmedicine.net

All aspects of the study, including results, will be strictly confidential and only the researcher will have access to data from participants. A report of the study may be submitted for publication, but individual participants will not be identifiable in such a report. If you have any enquiries about the research, you can contact the researcher, Rhiannon Parker, using the contact details above.

If you have any concerns or complaints regarding the way the research about the way this research has been conducted, you may contact the University of Wollongong's Ethics Officer on (02) 4221 3386 or email rso-ethics@uow.edu.au

Thank you for your interest in this study.

APPENDIX D: STUDY 2 COMPUTER-ASSISTED SELF-INTERVIEW

Medical Illustrators' Computer-Assisted Self-Interview

<https://docs.google.com/forms/d/e/1FAIpQLSerbjNupohlufb8pdgtgA1JC4tatI9PrA-OONm0xI0v7MLh3w/viewform>

Section 1

Welcome to a study on gender in medical illustrations! We estimate that this online interview will take approximately 15 minutes to complete. Please note that participation is voluntary and that you can withdraw from the study at any stage. The data collected are confidential and your participation is therefore anonymous. We are most grateful for your help in this study!

What is your gender?

- Male
- Female
- Other

What is your age?

Section 2

How many years have you worked as a medical illustrator?

What kind of illustration training have you had?

Did this training include medical illustration studies?

Have you had any medical training and, if so, what kind?

Can you name any medical illustrators who have inspired you?

Do you work for a single employer and/or are you a freelance illustrator?

Section 3

* Required

What illustrative styles do you employ when creating an image and is there a reason for this choice?

For example, do you draw naturalistic and/or diagrammatic representations?

What illustrative methods and/or technologies do you use?

What kinds of clients and audiences do you produce medical images for?

For example, publishers of educational textbooks.

How much of your work is self-directed and how much is based on specifications provided by others such as clients or employers?

What kinds of references do you use for anatomical illustrations?

For example, do you use live models, plastic models, photos, etc.?

Do you choose these references for your illustrations or are they chosen for you? *

- I choose them
- They are chosen for me
- Both

Section 4a (for options 'I choose them' and 'Both')

What are your reasons for choosing certain references for anatomical illustrations?

For example, is there a reason why you might prefer working with live models rather than photographs?

What are your criteria for choosing references when illustrating male and female surface anatomy?

For example, is there a particular body type you look for when illustrating men and women?

Is the availability of male references the same as the availability of female references?

- Male references are more often available
- Female references are more often available
- Male and female references are equally available

Are the references from a broad range of ethnicities?

Do the references include a broad range of body types?

Do the references include a broad range of ages?

Section 4b (for the option 'They are chosen for me')

Who chooses your illustrative references and why?

Is there a criteria for their choice of reference for male and female surface anatomy illustrations?

For example, are only certain body types chosen?

Do you feel that these choices are ever gender biased?

1 2 3 4 5

Never biased Always biased

Are you provided with both female and male references equally?

- I am given more male references
- I am given more female references
- I am given equal male and female references

Are the references from a broad range of ethnicities?

Do the references include a broad range of body types?

Do the references include a broad range of ages?

Section 5

* Required

Other than breasts and genitalia, what types of gendered characteristics do you use to distinguish female and male bodies?

For example, do you often give men short hair and women long hair?

What do you think the ratio of female to male images is in your work? If disparate, to what do you attribute this?

Are the majority of your female illustrations used to represent reproductive systems as opposed to general anatomy?

Do you feel that either men or women's bodies are easier to draw? If so, why?

Are you ever given gender-specific guidelines by your employers or clients? If so, can you give examples?

For example, images of the back need to be of a male.

Do you think there are biases in the representation of men and/or women in contemporary anatomical illustrations? If so, what kinds of bias have you noticed?

Do you think there are biases in the representation of men and/or women within the medical industry? If so, what kinds of bias have you noticed?

Is there anything else you would like to add?

Would you be interested in a follow-up interview? *

This interview will provide you with the opportunity to clarify and/or expand on any of the questions or issues brought up in this interview.

- Yes
- Maybe
- No thanks

Section 6 (For options 'Yes' or 'Maybe)

Contact Details

Name

Email Address

Your response has been recorded. Thank you for your participation in this study!

