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# Linking intersectional invisibility and hypervisibility to experiences of microaggressions among graduate women of color in STEM<sup>☆</sup>



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## ABSTRACT

Given their intersecting identities as both women and people of color within STEM discourses that have been historically shaped to respond to one or the other, women of color are invisible within both (Crenshaw, 1991). These experiences of intersectional invisibility increase the likelihood of being scrutinized, isolated, and marginalized by the dominant group. Thus, exacerbating the chilly STEM climate. Using a nationwide sample of 176 participants, the current study examined microaggressions as an avenue through which women of color are rendered simultaneously invisible and hypervisible in STEM fields. Further, our study explored recommendations for addressing such experiences of microaggressions and intersectional invisibility. The four themes that emerged from participants' microaggressive experiences included: delegitimization of one's skills and expertise, implicit and explicit messages communicating their lack of belonging in STEM, instances where both their voice and physical presence were ignored, and gendered and racialized encounters. Nonetheless, students were encouraged to engage in agentic acts such as cultivating communities of support, internalizing messages of success, and foregrounding reasons for pursuing STEM. Implications are discussed in terms of increasing persistence among women of color in STEM.

## 1. Introduction

Women of color remain largely invisible across all levels of education in science, technology, engineering, and mathematics (STEM) fields. In 2014, Black, Latinx, and Indigenous women represented only 5.34%, 5.24%, and 0.01% of the total doctorate recipients in the physical sciences, engineering, and math, respectively (National Science Foundation: NSF, 2017). However, efforts to broaden participation among women and ethnic minorities in STEM are unquestionably abundant. In 2012 alone, over \$911 million dollars were awarded in funding from the National Science Foundation (Committee on Equal Opportunities in Science and Engineering: CEOSE, 2014). This was a \$200 million dollar increase from 2011 (CEOSE, 2014). Additionally, more than three decades of scholarship have been published and countless diversity and inclusion initiatives developed. Despite these efforts to increase women of color, their continued underrepresentation in STEM demonstrates that progress has been exceedingly slow. Moreover, the extant efforts have fallen short in addressing the nuanced experiences of recruiting and retaining people who belong to marginalized racial and gender groups (i.e., women of color). According to Ong, Wright, Espinosa, and Orfield (2011), “failure to advance the education of women of color... represents a failure of the United States to maximize our own talent pool at a moment

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when we can ill afford it—socially, technologically, or economically” (p. 173).

The status of women of color in STEM was first addressed by Malcom, Hall, and Brown (1976) in the publication *The Double Bind: The Problem of Being a Minority Women in Science*, and later by Ong and colleagues in 2011. The “double bind,” rooted in intersectionality, refers to the unique challenges faced by female scientists of color as they simultaneously navigate race- and gender-based marginalization in male-dominated STEM programs (Malcom et al., 1976; Ong et al., 2011). Reports to date have highlighted the extent to which women of color are not regarded as people or future scientists but instead as representatives of their race and gender (Alexander & Hermann, 2016; MacLachlan, 2006). This (mis)perception results in women of color being scrutinized, judged, and treated as intellectual inferiors (Brown, 2000). Given their low representation in STEM and lack of regard as competent scientists, women of color are often rendered invisible in STEM spaces (Ong et al., 2011). One way in which such invisibility can be levied is through acts of microaggression. Microaggressions have been regarded as among the most offensive acts committed against women and people of color (Yosso, Smith, Ceja, & Solórzano, 2009). Yet to date, few studies have examined microaggressions as an avenue through which women of color are made to feel invisible in STEM fields. We address this gap in the current literature by using a sample of 176 graduate women of color enrolled in research intensive STEM doctoral programs across the United States.

### 1.1. Intersectionality and intersectional invisibility

The current study draws on the theoretical framework of Intersectionality (Collins, 2000; Crenshaw, 1991) which posits that people rarely experience life as one aspect of their socially constructed identities (i.e., “woman” or “man”). Instead, an individual's lived experience occurs within the context of their intersecting identities (poor immigrant, Black woman, queer Muslim woman etc.). Intersectionality theory calls attention to how peoples' perspectives and nuanced experiences are shaped differently as they navigate multiple, shifting categories of identity (e.g., gender, race, class, religion, and ability). In fact, researchers have stated that we all reside within the “matrix of oppression,” and that the structures of race, class, and gender “create disadvantages for women of color” but also “provide unacknowledged benefits for those who are at the top of these hierarchies” (Dill & Zinn, 2016, p. 327). Furthermore, individuals' lived experiences as a conglomerate of their intersecting identities shape the way they are perceived by others, their perceptions of themselves, and their plans for the future (Ashcraft, 2014). A number of researchers have agreed on the salience of intersecting identities among minority women as an important element in their development and persistence in STEM fields (Carlone & Johnson, 2007; Ong, 2002; Settles, Cortina, Malley, & Stewart, 2006; Sosnowski, 2002).

