

Diary Study on Microaggressions, Identity Shifting, and Mental Health among Black Women in STEM Graduate Programs During COVID-19: The Mediating Role of Perceived Supervisor Support

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Black women in STEM graduate programs may develop coping strategies, such as identity shifting, to minimize gendered racial stressors, especially in the context of COVID-19. Identity shifting is the process of altering one's speech, behavior, perspective, and appearance. Past studies found a positive association between identity shifting and mental health outcomes among young Black women; however, research on the mental health of Black women in STEM graduate programs is limited. The present study utilized a Black feminist standpoint theoretical framework to examine daily experiences of gendered racial microaggressions (GRM), identity shifting, perceived supervisor support (PSS), and mental health outcomes among 102 Black women in STEM graduate programs. Participants completed online daily questionnaires for 10 workdays using Qualtrics. We hypothesized that identity shifting and GRM would positively predict anxiety and depressive symptoms. Additionally, we hypothesized that PSS would significantly mediate the relationship between GRMs and mental health outcomes. Results showed that women with higher experiences of GRM and shifting reported more depressive and anxiety symptoms. PSS did not mediate the relationship between GRM and mental health outcomes. The results of this study can be used to develop culturally tailored support programs to create inclusive environments for Black women in academia.

Keywords: Black women; identity shifting; microaggressions; mental health; STEM

Black women in the U.S. are forced to tackle incidents of the "double bind" by experiencing gendered racism (the interaction between racism and sexism) in their science, technology, engineering, and mathematics (STEM) educational programs and careers (McGee & Bentley, 2017; Ong et al., 2018). A subtle form of gendered racism that Black women may experience in academia is known as gendered racial microaggressions, which are subtle verbal, behavioral, and environmental forms of oppression based on the intersection of one's race and gender (Lewis et al., 2010). Experiences of gendered racial microaggressions in academic environments may force Black women to develop coping strategies to manage these experiences of oppression (Alfred, 2001), especially in the context of the COVID pandemic. The COVID-19 pandemic has added on another layer of stress related to the social unrest of violence against Black people in the U.S. and the public health crises.

The murders of Breonna Taylor and George Floyd, among others, along with the high COVID-19 disparities among Black people (Campbell et al., 2021), have negatively influenced how Black women navigate these experiences of structural inequalities. Within higher education, COVID-19 led to virtual work and remote learning, which may have negatively impacted the mental health of students, staff, and faculty. Additionally, due to the social unrest in June 2020, researchers across the U.S. started protests, such as #ShutdownSTEM, against academic institutions in the wake of murders against Black people (Ileka et al., 2020). Moreover, many PWIs (predominantly White institutions) increased their diversity, equity, and inclusion (DEI) efforts. Yet, this may have led to more pressure put on Black women to be a part of diversity committees, which in turn led to high levels of burnout. At the intersection of racism and sexism in academia, Black women scholars have been historically viewed as less capable, which has resulted in fewer tenured positions for Black women faculty and fewer Black women being admitted to doctoral programs at PWIs (Walkington, 2017).

Black women graduate students have a unique experience because they are not faculty members, yet, many share similar responsibilities as faculty, such as teaching undergraduate students and conducting research. However, graduate students lack the protection and job security of tenured faculty, relying on small stipends (Patton & Harper, 2003) and few, if any, benefits. Given this disparity and the COVID-19 pandemic, stressors related to balancing coursework, teaching, research requirements, maintaining health coverage, and navigating experiences of discrimination may be amplified for Black women graduate students. One identity management strategy Black women may use to cope with experiences of gendered racial microaggressions in academia is known as identity shifting. Identity shifting is described as the conscious and unconscious process of altering how one talks, behaves, one's perspective, and appearance to contest negative consequences associated with discrimination or to enhance intrasocial and professional relationships with other Black people (Dickens et al., 2022; Jones & Shorter-Gooden, 2004). Past studies discovered a positive association between identity shifting and anxiety and depressive symptoms among young Black women (Jones et al., 2021). Relatedly, Kim et al. (2022) examined rates of psychological disorders among college students before and during the COVID-19 pandemic and found that women and Black students faced a heightened risk for alcohol use disorder and depression, respectively. However, the presence of research on the mental health among Black women in STEM graduate programs is limited.

One promising area of research on Black women in STEM graduate programs is that perceived support from mentors and advisors positively impacts learning outcomes and other academic experiences (Bryson & Kowalske, 2022). When individuals engage in positive and authentic interactions more frequently, especially with their graduate advisor, they are likely to thrive in their STEM careers. Together, by using a daily diary method to explore the association between identity shifting during the COVID-19 pandemic (Gunthert & Wenzel, 2012), this research will contribute to a growing body of theoretical work on identity formation and interpersonal interactions among Black women in STEM graduate education. In so doing, we first provide a theoretical foundation for this work by situating our discussion of experiences of microaggressions, identity shifting, and perceived supervisory supported mental health outcomes using the Black feminist standpoint framework. Applying these insights to the examination of these factors on the mental health outcomes among Black women in STEM graduate programs is needed.