APPENDIX E: STUDY 3 ONLINE TASK

Welcome and Introduction

<http://genderinmedicine.net>

Welcome to a study on gender representations in anatomy education!

Dear Participant,

You have opted to participate in a study on gender representations in anatomy textbook imagery.

You will complete three tasks:

1. View a range of images from anatomy textbooks.
2. Complete an IAT (Implicit Association Test) in which you will sort words into categories as quickly as possible.
3. Answer a brief questionnaire.

You should be able to complete the tasks within 10 minutes. Please note that participation is voluntary and that you can withdraw from the study at any stage. The data collected are confidential and your participation is therefore anonymous. If you have further questions please email me.

Please also note that you will need **Java** enabled to complete this research.

If you agree to take part in this research please press **SUBMIT**

SUBMIT

Introduction to the Priming Task

Link to priming task

<http://genderinmedicine.net/biased/launchB.html>

Link to control task

<http://genderinmedicine.net/control/launchB.html>

Anatomy Textbook Images

Hi There,

Once you press next you will be shown a number of images taken from anatomy textbooks used in Australian universities. **They will scroll through automatically and after 2 minutes a pop-up window will direct you to the next page.**

As you view the following images, try to imagine the chapters they would appear in within an anatomy textbook.

When you are ready please press

NEXT

Priming and Control Task Images

Accompanying text:

What anatomy chapter would this image appear in?

Priming Images



Human Anatomy & Physiology
(Marieb et al. 2012, p.61)



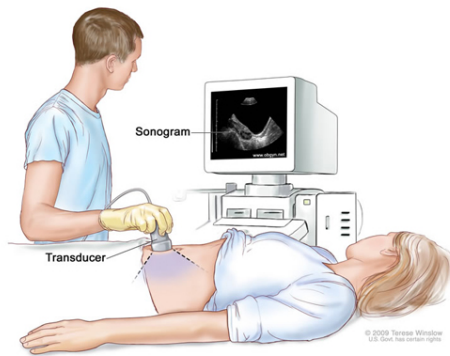
Fundamentals of Anatomy & Physiology
(Martini et al. 2012b, p.108)



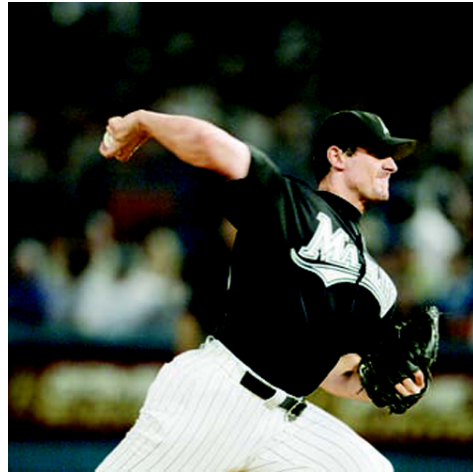
Human Anatomy & Physiology
(Marieb et al. 2012, p.199)



Human Anatomy & Physiology
(Marieb et al. 2012, p.386)



(NCI Visuals Online 2016)



Human Anatomy (McKinley & O'Loughlin 2012, p.386)



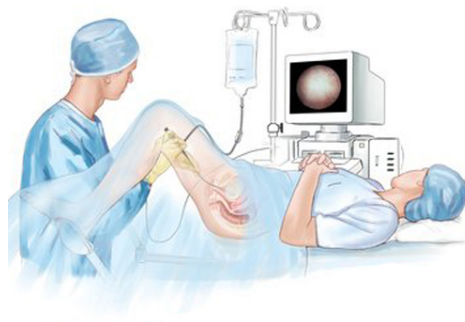
Human Anatomy & Physiology (Marieb et al. 2012, p.428)



Anatomy & Physiology (Saladin 2012, p.305)



Human Anatomy & Physiology (Marieb et al. 2012, p.524)



(NCI Visuals Online 2016)



Human Anatomy (Martini et al. 2012a, p.539)



Human Anatomy & Physiology (Marieb et al. 2012, p.954)



Introduction to The Human Body (Tortora & Derrickson 2012, p.177)