According to Purdie-Vaughns and Eibach (2008), intersectionality research often focuses on the additive effect of holding multiple subordinate group identities (e.g., ethnic minority women, white lesbian women, black gay men). That is the idea that people with multiple marginalized identities experience ‘more’ oppression and discrimination than those holding fewer marginalized identities (e.g., white women). In extending our understanding of intersectionality, Purdie-Vaughns and Eibach (2008) put forth a model of intersectional invisibility that focuses on *how* people at the margins of multiple intersecting identities differ in their experiences of oppression compared to people with a single disadvantaged identity. These researchers posited that people holding two or more subordinate identities, in this case women of color, are neither prototypical representations of women (who are typically thought of as White) nor prototypical representations of people of color (who are thought of as men); and as a result, often experience intersectional invisibility. Purdie-Vaughns and Eibach (2008) defined intersectional invisibility as “the general failure to fully recognize people with intersecting identities as members of their constituent groups” (p. 381). Consequently, those holding multiple subordinate identities (e.g., ethnic minority women) will face challenges associated with misrepresentation, marginalization, and disempowerment.

Within STEM, women of color are also considered non-prototypical representations of scientists, engineers, or mathematicians (Carlone & Johnson, 2007). This becomes quickly apparent from the images that appear from a Google search of words such as *engineer*, *physicist*, or *scientist*; a significant number of the images are white males. Women of color's non-prototypicality in STEM, amidst an audience of White males, make recognition as a scientist problematic (Carlone & Johnson, 2007). This further exacerbates the marginalization they encounter in STEM. In fact, gender and racialized microaggressions have been shown to delegitimize women of color's credibility, competency, and belongingness in STEM fields (Brown, 2000; Joseph, 2007; MacLachlan, 2006).

### 1.2. Invisibility, hypervisibility, and microaggressions

Not only are women of color rendered invisible because of their non-prototypicality in STEM, they are simultaneously subjected to heightened *visibility* (i.e., hypervisibility) for this very reason. Ryland (2013) described hypervisibility as “scrutiny based on perceived difference, which is usually (mis)interpreted as deviance” (p. 2222). Such perceptions of ‘otherness’ or difference increases the likelihood of being scrutinized, surveilled, isolated, and marginalized by the dominant group. Both heightened visibility and invisibility have been cited as contributing factors to a “hostile working environment” for minority groups (Simpson & Lewis, 2005, p. 1259). One mechanism through which such hostility is levied is via acts of microaggression.

Sue, Bucceri, Lin, Nadal, and Torino (2007) defined microaggressions as “brief and commonplace daily verbal, behavior and environmental indignities, whether intentional or unintentional, that communicate hostile, derogatory, or negative slights and insults to the target group” (p. 273). Within STEM, women of color experience microaggressions ranging from gendered and racialized remarks that are either overt or covert (Brown, 2008; Kachchaf, Ko, Hodari, & Ong, 2015) to statements that diminish their competencies as scientists, engineers, and mathematicians (Camacho & Lord, 2011; Carlone & Johnson, 2007; Herzig, 2004). Although seemingly trivial, microaggressions exacerbate women of color feelings of lack of belonging to STEM, which in turn heightens feelings of isolation (Joseph, 2012; Ong, Smith, & Ko, 2018).

In recent studies, microaggressions have been shown to have significant negative consequences on mental and physical health, as well as lowered work and academic productivity (Charleston, Adserias, Lang, & Jackson, 2014). Nadal, Griffin, Wong, Hamit, and Rasmus (2014) found that higher frequencies of racial microaggressions negatively predicted participants' mental health and were significantly correlated with depressive symptoms and negative affect. With added environmental stressors such as microaggressions, graduate women of color have frequently remarked that they are graduating with two doctorates instead of one: a degree for successful completion of their doctoral requirements and a degree for successfully navigating the oppressive milieu that exists in STEM (Wilkins-Yel, Zounlome, Sparks, & Mukherjee, 2018).