A Black Feminist Standpoint Approach

The present study utilized a Black feminist standpoint theoretical framework to examine daily perceptions of gendered racial microaggressions, identity shifting, perceived supervisor support, and mental health outcomes among Black women in STEM graduate programs. Stemming from a Black feminist approach, "standpoint theory" (Collins, 2000) informs the experiences of Black women. The Black Feminist Standpoint framework is a collective knowledge of Black women gained from factors relative to their historical position. It allows for Black women to offer an alternative position that reveals a representation of their views (Collins, 2000). This framework advocates for the use of women's everyday lives as a foundation for constructing knowledge to criticize dominant knowledge arguments that are based upon the lives and experiences of men and White people across different contexts (Harding, 1991), including STEM. Being informed by Black women about their experiences in STEM graduate programs and how other people's perceptions of them might influence their health outcomes is necessary to make visible the truth about their experiences. Due to the intersection of gendered racism, it uniquely shapes the ways that race and gender-based systems of oppression intersect to create multiple burdens for Black women (Crenshaw, 1989; Essed, 1991), such as the ways in which Black women were directly impacted by the risk of COVID-19 in the pandemic. Accordingly, using one's standpoint to engage in conversations about one's experience can ultimately empower the individual and by extension, a community (Collins, 2004). Overall, the Black feminist standpoint framework necessitates that the experiences of Black women in STEM graduate programs are heard to comprehend the complexity of their identities and experiences in STEM environments.

Gendered Racial Microaggressions (GRM) among Black Graduate Women in STEM

Black women in STEM graduate programs may be more susceptible to experiences of subtle forms of gendered racism (intersection of sexism and racism; Essed, 1991), known as gendered racial microaggressions. Gendered racial microaggressions consist of subtle and everyday verbal, behavioral, and environmental slights, which are derogatory, based on race and gender (Lewis et al., 2013). As an example, a Black woman may be told that she speaks so articulately for a Black woman. The intersection of oppression, based on race and gender, has

shown to increase the marginalization of Black women in academia, especially during the COVID-19 pandemic (Njoku & Evans, 2022). Studies found that African American undergraduate women face racial or gendered microaggressions within their STEM educational program (Fries et al., 2012; McPherson, 2017). Qualitative studies also revealed that Black college women majoring in STEM discussed experiences of gendered racial microaggressions, for example, how their White or male peers doubted their intellectual abilities due to their race and gender (McPherson, 2017) or how they were excluded or ignored by their White peers (Newton, 2022). Relatedly, Dickens (2018) conducted interviews with early career Black women, and many discussed how the subtle expectation of being the “model Black citizen” in the workplace put pressure on them to not confirm the gendered racialized stereotypes about Black women. In response to these experiences of microaggressions, Black women in graduate STEM programs may display academic resilience and persistence despite experiencing discrimination (Lane & Id-Deen, 2020; McGee et al., 2020). Hall and colleagues (2015) employed a daily diary methodology to examine triggers of social identity threat, and experiences of discrimination among a sample of engineers, and the results showed that women reported more daily experiences of discrimination relative to men, which predicted higher burnout. However, this study did not investigate the intersection of race and gender to explore daily experiences of discrimination from those with multiple marginalized identities, such as Black women. Despite rich qualitative research on Black women’s experiences of gendered and/or racial microaggressions in college or in STEM, a daily quantitative assessment of Black women’s gendered racial microaggressions experiences in STEM graduate programs and related outcomes is lacking.

Identity Shifting as a Coping Mechanism in STEM

The COVID-19 pandemic led to an increase in stress and anxiety and consequently college students developed coping strategies to manage the stressors that impacted their mental and physical health (Yuan-Huang et al., 2022). Some Black women choose to cope with stressors associated with gendered racial microaggressions through resistance, which involves speaking up to the perpetrator of the gendered racial microaggression (Lewis et al., 2012), and some may engage in identity shifting. Identity shifting is an unconscious or conscious coping strategy consisting of changing the way one talks (e.g., code switching), acts, one’s appearance, and/or perspective (Dickens et al., 2022). For example, a Black woman in a STEM graduate program may decide not to share her perspective on an issue to avoid confirming a stereotype about Black women.