Human Anatomy & Physiology (Marieb et al. 2012, p.801)



Introduction to The Human Body (Tortora & Derrickson 2012, p.634)



Human Anatomy (Martini et al. 2012a, p.234)



Human Anatomy (Martini et al. 2012a, p.286)



Fundamentals of Anatomy & Physiology (Martini et al. 2012b, p.279)



Fundamentals of Anatomy & Physiology (Martini et al. 2012b, p.416)



Anatomy & Physiology (Saladin 2012, p.24)



Anatomy & Physiology (Betts et al. 2013, p.209)



Fundamentals of Anatomy & Physiology (Martini et al. 2012b, p.321)

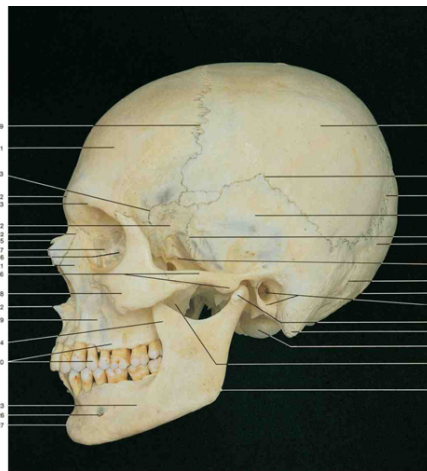


Human Anatomy (Martini et al. 2012a, p.410)

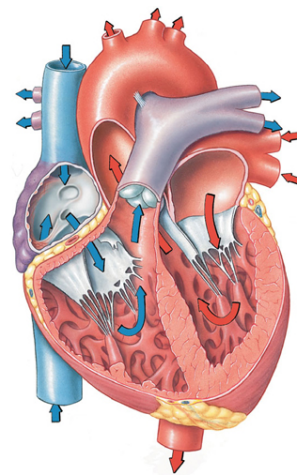


Human Anatomy & Physiology (Marieb et al. 2012, p.764)

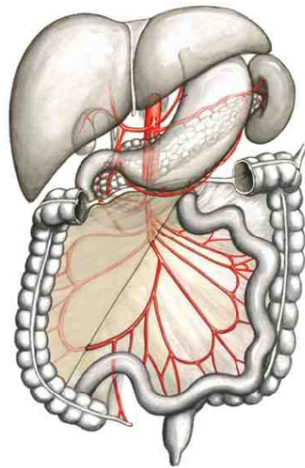
Control Images



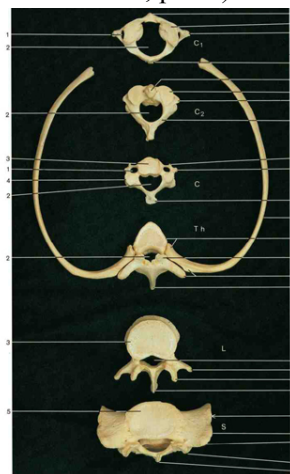
Color Atlas of Anatomy (Rohen et al. 2011, p.21)



Human Anatomy (Martini et al. 2012a, p.555)

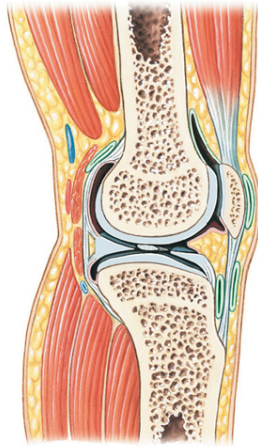


Color Atlas of Anatomy (Rohen et al.



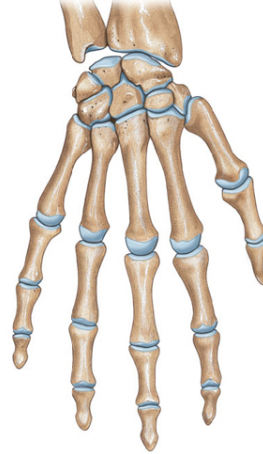
Color Atlas of Anatomy (Rohen et al.

