A Virtue Ethics Analysis of Biased Data in Medical Textbook Literature

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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Introduction

Medical textbooks are valuable tools used to educate healthcare professionals and ultimately aid in the diagnosis and treatment of ailments in all populations. Martin I. Boyer authored the well-known and implemented textbook, *AAOS Comprehensive Orthopaedic Review, 2nd edition*, which comprises the core curriculum of the Department of Orthopaedic Surgery residency program at UVA. However, this trusted source of medical information contains racially biased data that can propagate implicit biases in these prospective doctors. There are many scholarly works that recognize the presence of racial biases in medical educational materials, as well as the role of these disparities in creating implicit biases in those consuming the materials and in marginalizing different groups of people. What these past works fail to understand, though, is the morality of the authors in their actions of producing academic materials which contain racial disparities in data. If teachers and consumers of medical textbooks continue to overlook the morality of the authors in their production of biased data, they will fail to acknowledge that this data is not the whole truth and will continue to propagate these implicit biases.

I will use the ethical framework of virtue ethics, which focuses on the moral character of the acting person, to explain that author Martin I. Boyer is morally responsible for the distribution of racially biased information in *AAOS Comprehensive Orthopaedic Review, 2nd edition* (van de Poel & Royakkers, 2011). I will assess Boyer according to the professional virtue of integrity, which is set forth by Onyebeke, Iroku-Malize, McCullough, Grünebaum, and Chervenak (2021) as a virtue of medical educators. To support my claim, I will analyze and determine the presence of data disparities of qualitative data, visuals of ailments, and visuals of surgery/anatomy within the *AAOS Comprehensive Orthopaedic Review, 2nd edition* textbook.

Background

The *AAOS Comprehensive Orthopaedic Review, 2nd edition* was adopted by UVA medicine in 2015 as the template for their core curriculum of the Department of Orthopaedic Surgery residency program (University of Virginia, 2016; University of Virginia, 2018). Although there are two other editions (1st and 3rd) authored by Jay R. Lieberman, the edition employed by the UVA curriculum was authored by Martin I. Boyer and published in 2014 by the American Academy of Orthopaedic Surgeons (AAOS) (Boyer, 2014). AAOS is known as the world's largest medical association of musculoskeletal specialists and is a trusted leader in advancing musculoskeletal health education (AAOS, 2020). This trusted and widely used source of educational material is used in the UVA orthopedic surgery residency program to teach and reinforce concepts which are vital to the knowledge of the resident doctors.

Literature Review

There are many scholarly sources that research racially biased data in the realm of medicine and medical education. These works typically focus on the presence of this biased data and the real-life impacts it has on medicine, and often provide a data-based reason for exclusion, such as lack of diversity in clinical research and trials. These viewpoints make statistical conclusions, but do not make judgments regarding the morality of the educators who are providing these data as educational tools to health professionals.

In the journal article "Representations of race and skin tone in medical textbook imagery" Louie and Wilkes (2018) explore the existence of disparity in skin tone representations within

various textbooks used at top medical schools. This research analyzed 4146 images from four medical textbooks and grouped the images into three groups of skin tone based on the Massey-Martin skin color guide: light, medium, and dark. It was found that there was very little skin tone diversity in the textbooks, with the best book depicting 63.4% light, 28.2% medium, and 8.4% dark; and the worst book depicting 99.7% light, 0% medium, and 0.3% dark. Louie and Wilkes (2018) point out that this underrepresentation of skin tone in the medical curriculum has been an important contributor to racial inequality in health care experience and outcomes. The "hidden curriculum" of medicine, or the uncritical aspects of medical training such as textbook visuals, is also introduced as an important factor in the marginalization of different groups (Louie & Wilkes, 2018). This scholarly work emphasizes the presence of skin tone disparities in medical imagery and sets out the broad implications that these disparities in the "hidden curriculum" have in the medical field.