Due to Black women’s token status (the only or one of few Black women) in STEM graduate programs, it may prompt more engagement in identity shifting strategies among this population. STEM disciplines and environments are traditionally White and male and have been perceived by many to not be very welcoming (Dickens et al., 2020). Black women may engage in shifting by assimilating to the predominantly White male culture to confront gender and racially based stereotypes they do not want to confirm. Past research found that Black college women may feel pressured to censor themselves or might engage in shifting to avoid experiencing a microaggression, such as being labeled the angry Black woman (Lewis et al., 2016). While some research has examined how Black women in higher education in STEM

engage in shifting as a coping strategy (Dickens et al., 2022), few research has specifically centered on the identity shifting experiences of Black women in STEM graduate programs.

Growing Research on Mental Health Outcomes among Black Women in STEM Graduate Programs

Recent research indicated that graduate students in STEM disciplines are at increased risk for experiencing mental health concerns, and this risk is magnified for women (Wilkens-Yel et al., 2021). For those women who hold minoritized identities, such as Black women, frequent incidents of sexism, racism, and microaggressions may be correlated with decreased feelings of connectedness and belonging (McGee, 2020; Ong, 2018). The isolation and marginalization of being one of few Black women in STEM graduate programs, coupled with the COVID-19 pandemic, may also lead to feelings of anxiousness and depression. Research suggests that Black college students are twice as likely to be connected to someone who has been affected by the COVID-19 pandemic (e.g., hospitalization or death; Gaynor & Wilson, 2020). Moreover, Black students may have experienced feelings of anxiety and stress due to grief and even financial burdens, among other factors (Jones et al., 2022). Anxiety disorders are also one of the most common mental health conditions reported in Black women (Lacey et al., 2015); however, the realistic burden of anxiety in Black women is not known, given that mental health symptoms are typically underreported in this group (Takayanagi et al., 2014).

Previous research has revealed that Black collegiate women reported higher rates of mental health symptoms (e.g., anxiety and depression) relative to their White counterparts (Longmire-Avital & Robinson, 2017). Anxiety symptoms can often be caused by unmet expectations, feeling pressured, insecurities, and having little to no support from others (Neal-Barnett et al., 2011). Depressive symptoms are often characterized by feelings of sadness, hopelessness, sleep trouble, cynical thoughts about oneself, and psychological impairment to name a few (Braithwaite, 2003). Black women in higher education who experienced more gendered racial microaggressions or gendered racism were likely to report higher levels of depressive symptoms (Burke et al., 2023; Jones et al., 2022). While past research has examined mental health outcomes among Black women in higher education, few studies explored the mental health experiences of Black women in STEM graduate programs. In the STEM context, studies exploring the experiences of Black women in STEM graduate programs found that Black women who struggled in their graduate program experienced stress, which was associated with anxiety symptoms (Arnold et al., 2020; Wilkens-Yel et al., 2022). McGee & Bentley (2017) examined challenges of Black college women in STEM programs, and participants discussed trials relative to lack of representation, being stereotyped, and racial battle fatigue. Additionally, Arnold et al. (2020) found that unwelcoming STEM environments can play a major role in Black women graduate students' psychological distress. In terms of methodology, Seaton & Iida (2019) used a daily diary methodology for 2 weeks to explore the association between identity development, discrimination, and depressive symptoms among Black youth. Though not in STEM, they found that previous-day racial discrimination experiences were correlated with an increase in depressive symptoms. Despite these past studies, little quantitative research has used a daily diary method to examine the mental health of Black women in STEM graduate programs during the COVID-19 pandemic.

Influence of Perceived Supervisor Support for Black Women in STEM Graduate Programs

For Black women graduate students to persist through their STEM graduate program and to overcome experiences of structural gendered racism at PWIs (Burt et al. 2019), requires a series of support systems that actively work to combat this marginalization. Though isolation and lack of support in STEM can negatively impact Black women's well-being (McGee, 2016), studies have shown that there are several benefits to having a positive advisor–advisee relationship. A positive relationship with peers and advisors has been shown to positively impact academic experiences, promote persistence, career aspirations, and retention for Black women in STEM graduate programs (Bryson & Kowalske, 2022; Lovitts, 2002; Patton, 2009; Patton & Harper, 2003). Conversely, Black women in STEM graduate programs who receive ineffective advising from their supervisors have a higher chance of not completing their graduate program (Johnson-Bailey, 2004). Similarly, Bryson and Kowalske (2022) explored Black women's perceptions of their advisor/advisee relationship in their STEM graduate programs, and participants discussed that finding a good advisor was difficult and how poor advising negatively influenced their success in STEM and their mental health. However, the literature is sparse regarding the influence of perceived support of advisors on the mental health outcomes of Black women in STEM graduate programs