2011, p.302)



Human Anatomy (Martini et al. 2012a, p.213)

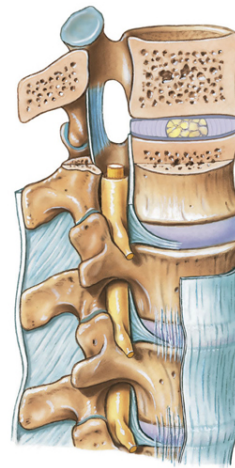
2011, p.190)



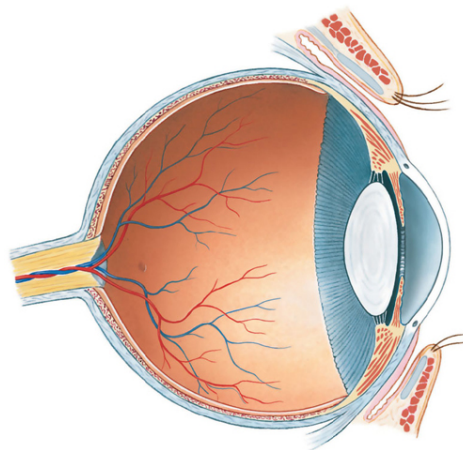
Human Anatomy (Martini et al. 2012a, p.191)



Human Anatomy (Martini et al. 2012a, p.427)



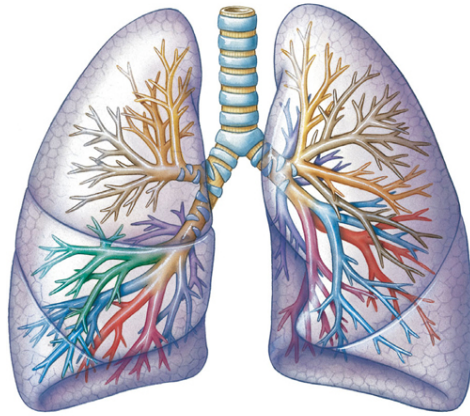
Human Anatomy (Martini et al. 2012a, p.221)



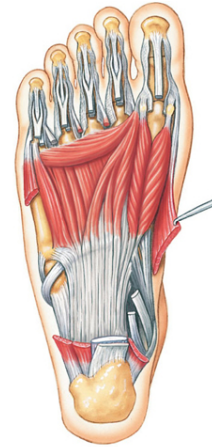
Human Anatomy (Martini et al. 2012a, p.493)



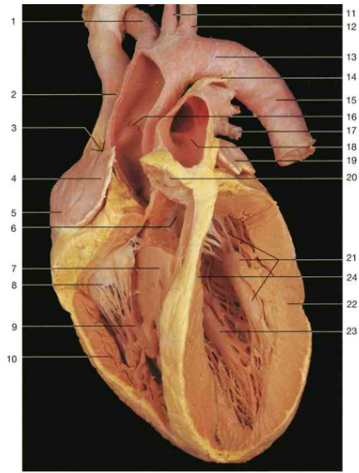
Human Anatomy (Martini et al. 2012a, p.235)



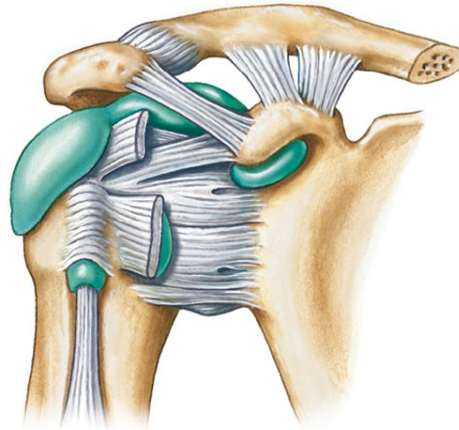
Human Anatomy (Martini et al. 2012a, p.642)



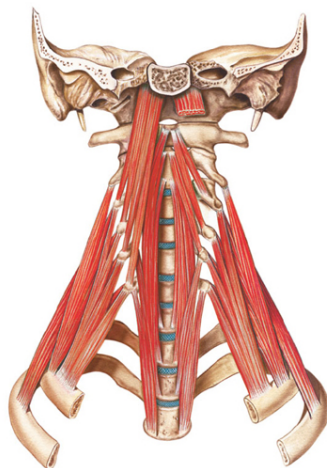
Human Anatomy (Martini et al. 2012a, p.323)



