Using the Implicit Association Test to address Healthcare Disparities in Minority Patients: Initiating the Discussion in Orthopedic Surgery

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Abstract
Healthcare disparities have become a notable topic of research in the last decade. Within Orthopedic Surgery, and more specifically, spine surgery, minority patients experience these disparities via increased lengths of stay, higher 30-day hospital readmission rates, and poor patient reported outcomes. One possible cause for these disparities is the implicit biases held by these patients’ physicians. The aim of this study is to assess the current state of implicit racial biases amongst orthopedic surgeons at various stages of training. To do this, 4th year medical students, majority applying into orthopedic surgery, as well as Orthopedic Surgery residents and attendings at an urban academic medical center were provided an anonymous, voluntary survey to document the results of an online Implicit Association Test specifically focusing on race. Our results demonstrated that medical students and residents mirror the general population with an inherent preference for white over black people. Attendings differed significantly from the general population with little to no preference for either race. While there are various hypotheses for these findings, the results suggest that there is a strong need for further research surrounding implicit bias and healthcare disparities in orthopedic surgery among both future and current physicians. With a better understanding of how to shift these biases, achieving equity in patient care can become a more attainable goal.


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Introduction
Healthcare disparities refer to the differences in the quality of healthcare received by different population groups, including minority races.
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volume provider and to be treated at a low-volume hospital as compared with white patients. These results are concerning given that low-volume spine surgeons were found to have a 17% to 78% increase in the odds of complications and a 14% to 64% increase in the likelihood of readmission [18]. Further research has demonstrated that African American patients have significantly longer lengths of stay during their postoperative course as well as increased rates of 30-day hospital readmission. [5,11,16]. The aforementioned studies have not only identified these racial disparities, but have hypothesized causes and potential solutions for them as well. These solutions include improving patient education to clarify expected outcomes, addressing and accommodating the health literacy level of patients, recognizing patient insurance network limitations, and expanding provider coverage to low resource areas. However, while these might serve as effective starting points to bridge disparity gaps, none of these solutions address an easily overlooked probable root cause: societal bias towards disadvantaged persons. This would better explain both the systemic factors, such as barriers to accessing healthcare, as well as treatment inequalities on an individual patient-clinician level. The latter of which is usually attributed to implicit bias [15]. In an attempt to assess bias amidst physicians-in-training, multiple medical schools now ask first year medical students to take the Implicit Association Test (IAT) through the Project Implicit website. Project Implicit is a non-profit organization that fosters international collaboration amongst researchers focusing on implicit social cognition. Their goal is to educate the public about bias and collect population data. This group has created various self-assessments to evaluate these implicit biases across the general population. One of the many tests offered revolves around racial bias, which not only informs participants of their inherent preferences, but also the strength of that preference. Project Implicit notes that the general population’s preference is for white over black people [9]. The goal of this study is to evaluate the race-related implicit biases present in Orthopedic Surgery, a predominantly white surgical field. More specifically, we aim to assess this racial bias at three different stages of orthopedic surgical training, hypothesizing that implicit biases will mirror those of the general population. However, regardless of results, we intend to initiate the discussion on the need for more research in surgical specialties, namely Orthopedics, on the topic of implicit biases and their association with healthcare disparities.

Methods

Survey

The survey was formatted using Google Form software. It contained one multiple-choice question asking participants to identify their IAT results for the “IAT Race” assessment from the Project Implicit Website. The prompt read “My IAT Results for Race stated” and had eight possible answers for the participants to select, each of which stated a preference for one race and the strength of that preference (little to no, slight, moderate, or strong). There was also an option for “I do not wish to participate” (See Figure 1). The survey did not contain any additional questions and did not solicit demographic information or any personal identifiers. Results were provided by the Google Form software in the form of a pie chart with corresponding percentages for each response. All results were anonymously recorded.

Survey Sample

To conduct the survey, a communication was sent to the 2020 cohort of orthopedic surgery virtual sub-interns, residents, and attendings at an urban and academic medical center. Participation in the survey was optional. The communication provided the participants with instructions and explained that all responses were anonymous. Participants were instructed
to complete the IAT for Race at the Project Implicit website via a provided link. A second link directed them to the survey, via Google Forms. The virtual sub-interns had the option to extend the instructions and links to their fellow medical students in the fourth year of education at their respective institutions. Although demographics were not assessed for each individual participant, the demographics of the institutions of the virtual sub-interns and national demographics of orthopedic residents and attendings can be seen in figures 2 and 3. [1,2,7,14,19]. A total of 19 medical students, 24 residents, and 21 attendings responded to the survey.

![Survey for IAT Results](image)

**Figure 1:** This image represents the survey provided to the cohort of students for this study.
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**Figure 2:** This image depicts the demographics of the institutions of the medical students who completed the survey. PCOM - Philadelphia College of Osteopathic Medicine. SGU - St. George’s University. FIU – Florida International University. The majority of the data was compiled from the 2020 FACTS by AAMC [14]. PCOM and SGU results were derived from separate websites [7,19]. *SGU reported enrollment by country vs. race/ethnicity and were not included in this result.