Lester, Jia, Zhang, Okoye, and Linos (2020) build upon the knowledge and conclusions brought forth by Louie and Wilkes (2018) by analyzing a specific case of racially biased representations in medical images and showing how these disparities have affected the ability of health professionals to diagnose COVID-19 skin manifestations across all populations. The Fitzpatrick skin color scale was used on 130 images of COVID-19 skin rashes. Results of this study showed that 92% of images showed fair or white skin tones and none showed brown or dark brown skin tones (Lester et al., 2020). Lester et al. (2020) points out the consequences of this disparity, as the early detection of COVID-19 is critical to initiate clinical care and limit the spread of the virus, and notes that black people make up 13.4% of the population but account for 30% of cases of COVID-19. This study emphasizes the role of the hidden curriculum in patient health and care outcomes.

While the aforementioned scholars have highlighted and discussed the role of medical education and its ability to propagate implicit biases because of disparities in racial representations, as well as the detrimental effects this can have in medical practice, they have not yet adequately considered the morality of the educators who produce technologies, such as textbooks, using these biased representations. To bridge this gap in understanding, I will use the framework of virtue ethics to assess the morality of Martin I. Boyer in his role as an author of a medical textbook that contains racially biased data.

Conceptual Framework

The morality Martin I. Boyer as the author of *AAOS Comprehensive Orthopaedic Review, 2nd edition* will be analyzed by drawing on the ethical framework of virtue ethics. This framework, developed by philosopher Aristotle, focuses on the character of the acting person, and emphasizes people developing into morally good individuals (van de Poel & Royakkers, 2011). The ultimate goals of virtue ethics and the practice of shaping people's characters by nurture, education, and practice is to achieve "the good life" or *eudaimonia.* This state of being is known by Aristotle as the final goal of human action and is achieved by performing activities related to reasoning and virtue. The development of good characteristics, called virtues, is essential to determine what a good life is, as well as how to lead a good life. Virtues are characteristics that hold an equilibrium position between two extremes of evil. For example, generosity is a virtue that lies between stinginess and being a spendthrift. These moral virtues are not innate and with a person from birth, but rather they can be developed and practiced just like any other skill, and people are expected to use their moral skill to reason between vices and find the "good" course of action (van de Poel & Royakkers, 2011).

Performing virtuous activities is a characteristic of living a good life, so it is important to look at the relevant virtues of a circumstance to determine if the acting person was morally good. However, the relevant virtues are not static, and will depend both on the context of the situation and the position the acting person holds (van de Poel & Royakkers, 2011). In this case, Boyer is an author of a medical textbook that is used as a tool to provide information to medical professionals and enhance their knowledge of orthopedics; thus, his position can be characterized as a medical educator. Therefore, I will use a set of professional virtues for medical education identified by Onyebeke et al. (2021), which are as follows: compassion, integrity, humility, self-effacement, and self-sacrifice. Although having these virtues does not necessarily mean one is a virtuous medical educator, lack of any identified virtue is enough to show a gap in moral education.

For the purpose of this analysis, I will focus on the specific virtue set forth by Onyebeke et al. (2021) of integrity. Integrity, in this context, is defined as education to the standards of intellectual and moral excellence. These excellencies must be achieved by putting all patients' health-related interests first and conforming actions to the best available evidence. Drawing on virtue ethics, in what follows I will determine the morality of author Martin I. Boyer by analyzing the information and data included in the *AAOS Comprehensive Orthopaedic Review, 2nd edition* textbook and comparing it to other sources to determine if the contents follow the medical education virtue of integrity.

Methods

In the following analysis, I will show disparities in the skin colors used in visual representations within *AAOS Comprehensive Orthopaedic Review, 2nd edition*. For the purpose of this paper, I will include both photographic and diagrammatic visuals in my analysis.

I will classify the represented skin tones using the Fitzpatrick skin color scale (Figure 1) and will group the tones into three categories: "light," which encompasses skin types I and II; "medium," which encompasses skin types III and IV; and "dark," which encompasses skin types V and VI.