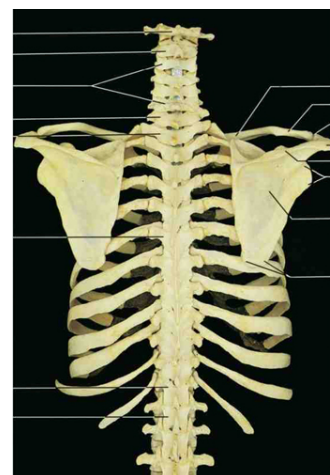
Color Atlas of Anatomy (Rohen et al. 2011, p.256)



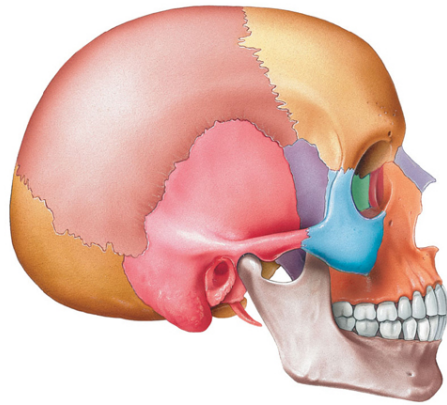
Human Anatomy (Martini et al. 2012a, p.224)



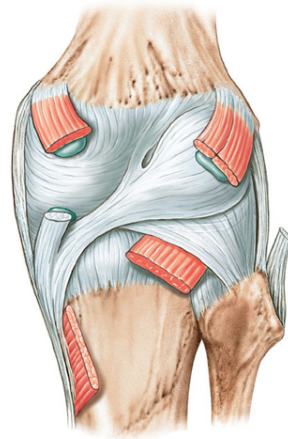
Human Anatomy (Martini et al. 2012a, p.281)



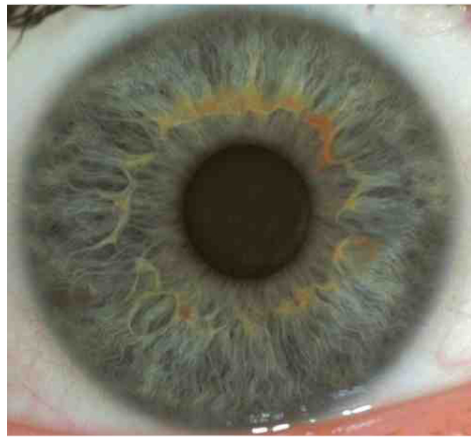
Color Atlas of Anatomy (Rohen et al. 2011, p.370)



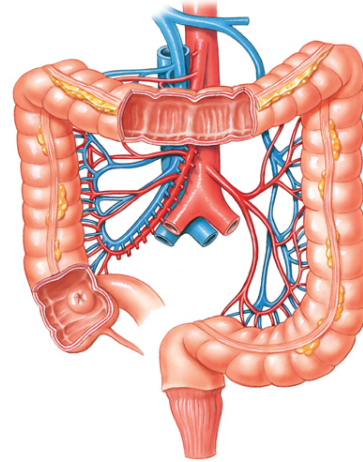
Human Anatomy (Martini et al. 2012a, p.143)



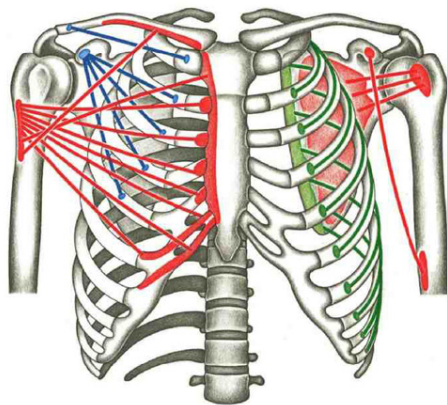
Human Anatomy (Martini et al. 2012a, p.233)