### Statistics

To compare the three groups, two-sample independent t-Tests were completed through the OpenID software. Each response was valued from +3 to -3, with 0 representing “little to no automatic preference” for white or black people. The groups were evaluated as follows: medical students to residents, medical students to attendings, and residents to attendings. An ANOVA was also completed using the OpenID software. All “I do not wish to participate” responses were excluded from both the t-tests and ANOVA. Further evaluation using the OpenID t-Test software was performed to compare the results from each group in this survey to those of the general population as documented on the Project Implicit website.

### Results

19 medical students, 24 residents, and 21 attendings responded to the survey. Of those who responded, no medical students selected “I do not wish to participate,” whereas 41.7% (10/24) of residents and 19% (4/24) of
Attendings selected this response. The majority of medical students 31.6% (6/19), selected “slight preference” for white over black people, followed by “little to no automatic preference” for white or black people (26.3%, 5/19) and “slight preference” for black over white people (15.8%, 3/19). Both “moderate preference” and “strong preference” for white over black people were 10.5% (2/19), respectively. One participant selected “moderate preference” for black over white people (5.3%, 1/19). None of the participants selected “strong preference” for black over white people. (See Figure 4). For the residents, “slight preference” and “moderate preference” for white over black people were the most frequently selected options at 16.7% (4/24) each. “Little to no automatic preference” followed with 12.5% (3/24). Finally, 8.3% (2/24) chose “strong preference” for white over black people and 4.2% (1/24) selected strong automatic preference for black over white people. (See Figure 5). For the attendings, “little to no automatic preference” was the majority with 38.1% (8/21). “Moderate preference” for white over black people followed with 23.8% (5/21). “Slight preference” had 9.5% (2/21) of the responses. “Moderate preference” and “strong preference” for black over white people each had 1 response for 4.8% (1/21). None of the attendings selected “strong preference” for white over black people or “slight preference” for black over white people. (See Figure 6). Using a +3 to -3 scale for each response, the mean and standard deviation for the medical student, resident, and attending groups were 0.5789/1.3464, 1.0714/1.5424, and 0.4118/1.4168, respectively. Given the adequate sample size and distribution, parametric testing was used to analyze the data. No statistical significance was found between any of the comparison groups using the t-test nor the ANOVA (medical student to resident 95% CI -0.493 [-1.52, 0.53], p=0.34; medical student to attending 95% CI -0.1671 [-0.769, 1.1034], p=0.3628; resident to attending 95% CI 0.6597 [-0.429, 1.748]; ANOVA p=0.4256). (See Figure 7). When evaluating the groups of this study to the general population results from the Project Implicit website using a t-test, attendings were found to have a statistically significant difference of having a majority select “little to no preference” for white or black people (95% CI -0.788 [-1.531, -0.045], p=0.0377). No statistical difference was seen with residents or medical student compared to the general population (medical student 95% CI 0.621 [-1.324, 0.0819], p=0.0834; resident 95% CI -0.129 [-0.948, 0.6904], p=0.7583). (See Figure 7).