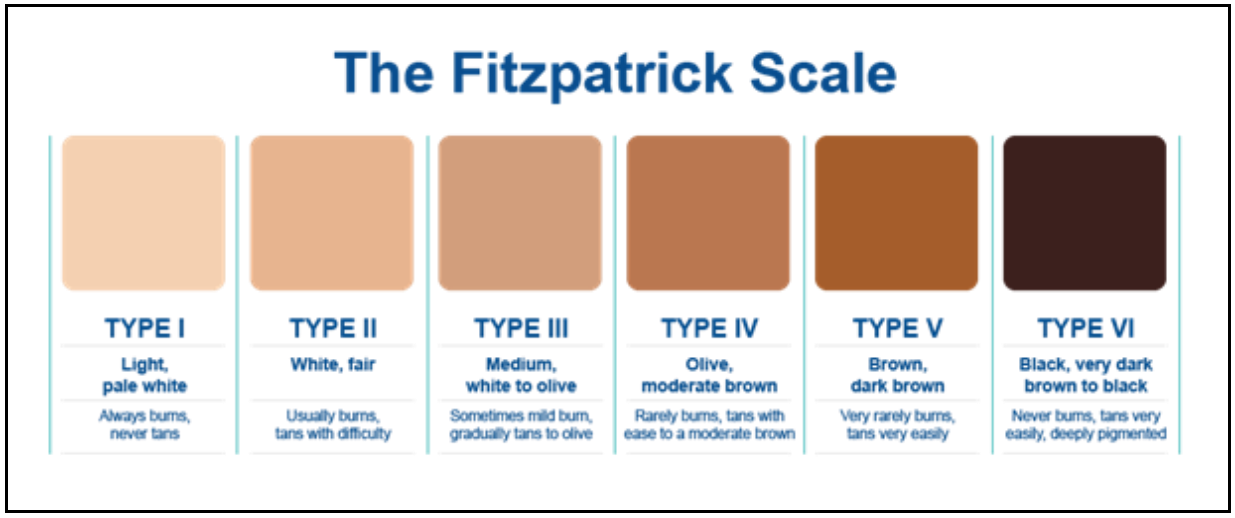

Figure 1: Visualization of the Fitzpatrick skin color scale (Sutton, 2016).

Analysis

Martin I. Boyer, the author of *AAOS Comprehensive Orthopaedic Review, 2nd edition*, can be categorized as a medical educator because the technology he created in this textbook is used, both widespread and within the UVA Department of Orthopaedic Surgery residency

program, as a tool to educate health professionals. As such, it is vital for Boyer, as a medical educator, to provide these prospective doctors and other health professionals who consume his technology with unbiased information that will aid in their knowledge of the foundation of orthopedics in medicine. Racial disparities are prevalent throughout all sectors of medicine and health in the U.S. and stem from many factors such as health care accessibility, increased disease risk from genetic and ethnic factors, and implicit biases ("Minority heath & health disparities," 2022). Awidi and Hadidi (2021) further discuss the gap in racial health data, with Black Americans under-represented in all studies throughout a 5-year period that resulted in a US Food and Drug Administration (FDA) cancer drug approval.

With this historical underrepresentation of different racial and ethnic groups in clinical health data, the current data being used cannot be considered as having integrity. The effects of underrepresentation in the "hidden curriculum" of medicine, as explained by Louie and Wilkes (2018), are the marginalization of certain groups in medicine and the formation and propagation of implicit biases in healthcare professionals. Implicit biases are the attitudes and beliefs about characteristics that happen outside of a person's conscious awareness and cannot be measured directly (Sabin, 2022). These behaviors, as opposed to explicit discrimination, which can be assessed directly and handled accordingly, are much more difficult to recognize, thus they pose a more pervasive threat for disparities in healthcare to arise. In the analysis that follows, I will discuss three examples of biased data in Boyer's textbook, all of which contribute to the biases in the "hidden curriculum" of medicine and are a result of Boyer's failure to practice the professional virtue of integrity.

Integrity in Qualitative Data

Boyer fails to practice the professional virtue of integrity in the *AAOS Comprehensive Orthopaedic Review, 2nd edition* by using biased qualitative data throughout the textbook. Qualitative data in the healthcare world is used to categorize different ailments in populations. Qualitative data could be, for example, the symptoms of an illness or the characteristics of different severities of an ailment. Boyer uses qualitative data as a teaching tool in his textbook when he describes the Oestern and Tscherne classifications for closed-fracture soft-tissue injuries (Figure 2). Note that, in Figure 2 below, the grade of the injury is determined using descriptions that include presence and severity of abrasions, which are the rubbing or wearing off of skin, and/or contusions, which are bruises.