### 1.3. The current study

To date, studies have examined visibility and invisibility as it relates to cultural experiences such as tokenism and minority stress (Settles, Buchanan, & Dotson, 2018). However, to the best of our knowledge, similar examinations linking visibility and invisibility to microaggressions have been scarce. Furthermore, examinations of microaggressions in STEM have been limited to studies with a small sample of graduate women from one ethnic group (Alexander & Hermann, 2016) or to samples comprised of only undergraduate students (Camacho & Lord, 2011; Espinosa, 2011). To address this gap in the literature, the current study examined: 1) ways in which microaggressions might act as an avenue through which women of color are rendered simultaneously invisible and hypervisible in STEM fields; and 2) participants' recommendations for addressing experiences of microaggressions and intersectional invisibility. It is through an increased understanding of these nuanced experiences that efforts to broaden participation in STEM can be effectively applied to women of color.

## 2. Method

### 2.1. Participants

Data were collected from a nationwide sample of 176 graduate women of color enrolled in STEM doctorate programs. Their ages ranged from 21 to 42 ( $M = 28.06$  years,  $SD = 4.32$  years). The ethnic breakdown of the sample included American Indian/Native American (7%), Asian American (39%), African American (23.3%), Hispanic (20%), and Multiethnic (7.5%). Participants were enrolled in a number of STEM fields, but more than 70 students were enrolled in the following five areas: Electrical Engineering, Physics, Chemistry, Earth and Geological Science, and Computer Sciences. Study participants attended institutions that were primarily located in the Midwest and on the West-coast. A total of 85% of participants identified as U.S. citizens, 10% identified as international students, and 5% preferred not to self-disclose.

### 2.2. Procedures

Participants were recruited from STEM doctoral programs across the United States. Recruitment letters containing the link to the online surveys were sent to department administrators who were then asked to forward it to their students. Interested participants, were first presented with a consent form, and those who provided consent were subsequently taken to the online survey. The open-ended questions used in the current study were a part of a larger survey that employed a mixed-method approach to examining the influential factors on STEM academic persistence among doctoral women of color.

### 2.3. Open-ended prompts

Study participants were asked to anonymously respond to two open-ended questions that were a part of the larger survey packet. The prompts included:

1. "Reflect on your graduate experience thus far. Can you recall a classroom/lab situation where the issue of your race and/or gender was involved? If so, please describe the situation(s) in detail."
2. "Think about a young woman of color entering a STEM graduate program in the upcoming academic year. Please use the space below to write her some "words of wisdom" that could guide her as she embarks on her journey. To assist in this process, you could write the letter you wished someone would have written you. Note that this can be any length, but we ask that it be at least 6-8 sentences."

### 2.4. Coding and analyses

Constant comparative analysis (Corbin & Strauss, 2008; Glaser, 1965) was used to individually code the open-ended survey responses. This well-researched method of analyzing qualitative data facilitates the coding of emergent themes from the data such that the data is constantly being revisited until it is clear that no new themes exist (Fram, 2013). The responses in the current study ranged from 5 to 6 sentences to several paragraphs. Themes were developed based on commonalities evident in the data. Coding was completed by a team of the co-authors in this study. We first independently used open coding to label each participant's response in a brief descriptive way. Responses that were similar to an earlier code were grouped together under existing labels and those that were not similar were given new codes. The process was carried out until saturation was achieved. This was determined when the necessity

for the creation of new labels ceased. Achieving inter-coder consensus was essential to ensuring trustworthiness of the data coding process. To do this, the co-authors met to compare and discuss the labels that were independently created. During these meetings, disagreements and discrepancies were discussed to consensus and in some cases, labels were updated to reflect the new codes. By achieving inter-coder consensus, the authors could ensure that the labels were grounded in participant's responses versus individual personal biases. Subsequent to achieving consensus, axial coding was used to form broad themes or categories which was a combination of smaller labels. Using a similar process to open-coding, new themes were created when it was found that labels were too dissimilar to be grouped together and the creation of an additional theme would better capture the label's essence. The creation of themes was also discussed to consensus.