The Present Study

While previous research has used daily diary methodology to explore gender differences in discriminatory experiences in engineering (Hall et al., 2015) and daily experiences of racial discrimination and depressive symptoms among Black youth (Seaton & Iida, 2019), few studies to date have used this methodology to center the experiences of Black women, particularly among those in STEM graduate programs. The present study utilized a Black feminist standpoint theoretical framework to examine daily perceptions of gendered racial microaggression, identity shifting, perceived supervisor support, and mental health outcomes among Black women in STEM graduate programs. We hypothesized the following: H1: Identity shifting would significantly positively predict mental health outcomes (anxiety and depressive symptoms), such that women who report more shifting will significantly predict more depressive and anxiety symptoms. H2: Gendered racial microaggressions (GRMs) would have a significant positive relationship with mental health outcomes, such that women higher in experiences of GRM would also report more depressive and anxiety symptoms. H3A: Perceived supervisor support would significantly mediate the relationship between GRMs and depressive symptoms, such that lower levels of perceived supervisor support would explain the positive association between gendered racial microaggressions and depressive symptoms. H3B: Perceived supervisor support would mediate the relationship between GRMs and anxiety symptoms, such that lower levels of perceived supervisor support would explain the positive association between gendered racial microaggressions and anxiety symptoms.

Method

Participants

The convenience sample included 102 Black women in STEM graduate programs. Eligibility to participate in the study included: 18 years of age or older, identification as a

Black/African American woman, and enrolled full time in a STEM (science, technology, engineering, mathematics, psychology, economics, sociology, and political science) graduate program. As shown in Table 1, participants had an average age of 27.66 (SD = 5.60). Most of the participants identified as Black/African American, N = 56 (66%), and Straight/Heterosexual N = 61(71%), with an income of \$15,001-\$30,000 (38%), followed by \$30,001-\$50,000 (29%).

Data were collected from February through October 2022, during the COVID-19 pandemic. Most of the participants had all virtual classes and/or research experiences (45%), 40% had hybrid, with both in-person and virtual aspects of classes and research experiences, and 15% had all in-person classes and/or research experiences. Most participants had a mentor within their respective departments (90%, N = 74) while few did not (10%, N = 8). The race of their mentors was mostly White (49%), followed by Asian/ Pacific Islander (20%), and African American/ Black (13%). Most mentors were identified by participants as men (57%) and 41% as women. Most participants interacted with their faculty once a week (41%), followed by 3-4 times a week (23%) and 1-2 times a semester (8.5%).

Procedure and Measures

This study was approved by Spelman College and Winston Salem State University's Institutional Review Boards (IRBs). Upon approval, in 2021 Black women graduate students were conveniently sampled and recruited via emails, and social media platforms (e.g., Facebook and Twitter) across different types of institutions, including Historically Black Colleges/Universities (HBCUs) and predominantly White institutions (PWIs). All eligible participants completed an online pre-screening survey. Those who met the eligibility requirements were then shown the consent form and affirmed their consent via Qualtrics Survey platform. If participants consented to participate in the study, participants completed a daily online survey for ten workdays via Qualtrics.

For ten consecutive workdays, at roughly 3:00 pm eastern standard time (EST), participants received an email containing a link to a daily online survey administered via Qualtrics. Instructions were to fill out the survey any time before 11:59 pm EST that same day and to complete a total of ten surveys within the next ten workdays (Monday through Friday). The 3:00–11:59 pm time frame was provided to ensure that the graduate students with varying course/work and personal schedules would have an opportunity to report on their daily experiences toward the end of their day. Participants completed questionnaires for 10 workdays, reporting on their daily experiences and interactions with colleagues (peers and professors), and daily experiences of shifting and mental health outcomes. All participants were compensated up to \$50 for completion of the daily surveys (\$5 per day completed by the designated time). The survey took roughly 20-30 minutes to complete daily.

Except for the identity shifting measurement (which was completed daily) and demographic questionnaire (which was completed on Day 1), all measures listed below were completed at the end of each work week on Day 5 and Day 10. Instructions for all questionnaires were altered to ask participants to rate items based on their experiences “today.” Items in all scales were thus reworded from the present tense to the past tense.

Demographic Information

Participants were asked to complete a demographic questionnaire on Day 1, including ethnicity, age, gender, type of graduate program, income, and type of institution, to name a few.

Gendered Racial Microaggressions Scale

The frequency of gendered racial microaggressions was assessed using the Gendered Racial Microaggressions Scale (GRMS; Lewis & Neville, 2015), which consisted of 26 items

measured on a 6-point Likert scale. A sample item was: “Someone has accused me of speaking angry when speaking calm.” The response options ranged from 0 (Never) to 5 (Once a week or more) and were averaged, with higher scores indicating more experiences of gendered racial microaggressions ($\alpha = .98$).