Oestern and Tscherne Classification of Closed-Fracture Soft-Tissue Injury

Grade	Description
0	Injuries from indirect forces with negligible soft-tissue damage
I	Superficial contusion/abrasion, simple fractures
II	Deep abrasions, muscle/skin contusion, direct trauma, impending compartment syndrome
III	Excessive skin contusion, crushed skin or destruction of muscle, subcutaneous degloving, acute compartment syndrome, and rupture of major blood vessel or nerve

Figure 2: Qualitative data included in *AAOS Comprehensive Orthopaedic Review, 2nd edition* that displays descriptions with a white "norm" (Boyer, 2014).

However, both the figure and the accompanying text from Boyer's textbook section on trauma overlook the fact that these visual signs of injury may look different on darker skin tones. Signs of trauma on light skin tones is thus suggested as the "norm." Langlois and Gresham (1991) recognize that darker-toned skin can obscure certain injuries such as contusions and

abrasions, thus making them more difficult to identify. Boyer does not add any description or note within the textbook acknowledging and discussing the difficulties of injury identification on a variety of skin tones. As such, when this textbook information is taught to medical professionals, it can have serious effects on the well-being of patients with darker skin tones.

In fact, Santiago, Weedn, and Diaz (2022) suggest that the lack of inclusive information and data in textbooks may even hinder the ability of forensic pathologists to reliably recognize blunt force injuries in dark-toned skin. In their study using autopsy records of blunt force injuries, they found that both the average observed and the average reported number of injuries for African American victims was lower than it was for White victims. This example shows the consequences that these disparities, which are created by the lack of acknowledgement of the impact of race in the representation of injuries, may have.

In virtue ethics, as a medical educator, Boyer is morally required to provide unbiased data in his educational tools. However, it is clear that Boyer left out key details pertaining to the visual symptoms of trauma injuries on different skin tones, thus perpetrating implicit racial biases through his work. Boyer did not include and promote the health-related interests of all people through his work; thus, he did not achieve the moral excellencies that are characteristic of the professional virtue of integrity.

I have determined that Martin I. Boyer failed to practice the professional virtue of integrity when he authored the textbook *AAOS Comprehensive Orthopaedic Review, 2nd edition* and included biased qualitative data within it. Some might argue that it is not valid to deem that Boyer did not promote the virtue of integrity through the qualitative data included in his textbook if he was ignorant (lacked the knowledge) of the issues at hand. However, it should be noted that there has been much documentation on the manifestation of bruises on different skin tones, with

articles such as Langlois and Gresham (1991) preceding the publication of the *AAOS Comprehensive Orthopaedic Review, 2nd edition* by over 20 years, and, as a medical educator, it is Boyer's duty to provide accurate and thorough documentation. Therefore, I argue that Boyer was not ignorant of the issues at hand when he authored this textbook, but rather displayed incompetencies and shortcomings by choosing not to include data that was pertinent to differences in the manifestation of bruises on skin tones. In doing this, Boyer does not uphold the excellency of conforming his actions when authoring this work to the best available medical evidence, therefore, I stand by my claim that Boyer failed to practice the professional virtue of integrity in his use of biased qualitative data.

Integrity in Visuals of Ailments

Boyer fails to practice the professional virtue of integrity in the *AAOS Comprehensive Orthopaedic Review, 2nd edition* by using visuals of ailments that contain disparities in the representation of different skin tones. In this text, visuals of ailments encompass both anatomical diagrams and photographic examples of conditions such as medical deformities, wounds, cysts and growths, and infections. These visualizations are a vital tool to aid readers in the understanding of certain concepts and can go beyond the descriptive capabilities of written text. As discussed in Louie and Wilkes (2018), these visuals, which are part of the hidden curriculum in medicine, have a profound impact on the creation of implicit biases. These disparities are not only difficult to recognize in literature, but the behaviors they cause are unlikely to be acknowledged and stopped at the individual level as well (Sabin, 2022).