Discussion

In our study, the majority of graduating medical students demonstrated a “slight preference” for white over black people. Residents were split equally between “slight preference” and “moderate preference” for whites. Attendings, on the other hand, uniquely demonstrated “little to no preference” most frequently. This was statistically significant when compared to the general population who, according to the Project Implicit website data [9], demonstrate a “slight preference” for white over black people. This deviation by the attending population is unexpected as previous research has shown that practicing physicians often have implicit biases towards white over black people [4]. One explanation for these findings could be clinical experience. Of the three surveyed groups, attending physicians have dealt with the greatest number of patients and many different clinical scenarios. In doing so, inherent preferences towards one racial group over another might have shifted. Another hypothesis involves diversity training that many healthcare facilities have mandated for faculty and employees in order to improve patient care. Attending physicians would be more likely to complete these trainings, as medical students and residents often follow separate curriculums unaffiliated with the hospitals where they provide care. Additionally, the attending group had the lowest response rate of the three groups, which indicates a possible selection bias for those with less racial bias. Finally, the IAT
itself likely has a generational component, with many of the presented faces being famous individuals that a more senior population would better recognize. Further evaluation of diversity within the medical field, diversity training amongst medical professionals, and of the IAT itself is necessary for developing a better understanding of these racial biases in medical field. Mania et al. examined 14 studies that evaluated the association between implicit bias and healthcare outcomes, only one of which assessed implicit bias in a surgical setting. Seven of those studies found a statistically significant association between implicit bias and outcome. Amongst those studies, patient-provider communication appeared to be most influenced by implicit bias. Black patients tended to rate pro-white biased physicians who displayed a more negative affect, used verbal dominance, less emotion, or decreased content communication poorly in interpersonal treatment, supportive communication, and patient centeredness categories [10]. Furthermore, black patients reported lower satisfaction and confidence in recommended treatments, as well as greater anticipated difficulty with completing those treatments when interacting with this physician population [10]. While it is clear that provider bias can affect outcomes, to date, there has been limited on prevalence of these biases both within the surgical setting, and across different stages of medical training. Although our results demonstrated little to no racial preference amongst attending physicians within Orthopedics, the surveyed physicians-in-training showed racial bias towards whites over blacks. This proves that there is still a need for improvement in order to provide equitable patient care. As Mania et al showed in their review, blacks are more likely to demonstrate no implicit bias compared to whites and other minorities [10]. This fact best explains the continued need for diversity within the field. According to the American Academy of Orthopedic Surgeons (AAOS), the demographics of orthopedic surgeons has changed significantly over the last decade. In 2008, 89.3% were Caucasian and 1.6% were African American. In 2018, the Caucasian group dropped by almost 5%, whereas almost all the minority populations rose by at least 0.3% [2]. The AAMC reported that most orthopedic surgery residents are white, but 10% less than the present orthopedic attending surgeon population (84.7% vs 74.6%). The African American population among residents is 4.6% [2]. Organizations like White Coats 4 Black Lives, Student National Medical Association and Nth Dimensions, to name a few, aim to increase the representation of racial minorities in medicine and ensure proper care of racial minorities as patients. With this approach, the current and upcoming generation of physicians, including those going into surgical specialties, are changing the face of healthcare. By continuing to diversify the field of orthopedic surgery, the healthcare disparities linked so closely to provider bias will hopefully begin to fade. As stated previously, multiple institutions have implemented IAT tests annually into their training so that current and future physicians are aware of their biases. Many institutions also offer courses in professionalism, social determinants of health (SDOH) and clinical skills in order to teach students how to treat patients from all backgrounds. The literature suggests that interventions like these have opposing outcomes. Two studies reviewed by Mania et al. looked at interventions to reduce implicit bias. One found that counseling trainees assigned to a multicultural training course showed a 9% decrease in implicit bias when compared to those assigned to a control class [10]. While the other, which used cultural competency virtual training modules featuring simulated minority clients on a group of established providers, revealed no difference between pre- and post-simulation levels of bias [10]. These two studies differed both in their methods of intervention (counseling vs. simulation) and in the populations they assessed (trainees vs. established providers). Combining these findings of reduced bias in a trainee population with our study results could suggest
that cultural competency counseling is an effective measure for reducing implicit racial biases. Further investigation to assess the effectiveness of different intervention modalities amongst physicians and trainees in surgical fields would be useful. A final parameter to discuss is the use of IATs to evaluate one’s own implicit biases. Greenwald et al. showed that in the case of Black-White interracial behavior, IAT results had greater predictive validity than did self-reported measures for determining a test-takers preference [8]. This claim initiated an academic debate that was later rebutted by Blanton et al. who argued that IAT results did not accurately predict how people acted in society [3]. Further studies that have examined the ability of these tests to correlate with societally significant impacts have not reached an agreement [6,12,13]. Regardless, it appears that a measurement better than the IAT at correlating perceived biases to actual discriminatory actions does not yet exist. Additional methods have been proposed to strengthen the validity of the IAT, such as the multimethod measurement statistical model, which controls for systematic error [17]. However, until these analyses become streamlined, the IAT will likely remain the gold standard for objectively determining one’s implicit biases.

Limitations

Recognizing the limitations of this study is important. The first is the small number of participants, both in total number of respondents but also respondents who selected “I do not wish to participate.” This result may be due to the lack of incentive to participate, or more interestingly not wishing to admit the results after taking the test. A future study with a larger sample size would lend to understanding implicit biases in future and current surgeon populations. In addition, this study could be further improved by increasing the amount of demographic and background data requested of each participant including participant’s race, current institution, if they had taken an IAT before, and if they had received diversity education/training in professionalism, SDOH, or clinical skills.

Conclusion

The overall goal of this study is to initiate a discussion surrounding implicit biases and their effect on health care disparities, specifically within orthopedic surgery. Healthcare disparities, especially those pertaining to race, are important as they have been shown to negatively affect patient outcomes. Participants in this study had varied IAT results with both medical students and residents showing a preference for white over black people as compared to attendings who showed no preference. Medical institutions must continue to implement ways to face implicit bias, learn how to communicate effectively with patients and provide equitable healthcare to patients from many different backgrounds. Constantly assessing one’s biases as they may change throughout medical school, residency and in practice is important to ensure that each patient, whether they are surgical candidates or not, receive optimal care. More research is needed to evaluate provider biases and their effect on healthcare, especially as they relate to surgical subspecialties. Furthermore, the identification of successful methods of reducing implicit bias will prove crucial to reducing the inequitable interactions between providers and minority patients.
Figure 3: This image depicts the demographics of orthopedic surgeons in race/ethnicity and sex of residents and attendings.12,13.
Figure 4: This image is a pie chart, which represents the results of the survey for the medical student group. The largest percentage of the chart at 31.6% for “slight automatic preference” for white people over black people.
Figure 5: This image is a pie chart, which represents the results of the survey for the resident group. The largest percentage of the chart at 41.7% for “I do not wish to participate”.
Figure 6: This image is a pie chart, which represents the results of the survey for the attending group. The largest percentage of the chart at 38.1% for “little to no preference” for white or black people.
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Figure 7: Statistical analysis comparing the survey results of residents, attendings, and medical students to each other and to national data from the Project Implicit website.
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