### 3. Results

The eight themes delineated in the current study address our two research questions. The first question, Microaggressions and Intersectional Invisibility, consists of four themes that describe the way that microaggressions faced by women of color in STEM graduate programs relate to their experiences of invisibility and hypervisibility. The second question, Suggestions for Addressing Intersectional Invisibility, consists of three themes that reflect recommendations for coping with microaggressions and experiences of intersectional invisibility in STEM.

#### 3.1. Research question one: microaggressions and intersectional invisibility

##### 3.1.1. Delegitimization of skills & expertise

This theme highlights the plethora of instances where others viewed women of color as less qualified, competent, and capable than their peers. An overwhelming number of participants endorsed this theme, including those across varying ethnic identities, nationalities, and STEM academic disciplines. Participants described the ubiquitous nature of these experiences of delegitimization by saying:

It is on my classmates faces when they first meet me - the subtle shock that I, too, am in my PhD at [an Ivy league institution]. It is on the professors' faces when I get my grades back - the subtle shock that I, too, know the material. It is subtle but constant. Muted but present.

Across the myriad of settings where students' credibility was questioned, these encounters were levied by three groups of people. These included interactions with male colleagues, professors/advisors, and during their role as teaching assistants. One participant regarded her interaction with a male lab mate as 'undermining' and noticed that he only behaved this way with female scientist of color:

There is a graduate student in [the] lab who always undermines what I have to say. I'll simply ask if anyone knows where I can find some equipment and he has to ask me what I'm using it for so that he can tell me that I am doing a protocol wrong. I have never seen him do this to any other graduate student who was male. I have seen him do this to the other female Mexican graduate student[s] as well as the female professors of color.

Similarly, a participant described being paralyzed with shock after hearing disparaging comments about her productivity as mother:

My son was with me in the lab and I was working on a submission when one colleague stopped and said "Are you even productive with that kid around you?" and this was told in front of my son. The colleague shrug[ged] and then said "Do you even have any papers published yet?" I froze as I never had experienced such a situation or was mentally prepared for such a reaction from anyone.

In addition to peers, participants' credibility was also questioned by their professors and advisors. Participants also noted the debilitating effect of these comments: "My first advisor in my first year (not my current advisor) had made comments to me suggesting that I was only admitted since I am Hispanic and have a Hispanic last name." Another woman shared:

In my second year of graduate school I was in a course [that] was challenging and [where] there were only three students in the class. Our class did not have a TA since it was so small, so the only resource for additional help was the Professor. One day during office hours, between just myself and the Prof, he asked "where did I even go to undergrad?" he expressed that he graduated from an Ivy League and heavily suggested that I was not prepared and would not succeed at [this Ivy League institution]. This was early on in the semester and I felt alienated - I was in office hours for additional help but did not feel comfortable or supported by this professor. If I couldn't seek help from the Prof, how would I even be successful in this course? I kept to myself for the rest of the course and struggled through it alone. I was humiliated and did not even want to attend his lectures but pushed through because it was a degree requirement.

In their role as TAs, participants' credibility was yet again questioned. Undergraduate students went as far as asking White male graduate student TAs class questions after second-guessing TAs who identified as women of color.

As a teachers' assistant, there are a few students [who] don't respect me or won't listen to what I'm saying. [One student] refused to listen to what I was saying and insisted that he knew the material more than I did... He went on to ask the other TA who was a

white male with the same amount of experience. I got a feeling that I wasn't respected because I was either female or a female of color.

Experiences of constant delegitimization are a direct outcome of women of color not holding the prototypical identities of STEM graduate students (i.e., White and male).

### 3.1.2. "You don't belong here."

This theme explicates the ways in which graduate women of color were made to feel unwelcomed and excluded in their STEM programs. Such encounters fueled students' feelings of lack of belonging. For example, a participant remarked, "I feel like I am not welcome or do not belong in the same environment as my White and/or male counterparts." Another participant shared, "there's a constant message that you're not a competent scientist and you don't belong here." One participant described her encounter with a male colleague and the resulting psychological impact:

I was once stopped in the elevator by a male engineering student who asked if I felt weird being a girl in an engineering class. I never felt weird or even thought about the situation, but his question made me self-conscious.