Within *AAOS Comprehensive Orthopaedic Review, 2nd edition*, Boyer utilizes 41 total visuals of ailments. Depictions of the different skin tones portrayed in the textbook are shown below in Figure 3. When looking at the skin tones used within this textbook, and categorizing

them as described in the methods section, one would assume that the visual depictions of skin color at least match population data. For the United States, this would mean the skin tones used in visuals of ailments throughout the textbook would be approximately 65% light, 20% medium, and 15% dark ("United States," 2021).

Figure 3: Visual depictions from *AAOS Comprehensive Orthopaedic Review, 2nd edition* of each of the three skin tone categories. Left is "light," middle is "medium," and right is "dark" (Boyer, 2014).

However, analysis on the 41 images and diagrams of ailments within the textbook show that, out of 41 total; 36 (87.8%) fell into the "light" category, 4 (9.8%) fell into the "medium" category, and just 1 (2.4%) fell into the "dark" category. I argue that this amount of skew from expected data is not by chance. This argument is reinforced because there were only depictions of medium or dark skin tone in just 3 out of 11 sections of the textbook, meaning that 8 sections employed only light skin tones for visual ailments.

Through his depiction of biased visuals in *AAOS Comprehensive Orthopaedic Review, 2nd edition*, Boyer creates implicit biases regarding the types of patients that doctors will encounter and trains prospective doctors on how certain ailments will look mainly on light-skinned people. Since the data Boyer uses does not demonstrate and promote the well-being of all patients, he fails to act with the professional virtue of integrity.

Integrity in Visuals of Surgery/Anatomy

Boyer fails to practice the professional virtue of integrity in the *AAOS Comprehensive Orthopaedic Review, 2nd edition* by using biased visuals of surgery and anatomy. The surgery and anatomy visuals also serve as a tool to help students visualize text-based concepts. These depictions can be informative on where certain landmarks should be for surgery and, often, can communicate concepts beyond what the written messages in the textbook can do. It is important for medical educators to present this kind of information in ways so as not to create disparities in the data, otherwise readers will form biased reactions from the content (van de Poel & Royakkers, 2011). These implicit biases can have detrimental effects down the road. In fact, King and Domin (2007) suggest that groups who are underrepresented in medical education could experience differential diagnosis and treatment.

In this text, visuals of surgery and anatomy encompass both photographic and diagrammatic representations. These visuals depict how surgery and other procedures are performed, physical landmarks of the body used for various practices, and other anatomical diagrams. If Boyer, through his usage of visuals, does not account for how certain landmarks may look different or be identified in a different way based on the skin tone of the patient, he could perpetrate implicit biases and cause a gap in knowledge for health professionals. Therefore, one would expect, as it was for visuals of ailments, to have a skin tone representation similar to that of the percentages of different skin tones in the United States (“United States,” 2021).