Identity Shifting for Black Women Scale

Identity shifting was measured by the Identity Shifting for Black Women Scale (ISBWS; Dickens et al., 2022) which consisted of 15 items measured on a 5-point Likert scale. A sample item was: “I change the way I talk to counteract the stereotypes of Black women.” The response options ranged from 1 (Strongly disagree) to 5 (Strongly agree) and were summed to create the composite score, with higher scores indicating higher engagement in identity shifting behaviors ($\alpha = .91$).

Patient Health Questionnaire

Depressive symptoms were measured by Patient Health Questionnaire (PHQ-9; Kroenke et al., 2001) which consisted of 10 items measured on a 4-point Likert scale. A sample item was: “Little interest or pleasure in doing things.” The response options ranged from 0 (Not at all) to 3 (Nearly every day) and were summed to create the composite score, with higher scores indicating more reported depressive symptoms ($\alpha = .80$).

Beck Anxiety Inventory

Anxiety symptoms were measured by Beck Anxiety Inventory (BAI; Beck et al., 1988) which consisted of 21 items measured on a 4-point Likert scale. A sample item was: “Fear or worst happening.” The response options ranged from 0 (Not at all) to 4 (Severely-it bothered me a lot). Scores were summed to create the composite score, with higher scores suggesting more reported anxiety symptoms ($\alpha = .87$).

Perceived Supervisor Support Scale

Perceived supervisor support was measured using an adapted version of the Survey of Perceived Organizational Support (SPOS; Eisenberg et al., 1986) which consisted of 4 items measured on a 5-point Likert scale. A sample item was: “My graduate supervisor strongly considers my goals and values.” The response options ranged from 1 (Strongly disagree) to 5 (Strongly agree) and were averaged to create the composite score, with higher scores indicating more perceived supervisor support ($\alpha = .85$).

Results

Preliminary Analyses

R Version 4.2 and SPSS (Statistical Package for the Social Sciences) version 27 were used to complete the analyses. First, descriptive statistics were used to calculate frequencies, means, and standard deviations for all variables included in the analysis. Also, correlation analyses were conducted to explore preliminary relationships amongst the variables. Third, linear regression tests were employed to measure the influence of predictor variables on mental health outcomes. Data from days 5 and 10 were compared because the self-reported daily journal collected perceived supervisor support, GRMS, and depressive and anxiety symptoms information on those days. Skewness and kurtosis for the scale scores were close to normal. The standardized values for skewness ranged from -0.57 to 0.97 and kurtosis ranged from -0.38 to 1.08, with the distribution showing some degree of kurtosis. As noted in Table 2, participants on average reported moderate to high levels of shifting across all 10 days, and low levels of gendered racial microaggression, high levels of depressive symptoms, low to moderate levels of anxiety symptoms, and high levels of perceived supervisor support on Days 5 and 10. Finally, a

mediation analysis was conducted to test whether perceived supervisor support mediated the relationship between gendered racial microaggressions and mental health outcomes.

Identity Shifting and Mental Health Outcomes

To test hypothesis 1 that identity shifting would predict anxiety and depressive symptoms long-term, a linear regression model was used using SPSS. The overall model predicting depression explained 15.9% of the variance on depressive symptoms may be attributed to identity shifting and number of days, $R^2 = .16$, $F(2, 89) = 8.33$, $p < 0.001$. Within this model, the effect of identity shifting on depression was significant ($b = 0.17$, $SE = 0.04$, $p < 0.001$), such that engaging in higher levels of identity shifting predicted greater reported depressive symptoms. In addition, the overall model predicting anxiety with the identity shifting as a predictor explained 14.1% of the variance on anxiety symptoms may be attributed to identity shifting and number of days, $R^2 = .14$, $F(2, 102) = 8.21$, $p < 0.001$. Within this model, the effect of identity shifting on anxiety was significant ($b = 0.27$, $SE = 0.07$, $p < 0.001$), such that engaging in higher levels of identity shifting predicted greater reported anxiety symptoms.

Gendered Racial Microaggressions and Mental Health Outcomes

To test hypothesis 2 that gendered racial microaggressions (GRMs) would have a significant positive relationship with mental health outcomes across the days, it was examined using a linear regression model in SPSS. The influence of GRMs on depressive symptomatology was significant ($b = .49$, $SE = .58$, $p < .05$), and the overall model predicting depression explained 21.3% (adjusted R^2) of the variance, $R^2 = .21$, $F(2, 90) = 11.25$, $p < 0.001$, such that greater experiences of gendered racial microaggressions predicted greater reported depression symptoms. The influence of GRMs on anxiety symptoms was also significant ($b = .43$, $SE = .95$, $p < .05$), and the overall model predicting anxiety explained 16.3% of the variance on anxiety symptoms may be attributed to gendered racial microaggressions and number of days, $R^2 = .16$, $F(2, 102) = 14.54$, $p < 0.001$, such that greater experiences of gendered racial microaggressions predicted greater reported anxiety symptoms.