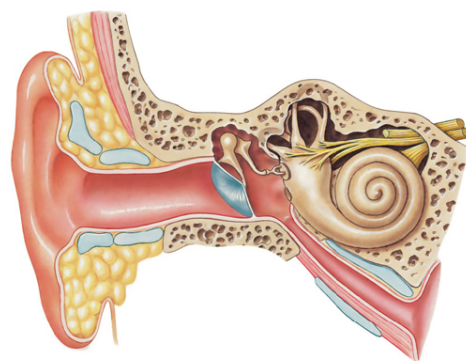
Color Atlas of Anatomy (Rohen et al. 2011, p.134)



Human Anatomy (Martini et al. 2012a, p.680)



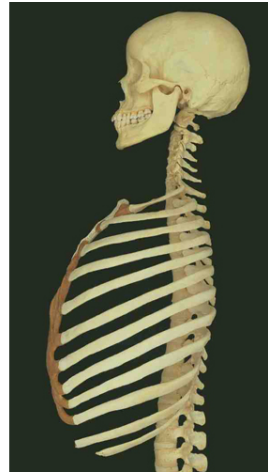
Color Atlas of Anatomy (Rohen et al. 2011, p.384)



Human Anatomy (Martini et al. 2012a, p.479)



Fundamentals of Anatomy & Physiology
(Martini et al. 2012b, p.875)



Color Atlas of Anatomy (Rohen et
al. 2011, p.194)

Introduction to IAT

<http://genderinmedicine.net/IAT/>

Welcome to the IAT

In the next task, you will be presented with a set of words to classify into categories. Classify the words **as quickly as you can** by pressing the letter "E" or "I" on your keyboard. When the answer calls for a response that matches the group on the left, press the letter "E". When it calls for a response that matches the group on the right, press the letter "I". Go as fast as you can, even if you make a few mistakes. For maximum speed, place your index fingers on the letters "E" and "I" and your thumbs on the space bar.

Here is a list of the categories and the words that belong to each of those categories.

Category	Item
Reproductive Health	Postnatal, Infertility, Fertility, Conception, Reproduction, Genitalia, Puberty
Sports Health	Bodybuilding, Sprain, Dislocation, Concussion, Exercise, Fitness, Musculoskeletal
Female	She, Woman, Her, Girl, Hers, Lady
Male	He, Man, Him, Boy, His, Gent

Keep in mind

- Keep your **index fingers** on the "E" and "I" keys to enable rapid response.
- The test gives no results if you go slow -- **Please try to go as fast as possible.**
- Expect to make a few mistakes because of going fast. That's OK.
- For best results, make sure that your monitor is set to maximum brightness and avoid distractions.

Continue

Example IAT slides

Female Male

Put your middle or index fingers on the **E** and **I** keys of your keyboard. Words representing the categories at the top will appear one-by-one in the middle of the screen. When the item belongs to a category on the left, press the **E** key; when the item belongs to a category on the right, press the **I** key. Items belong to only one category. If you make an error, an **X** will appear - fix the error by hitting the other key.

This is a timed sorting task. **GO AS FAST AS YOU CAN** while making as few mistakes as possible. Going too slow or making too many errors will result in an uninterpretable score. This task will take about 5 minutes to complete.

Press the **space bar** to begin.

If the **E** and **I** keys do not work, click the mouse inside the white box and try again. If the red **X** appears, press the other key to make the red **X** go away.

Reproductive Health Sports Health

See above, the categories have changed. The items for sorting have changed as well. The rules, however, are the same.

When the items belong to a category on the left press the **E** key; when the item belongs to a category on the right, press the **I** key. Items belong to only one category. An **X** appears after an error - fix the error by hitting the other key. **GO AS FAST AS YOU CAN.**

Press the **space bar** to begin.

If the **E** and **I** keys do not work, click the mouse inside the white box and try again. If the red **X** appears, press the other key to make the red **X** go away.

Female Male
or or
Reproductive Health Sports Health

See above, the four categories you saw separately now appear together. Remember, each item belongs to only one group. For example, if the categories **flower** and **animal** appeared on separate sides above - words meaning **flower** would go in the **flower** category, not the **animal** category.

The green and black items may help to identify the appropriate category. Use the **E** and **I** keys to categorise items into the four groups **left and right**, and correct errors by hitting the other key.