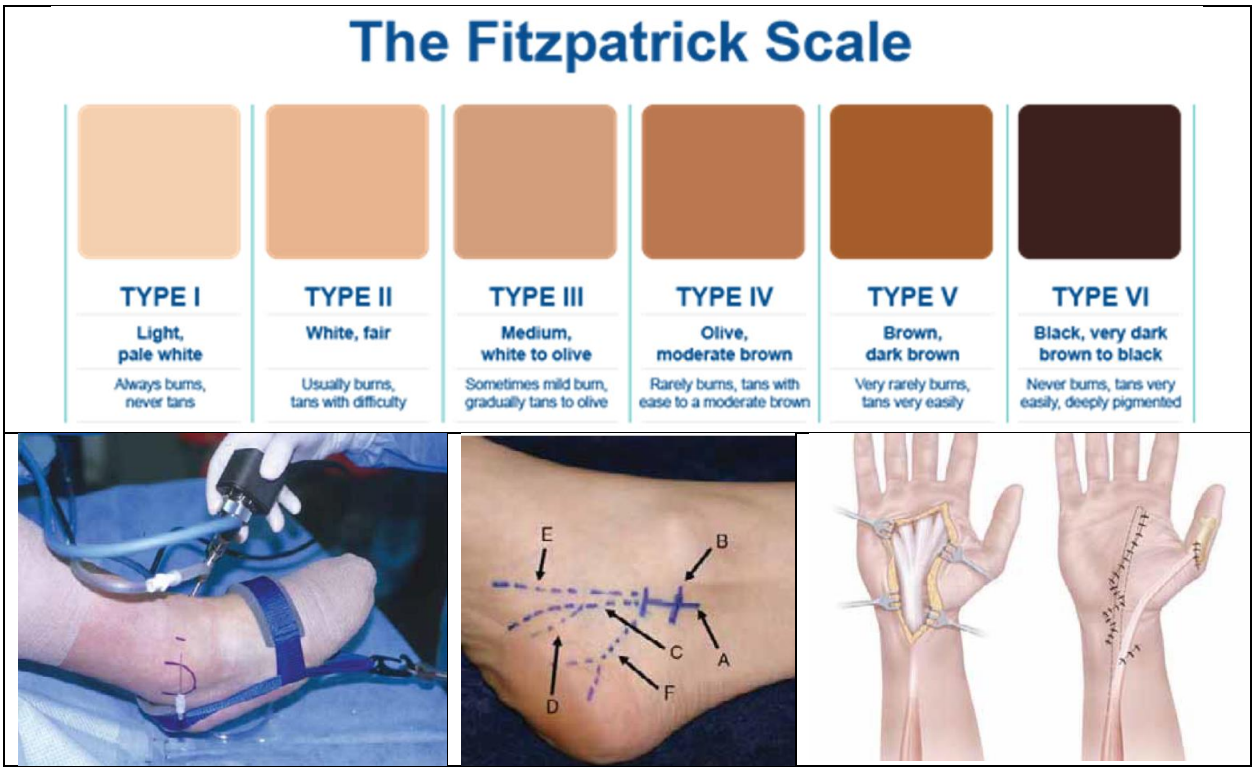

Figure 4: Three examples of surgical/anatomical visuals in *AAOS Comprehensive Orthopaedic Review, 2nd edition*, including both photographic and diagrammatic depictions, which are compared to the Fitzpatrick Scale. All three visuals fall under "type I" or "type II" on the Fitzpatrick Scale.

Three examples of photographic and diagrammatic visuals from *AAOS Comprehensive Orthopaedic Review, 2nd edition* are shown above in Figure 4, along with the Fitzpatrick Scale. As can be seen in Figure 4, all three visuals fall under "type I" or "type II" on the Fitzpatrick Scale, meaning they are classified as "light" skin color representation. When all 66 visuals of surgery/anatomy in the textbook are analyzed using this method, every visual depicts skin tones that represent the "light" skin tone category. This means that, throughout over 1500 pages of content, Boyer does not depict a single representation of "medium" or "dark" skin tones in the surgical/anatomy visuals of the *AAOS Comprehensive Orthopaedic Review, 2nd edition.*

This glaringly obvious deficit reinforces the idea that "light" skin is considered the "norm" in the textbook and, as validated by Louie and Wilkes (2018), creates the possibility that those who consume this content could develop implicit biases from it. As such, Boyer does not

encompass the essential moral excellence of the promotion of well-being for all patients and fails to practice the professional virtue of integrity.

Conclusion

Through the lens of virtue ethics, I have analyzed Martin I. Boyer's use of biased information in his textbook *AAOS Comprehensive Orthopaedic Review, 2nd edition* and determined that Boyer failed to practice the professional virtue of integrity. I brought forth evidence of racially biased data in the textbook in the form of quantitative data, visual representations of ailments, and visual representations of surgery/anatomy. These representations perpetuate implicit racial biases and the marginalization of people with darker skin tones and can affect the quality of care that people receive. The moral excellencies, such as the promotion of health-related interests of all people, needed to achieve the virtue of integrity cannot be met when this racially biased data is used.

It is important for both medical educators and the people they teach to understand this point because without the knowledge of Boyer's lack of integrity, the information in the textbook from this medical educator would be taken as the whole truth and those consuming the information would propagate these implicit biases. In addition, on a more general level, the use of the problem frame of virtue ethics to understand morality of information and the propagation of implicit biases via the "hidden curriculum" could be a valuable tool for medical students and professionals to use to determine their own implicit biases and seek out better sources of equitable information.

Word Count: 3545

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