Mediation Analyses for Depressive Symptoms

To test hypothesis 3A, whether perceived support mediated the relationship between GRM and depressive symptoms, mediation analyses were ran using R. The results showed that the Day 5 effect of GRMS on depression was not fully mediated by perceived supervisor support. The regression coefficient between GRMS and depression was significant ($p < 0.05$). The indirect effect was 0.04, and the 95% confidence interval ranged from -0.29 to 0.42. Thus, the indirect (mediated) effect was not statistically significant ($p = 0.85$).

In addition, the Day 10 effect of GRMS on depression was not fully significantly mediated by perceived supervisor support. The regression coefficient between GRMS and depression was not significant ($p = 0.13$). The indirect effect was 0.84, and the 95% confidence interval ranged from -0.41 to 2.60. Thus, the indirect (mediated) effect was not statistically significant ($p = 0.21$). In all, we concluded that the relationship between perceived supervisor support and GRMS and mental health outcomes likely does not change across time.

Mediation Analyses for Anxiety Symptoms

To test hypothesis 3B, whether perceived support mediated the relationship between GRM and anxiety symptoms, mediation analyses were ran using R. The Day 5 effect of GRMS on anxiety symptoms was not fully mediated by perceived supervisor support. The regression coefficient between GRMS and Anxiety was significant ($p < 0.05$). The indirect effect was 0.04, and the 95% confidence interval ranged from -0.29 to 0.40. Thus, the indirect (mediated) effect was not statistically significant ($p = 0.83$).

The Day 10 effect of GRMS on Anxiety was also not fully mediated by perceived supervisor support. The regression coefficient between GRMS and Anxiety was not significant ($p = 0.21$). The indirect effect was 1.47, and the 95% confidence interval ranged from -0.36 to 4.35. Thus, the indirect (mediated) effect was not statistically significant ($p = 0.17$). We concluded that the relationship between perceived supervisor support and GRMS and anxiety symptoms likely do not change across time.

Discussion

The current study provides an exploration of the negative mental health consequences of identity shifting (as a coping mechanism), and gendered racial microaggressions among Black women in STEM graduate programs in the United States. Our results were consistent with previous work that reported significant positive relationships between depression and anxiety symptoms, identity shifting, and gendered racial microaggressions (Burke et al., 2023; Dickens et al., 2022). Our findings also highlighted the deleterious impact that these experiences can have on the mental health of Black women navigating STEM graduate programs, especially during the COVID-19 pandemic.

Identity Shifting and Mental Health

As expected, identity shifting positively predicted both depressive and anxiety symptomology. Participants who reported greater engagement in identity shifting behaviors also reported more depression and anxiety symptoms. Previous research indicated that identity shifting can have both beneficial (e.g., cultural competence) and detrimental (e.g., inauthenticity) social and professional outcomes for Black women (Dickens et al., 2019; Johnson et al., 2016). Scholars also identified mental health consequences for Black women due to engagement in identity shifting, such as psychological discomfort, depression, and anxiety (Dickens & Chavez, 2018; Jones et al., 2021). One reason for the harmful consequences is that identity shifting as a coping mechanism is often thought of as embodying strategies that are inconsistent with one's authentic self (Dickens & Chavez, 2018; Swann et al., 2009). Not presenting as one's authentic self may be perceived as a necessary strategy in predominately White spaces (Johnson et al., 2016; Johnson et al., 2022; Jones et al., 2021; McCluney et al., 2021), such as STEM educational contexts. While the short-term effects of identity shifting may not be harmful, Dickens et al. (2022) noted that the long-term consequences can be detrimental to one's self-concept and psychological well-being; thus, this study attempted to investigate Black women's experiences consistently for two weeks.

Although most participants (77%) attended a PWI for graduate school, one-fifth (20%) of the sample attended an HBCU. The data on students at HBCUs also indicated a positive, significant relationship between identity shifting and the two mental health variables. Recent research (Hall et al., in press) indicates that Black women may engage in identity shifting to not only navigate oppressive contexts, but to also enhance within-group relations with Black peers at HBCUs. This form of identity shifting may be to foster relationships, connections, and community with others, but our findings still show that it was related to increased depression and anxiety symptoms. As a result, further exploration is warranted to examine the connection between identity shifting and mental health among Black women in graduate programs attending different types of institutions and navigating different cultural contexts as they pursue STEM degrees.

Gendered Racial Microaggressions and Mental Health

We also found support for our second hypothesis that participants who experienced more gendered racial microaggressions would also evidence more depressive and anxiety symptoms.