In addition to individual experiences where students STEM belongingness was questioned, participants also described exclusion through institutional structures. These experiences primarily stemmed from the low representation of women of color which resulted in experiences of both invisibility *and* hypervisibility. The following quote encapsulates these experiences: "My teachers recognize me on sight and it is quite apparent to me that they notice if I'm not in class. It is ...disconcerting." Another woman said: "Every Wednesday, there is coffee break at one of the buildings I do my experiments in. I am the only woman that is Latin in the room. Most are men and the women are super scarce." These institutional exclusionary practices are also communicated through social norms that implicitly communicate that women of color do not belong in STEM spaces. For one participant whose work primarily takes place in the field, she noticed the ways in which routine behaviors were normed on masculine needs: "It is awkward in many respects including dressing, sleeping arrangements, physical capabilities (or assumed capabilities), bathroom breaks (we all pee in the field, but men do it differently than a lone woman)."

Participants also noted the contradictory messaging that came from departments where they would articulate a verbal commitment to promoting diversity but would continually admit predominantly White cohorts. Essentially, programs would talk the talk but fail to walk the walk. This was aptly described in the following comment:

My grad program is quite lacking in diversity, and it is noticeable. Last year when the new prospective grad students came for a luncheon with the existing grad students, I intended to go and meet them but when I walked into the room almost every head was blonde. I felt viscerally uncomfortable and immediately walked out. Some version of this happens on a daily basis since there is so little diversity in the department. The department acts as if it is promoting diversity, but in fact the grad students of [c]olor often talk about the way the lack of diversity makes them feel and function as a grad student.

It is evident from the above quote that these experiences have far reaching consequences beyond students just being cognizant of their low representation. Repeated encounters of these unwelcoming experiences take a physical toll on students' psychological and emotional wellbeing and in turn impact their academic productivity. A participant described feeling devastated when she learned of how others viewed her department's diversity efforts:

My department administered an anonymous survey to the grad students, undergrads, staff, and faculty about diversity issues and the diversity training offered. We got to see some of the comments people made on it after the results were compiled. One specific commentary made me feel uncomfortable about my race: "A few respondents indicated concerns about diversity efforts in the department, noting this is nonsense, being concerned that these efforts make majority group members feel guilty, emphasizing diversity goes against a merit-based system or would mean that we would hire less qualified instructors, faculty, or admit less qualified students". I was pretty devastated when I read this. I felt like people thought I didn't belong.

The amalgamation of experiences where STEM spaces lack representation of people who hold similar gender and racial identities, amplify the message that women of color do not belong there.

### 3.1.3. Ignored, dismissed, and rendered invisible

This theme exemplified the ways in which participants' opinions, voices, and ideas were routinely ignored, dismissed, and rendered invisible by others. One participant stated, "I have often felt like my opinions go unheard during lab meetings or other discussions of my work." Another student noted that statements made by her were often ignored but when a male colleague made the same statement it was well-received:

[While] working with fellow students on homework questions, I felt like no one was listening to me. Many times, I have brought up a point or question that [was] completely ignored. Then, a male peer will say the EXACT same thing, and everyone will listen to what he said.

Consistent with the theory of Intersectional Invisibility (Purdie-Vaughns & Eibach, 2008), one student recounted a negative experience where a professor ignored her physical presence likely because of her non-prototypical representation:

[In] a "study hall" session, the [male] professor of the class was around to help students with homework and answer questions. During a lull, he struck up a conversation about his experiences in academia with the other 4 TA's (all cis-male) and me.

Throughout the entire 45-minute conversation, he did not look at me once; his eyes would slide over my head to the people sitting on either side of me. Chalking this up to awkwardness (which is also not okay, but a different issue), I tried asking questions to ... demonstrate that I was also interested in knowing about his academic journey. In response, he would briefly pause—but ignore my question otherwise—and continue talking to the others. This did not happen when one of the other TA's asked a question, regardless of how trivial or irrelevant it might have been. After several tries, I gave up, and listened in silence for the rest of the conversation. Afterwards, I asked one of the other TA's (who also happens to be a close friend) whether he had noticed anything weird about the evening, and he said "Yeah, the professor totally ignored you, but maybe he was just tired or didn't notice that you were there."

Participants also described experiencing dismissive commentary about their cultural identities and lived experiences. One student reported the following:

I've taken pedagogical classes where we talk about issues in diversity and being aware of diverse students. When we went into the discussion, a white male was angry that we were talking about this subject. He was very dismissive about "affirmative action" and was very vocal about feeling that it was unfair to him as a white male. I felt very awkward in this situation as I was one of the only females of color in the classroom. Almost everyone else was white, or an international student. The international students didn't quite "get" the big deal about race relations in the USA. Therefore, I felt like I was the only one feeling the discomfort with his angry comments.