Press the **space bar** to begin.

If the **E** and **I** keys do not work, click the mouse inside the white box and try again. If the red **X** appears, press the other key to make the red **X** go away.

Female Male
or or
Reproductive Health Sports Health

Woman

If the **E** and **I** keys do not work, click the mouse inside the white box and try again. If the red **X** appears, press the other key to make the red **X** go away.

Female Male
or or
Reproductive Health Sports Health

Puberty

If the **E** and **I** keys do not work, click the mouse inside the white box and try again. If the red **X** appears, press the other key to make the red **X** go away.

What degree are you enrolled in?

If the **E** and **I** keys do not work, click the mouse inside the white box and try again. If the red **X** appears, press the other key to make the red **X** go away.

Undergraduate Questionnaire

<http://genderinmedicine.net/form.html>

Gender in Medicine Questionnaire

Gender bias is defined as prejudice, stereotyping or discrimination based on a person's sex or gender.

1. What is your age in years:

2. Gender: Male Female Other Would Rather Not Say

3. What year of university are you in?

4. On a scale of strongly disagree to strongly agree, please rate your level of agreement with the following statements:

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
I already had knowledge of anatomy before attending university.						
I am supportive of gender equality.						
I believe that medicine is male dominated.						
In textbooks, if I saw the female body was presented only to show how it differed from the male I would regard this as biased.						
Male bodies are treated as the default in medical education.						
In anatomy textbooks, reproductive chapters have more images of females than males.						
In anatomy textbooks, non -reproductive chapters have more images of females than males.						
Medical studies are mainly done on males.						
I believe educators should raise awareness of the risks of gender bias in medicine .						
I believe educators should raise awareness of the risks of gender bias in anatomical textbooks .						
I believe anatomy educators should challenge gender-biased attitudes in the classroom.						

I believe anatomy educators should try to choose material that is not gender biased.						
I believe anatomy textbooks should highlight when gender bias could impact on the understanding of anatomy.						
I have seen gender biased behaviour during my medical science education.						
I have seen evidence of gender bias in anatomy class activities.						
I have encountered gender-biased behaviours among other students.						
I have encountered gender-biased attitudes among other students.						
I have seen evidence of gender bias in anatomy textbooks.						

5. If you have encountered gender bias during your medical science education, can you give an example?

6. If you have encountered evidence of gender bias in anatomy textbooks, can you give an example?

7. On a scale of strongly disagree to strongly agree, please rate how gender biased the following statements are:

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
The clitoris is a smaller form of the penis						
The clitoris and the penis are both erectile sexual organs						
The penis is the enlarged form of the clitoris						
The clitoris is the female equivalent of the male penis						
The clitoris is primarily a sexual organ						
The mammary glands are primarily organs of lactation						
The mammary glands are primarily sexual organs						
The penis is primarily a urinary organ						
The penis is primarily a sexual organ						

We may want to do research like this again in the future and if so you may be invited to participate. To ensure that we can match your responses we need a code that is unique to you but that cannot be used to identify you personally. Please provide your first initial, the last letter of your last name, the first initial of your mother's maiden name, and your day and month of birth.

For example, if your name was Joan Smith, you were born on the 25/12/1984, and your mother's maiden name was Taylor your code would be **JHT2512**

First Initial: Last Initial: Maiden Name

Initial: Day of Birth: Month of Birth:

Thank you for taking part in this study!

Graduate School of Medicine Questionnaire

http://genderinmedicine.net/form_pg.php

Gender in Medicine Questionnaire

Gender bias is defined as prejudice, stereotyping or discrimination based on a person's sex or gender.

1. What is your age in years:

2. Gender: Male Female Other Would Rather Not Say

3. What year of university are you in?

Read the following 3 vignettes and for each scenario, rate the likelihood of the listed differential diagnoses as the cause of the symptoms:

4. A 21-year-old female/male casual worker at a department store presents for a post-operative check-up. He/she was discharged from hospital a week ago after a 3-day admission for surgical repair of a fractured ankle. This morning he/she experienced an episode of shortness of breath associated with a feeling of a racing heart and chest heaviness. He/she is concerned and anxious about the impact of the injury on his/her fitness and capacity to return to work.