This finding is in line with other recent studies examining the relationship between gendered racial microaggressions and mental health outcomes among Black women (Erving et al., 2022). Our study only looked at the frequency in which Black women in STEM were subjected to gendered racial microaggressions and found the connection with greater depressive and anxiety symptoms. However, the Burke et al. (2023) found that the appraisal of stress among Black women experiencing microaggressions was a significant factor, more than the frequency, relative to their mental health outcomes. While the participants in the Burke et al. (2023) study were not in STEM, future studies with Black women in STEM should examine both the frequency and stress of microaggressions, along with analysis on the different dimensions of gendered racial microaggressions (e.g., Angry Black woman) to ascertain if the internalization or perception of the context of the microaggressions matter.

As mentioned previously, it is important to understand how gendered racism impacts the experiences of Black women in STEM (McPherson, 2017). In addition to the typical concerns of being a graduate student in STEM, Black students also deal with concerns and stress related to identity, discrimination, and biases more than their peers from other racial groups (Leath & Jones, 2022). These negative experiences have been shown to significantly influence Black women's sense of belonging, specifically at PWIs (Johnson, 2012). Attempting to adhere to dominating cultural norms to avoid race-related bias and discrimination carries added pressure, requires additional cognitive effort, may result in added stress and negative health effects, and may diminish the congruence between one's authentic self and the self they present in these spaces (Johnson et al., 2021; McCluney et al., 2019). DuBois (1903) described a double consciousness, or the struggle to remain one's authentic self while simultaneously conforming to a dominant culture. Feelings of isolation and exclusion may be reinforced through actions, policies (departmental and institutional), and individuals that implicitly and explicitly express that one does not belong in STEM (Dortch & Patel, 2017). Changing a well-established and supported cultural landscape that has been seen as unwelcoming and transmits messages such as "you do not belong" will require intentional, action-oriented strategies and policies by those in power to make a change (Hall & Dickens, 2020). One strategy that has shown great promise among Black graduate students in mitigating these feelings is the support of a supervisor/mentor.

Perceived Supervisor Support as a Mediator

We did not find support for our hypotheses that perceived supervisor support would mediate the relationship between gendered racial microaggressions and depression and anxiety symptoms. When students receive valued resources (e.g., time, advice, research assistance) from their supervisor (or mentor), they tend to develop a perception that the supervisor values their contributions and cares about their well-being (Rhoades & Eisenberger, 2002). Most (90%) participants in this study indicated that they had a mentor in their department and generally rated their relationships with supervisors/mentors as positive. This may have contributed to the lack of significant findings for this hypothesis. However, this finding is also encouraging given the racial and gender identities of the supervisors/mentors, (49% White, 57% men). Literature on Black women in STEM show that support from same race and gender supervisors/mentors is most effective and contributes significantly to their recruitment and retention (Sanchez et al., 2020). Previous research suggests that the three main types of support that graduate supervisors/mentors provide support are: psychosocial support (e.g., encouragement and role modeling), instrumental support (e.g., providing opportunities for professional advancement), and co-authoring experiences (collaborative presentations and research publications; Eby et al., 2013). While our study did not delve into these specific dimensions, future studies should

specifically investigate the influence of these important experiences among Black women in STEM.

Another potential reason why perceived supervisor support may not have been a significant mediator is that social support from family and peers may be the catalyst for positive mental health outcomes. Research on Black women showed that they benefit greatly from peer and familial support (Davis, 2019), especially from other Black women. However, because of stereotypes and tropes (e.g., Strong Black woman, Superwoman), many either lack this resource or do not feel it is necessary to reach out for support (Jones et al., 2021; Watson-Singleton, 2017). Jones et al. (2022) examined the role of social support in the relationship between gendered racism and mental health outcomes among 237 Black college women. Findings were in line with ours (more gendered racism was significantly related to poorer mental health outcomes), but that social support mediated this relationship. Future studies examining Black women's experiences in STEM should also examine the role of social support, that may help to explain the link(s) between negative experiences and mental health outcomes.

COVID-19 and Black Women in STEM

The COVID-19 pandemic ravaged much of the country, and Black communities were disproportionately impacted physically, economically, and psychologically. Students experienced shifting academic contexts such as moving from in-person to online classes and fewer face-to-face social interactions. During the pandemic, our participants indicated that they attended their STEM graduate programs as follows: 45% were completely virtual, 40% were involved in a hybrid model, and 15% continued in person. Fruehwirth et al. (2021) noted that Black students already experience more social isolation than students from other racial and ethnic groups and that these feelings were intensified by the pandemic. While there is a plethora of factors that may contribute to mental health outcomes of Black women in STEM graduate programs (e.g., finances, relationships), understanding coping mechanisms is an understudied area for Black undergraduate and graduate students. Previous studies indicated that one's coping mechanisms are significantly related to how well one processes challenging events (Jones et al., 2022). As previously mentioned, social support has been shown to be beneficial for Black women when utilized. However, it is not clear what types of coping strategies participants in our study used to manage being in a challenging, and potentially isolating program, while navigating the pandemic. One positive aspect is that Black women working from home during the height of the pandemic may have felt relief because they were freed from experiencing microaggressions at school (Onwuamaegbu, 2021). On the other hand, Black women who internalize the ideas that reaching out for assistance, support, and resources shows weakness may have experienced exacerbated mental health outcomes during the pandemic. For some, even though their specific program may not be welcoming or supportive, the relationships created on their campuses can aid in students feeling connected to a community. However, when a sense of community is removed, especially for students who are marginalized, there could be a heightened awareness of possible negative mental health outcomes.

Limitations and Future Directions

Although our study has numerous strengths and makes important contributions to research on the influence of identity shifting and experiencing gendered racial microaggressions on Black women's mental health, the present findings should be considered in the context of their limitations. Our study was a 10-day longitudinal diary study in which participants were asked to go online for two weeks and complete measures about their daily experiences and interactions. Our response rate (90 %) was great; however, there is missing data on all measures

which inevitably impacts the statistical accuracy of our analysis. Secondly, we used self-report data to measure the participants' perceptions and experiences for 10 days. Although we encouraged participants to respond to each question honestly, we cannot discount the potential of a social desirability bias. It is possible that participants may have underreported or overreported experiences.

Thirdly, overwhelmingly (77%) our sample came from STEM graduate programs at PWIs, where almost 50% of the mentors were White and/or men (57%). Future studies should include more participants from Minority-Serving Institutions (MSIs), including HBCUs, where there may be more racial, ethnic, and gender diversity among mentors/supervisors. Finally, we performed our study with a non-clinical sample of Black women in STEM graduate programs. As a result, we cannot infer that identity shifting and experiencing gendered racial microaggressions are key mechanisms in the development and maintenance of clinically elevated depression and/or anxiety disorders among Black women in STEM graduate programs. To address this, future studies are needed to examine the relationship among these variables in samples of Black women in STEM programs who meet criteria for depression and/or anxiety disorders.

Implications for Higher Education

Despite its limitations, this study has important applications for Black women in both undergraduate and graduate STEM programs. The number of Black women who persist in STEM is already dismal (Bureau of Labor Statistics, 2021); therefore, it is imperative to create more inclusive environments in higher education. It is not enough to just focus on the recruitment of Black women into STEM but there is also a need to dedicate time and resources to retention, progression, and matriculation.

Black women in STEM are prone to gendered racism, implicitly and explicitly (Dickens et al., 2020) and need culturally tailored support programs to persist in STEM. Strayhorn (2011) noted that Black students in STEM reported a lower sense of belonging than their peers from other racial groups, and Black women reported lower sense of belonging than Black men. Programs that are responsive to the needs of Black women pursuing STEM degrees should consider their intersectional identities. This means encouraging program creation and evaluation strategies that take their multiple identities into consideration, rather than viewing their identities as separate entities. Being the 'only one' or 'one of a few' may create negative psychological symptoms (e.g., depression, anxiety) and lead to feelings of invisibility and/or hypervisibility. Experiencing invisibility and/or hypervisibility leads to feelings of marginalization and a lack of a sense of belonging (Newton, 2022), which then may lead to identity shifting behaviors to mitigate experiences of discrimination and a host of other -isms (Dickens et al., 2019). While supervisors may perceive themselves as being supportive, the student may not actually feel or experience them that way. Well-meaning individuals are not immune to unconscious generalized beliefs about individuals or implicit bias. Black women may need different resources and support than their Black male or White counterparts. Dickens et al. (2021) talked about the 'double jeopardy' that Black women face in White-male dominated fields, such as STEM. Resources (e.g., financial, programmatic, human) must be dedicated to confronting gendered racism from STEM faculty and administrators and to supporting the psychological wellness of Black women. If resources and attention to these structural issues are not seen as an urgent matter, there will continue to be a documented shortage of Black women who persist in STEM (Stoeger et al., 2019).

Conclusion

Due to their underrepresentation, some Black women may feel the need to engage in identity shifting to abate negative experiences and blend in with the majority White culture of STEM. Identity shifting can be seen as impression management (Flores & Rosa, 2015); however, if a person frequently shifts from their actual self, this not only decreases the opportunity for others to know them authentically but also can take a toll on their psychological and emotional well-being. The pressure for Black women to shift to fit in with traditional STEM culture requires a significant amount of emotional and psychological labor. Black women are already facing gendered racism on many campuses but now coupling that with the COVID-19 pandemic creates a mental health crisis for Black women on college campuses. The urgent need for universities to support Black women cannot be overstated. The recruitment, retention, and matriculation of Black women in STEM depends upon it.

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