Rate the following differential diagnoses in terms of how likely they are to be the cause of the symptoms above:

Diagnosis	Impossible	Very unlikely	Unlikely	Likely	Very likely	Certain
Acute anxiety disorder						
Hypotension						
Pulmonary embolism						
Somatisation						
Thyrotoxicosis						

5. A 35-year-old female/male office worker describes increasingly frequent episodes of feeling anxious and light-headed with a racing heart and a fine hand tremor. He/she also describes recent weight loss and some work-related stresses.

Rate the following differential diagnoses in terms of how likely they are to be the cause of the symptoms above:

Diagnosis	Impossible	Very unlikely	Unlikely	Likely	Very likely	Certain
Acute panic disorder						
Chronic anxiety disorder						
Myocardial ischaemia						
Supraventricular tachycardia						
Thyrotoxicosis						

6. A 45-year-old female/male who has recently been through a bad relationship break-up reports an episode of chest pain while sitting on the sofa watching a morning television program. The pain was associated with shortness of breath and a sensation of feeling frightened, sweaty and shaky.

Rate the following differential diagnoses in terms of how likely they are to be the cause of the symptoms above:

Diagnosis	Impossible	Very unlikely	Unlikely	Likely	Very likely	Certain
Acute stress disorder						
Adrenal gland tumour						
Myocardial ischaemia						
Panic disorder						
Thyrotoxicosis						

7. On a scale of strongly disagree to strongly agree, please rate your level of agreement with the following statements:

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
I already had knowledge of anatomy before attending university.						
I am supportive of gender equality.						
I believe that medicine is male dominated.						
In textbooks, if I saw the female body was presented only to show how it differed from the male I would regard this as biased.						
Male bodies are treated as the default in medical education.						

In anatomy textbooks, reproductive chapters have more images of females than males.						
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Medical studies are mainly done on males.						
I believe educators should raise awareness of the risks of gender bias in medicine .						
I believe educators should raise awareness of the risks of gender bias in anatomical textbooks .						
I believe anatomy educators should challenge gender-biased attitudes in the classroom.						
I believe anatomy educators should try to choose material that is not gender biased.						
I believe anatomy textbooks should highlight when gender bias could impact on the understanding of anatomy.						
I have seen gender biased behaviour during my medical science education.						
I have seen evidence of gender bias in anatomy class activities.						
I have encountered gender-biased behaviours among other students.						
I have encountered gender-biased attitudes among other students.						
I have seen evidence of gender bias during my medical placements.						
I have seen evidence of gender bias in anatomy textbooks.						

8. If you have encountered gender bias during your medical education, can you give an example?

9. If you have encountered gender bias during your medical placements, can you give an example?

10. If you have encountered gender bias in anatomy textbooks, can you give an example?

11. On a scale of strongly disagree to strongly agree, please rate if you were/are concerned about studying the following parts of the body using cadaveric specimens:

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
The face						
The arm						
The hands						
The chest (male)						
The chest (female)						
The abdomen						
The genitals (male)						
The genitals (female)						
The leg						
The feet						

12. On a scale of strongly disagree to strongly agree, please rate how gender biased the following statements are:

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
The clitoris is a smaller form of the penis						
The clitoris and the penis are both erectile sexual organs						
The penis is the enlarged form of the clitoris						
The clitoris is the female equivalent of the male penis						
The clitoris is primarily a sexual organ						
The mammary glands are primarily organs of lactation						
The mammary glands are primarily sexual organs						
The penis is primarily a urinary organ						
The penis is primarily a sexual organ						

We may want to do research like this again in the future and if so you may be invited to participate. To ensure that we can match your responses we need a code that is unique to you but that cannot be used to identify you personally. Please provide your first initial, the last letter of your last name, the first initial of your

mother's maiden name, and your day and month of birth.

For example, if your name was Joan Smith, you were born on the 25/12/1984, and your mother's maiden name was Taylor your code would be **JHT2512**

First Initial: Last Initial: Maiden Name

Initial: Day of Birth: Month of Birth:

Thank you for taking part in this study!