Similarly, another student shared her experience of being excluded from a group project due to her cultural background:

I felt excluded from a project that required team work as a class requirement. I saw the final presentation the day it was due and despite my continuous asking to contribute [I] was told that "it's ok" and "it's not that hard" and "we can handle it." I had a strong feeling I was excluded because of my background. I wear a headscarf and hence it is clear that I am "different."

#### 3.1.4. Racialized & gendered encounters

Consistent with [Simpson and Lewis \(2005\)](#), participants' holding minoritized identities are hypervisible in spaces of low representation which results in experiences of being othered, considered 'deviant,' and in turn marginalized. In the current study, women of color experienced such marginalization through an onslaught of racialized and gendered stereotypes and unwanted negative comments about their appearance. Despite their being different stereotypes about different groups, these experiences were consistent across women holding varied ethnic identities and in different STEM disciplines ([Ghavami & Peplau, 2013](#)). However, in contrast to the previous themes, participants often described these encounters in relation to a single-axis identity versus their intersecting gender-racial identities.

As it pertained to racialized experiences, participants described encounters of such slights from both professors and peers. One student shared her experience after her Ph.D. candidacy exam when her committee made remarks such as "you spoke very well" and "crack the whip on your undergraduates." The last reference having significant connotations to slavery and the act of whipping students similar to whipping slaves. Another graduate student described the impact of others continuously discounting her Native American identity by saying "when having a conversation with some colleagues I mentioned that I am Native American, and someone says, "You don't look Native American." This is a comment I get often...it definitely bothers me a lot." This students' experience is a prime example of how microaggressions can be experienced as 'death by a thousand cuts.'

Consistent with the literature on visibility and invisibility, real or perceived shortcomings of women and people of color are often amplified while their achievements go largely unrecognized ([Lewis & Simpson, 2012](#)). This was the case for a participant of Asian descent who shared an experience of being belittled by a colleague when she voiced her academic concerns. She stated the following: "The major parts of having race and/or my gender as an issue comes from interacting with other graduate students who say things like 'Asian fail' when I express my concern in a course."

With regard to gendered experiences, participants described encounters where they were subjected to sexist remarks, gendered stereotypes, and unwanted negative comments about their appearance. One participant noted that she was "warned" against having any intentions of finding a husband in her lab.

I have been "warned" that I am not in the lab to find a husband and in the same breath I am told that my job probably makes me too masculine for men to find me attractive anyway.

Another participant described a similar warning from someone in an advisory capacity. She stated, "a potential advisor for a research project asked me if I was married or dating anyone and said it's good that I'm not because I need to be fully focused on the project."

Women of color in this study also reported frequent instances of tokenism and described experiencing discomfort when asked to represent their entire gender. One participant shared the following:

One class we were discussing teaching to a diverse population of students. Since physics is dominated by white males, I was often singled out to provide the "female minority" perspective. It can be quite uncomfortable to try to be the mouthpiece of an entire gender - especially when I believe that there is no such thing as the true "female perspective."

Although treatment based on racial or gendered stereotyping was more common, some participants also described experiencing differential treatment from males because of their intersecting identities as women of color. One participant noted how a White male

student refused to train her because she was a woman of color:

One male has clearly avoided training me on how to use laboratory equipment even after my advisor/boss has told him to train me several times. I believe this may be related to race (and possibly gender), because when other people (who are Caucasians) interact with them, the tone and behavior is different, and the other male received training on the equipment.

### 3.2. Research question two: suggestions for addressing intersectional invisibility and microaggressions

The current section describes three themes related to participants' suggestions/recommendations for addressing experiences of intersectional invisibility, hypervisibility, and microaggressions. Broadly, these suggestions offer a way to counter the tendency to internalize microaggressions and experiences of intersectional invisibility. It should be noted that these three strategies encourage academic persistence which in turn increases the representation of women of color in STEM. In so doing, they increase visibility and contribute to debunking the stereotype that only a certain type of person can be considered a prototypical representation of a scientist.

#### 3.2.1. Support seeking and regaining control

This theme highlights the individual agentic strategies suggested for addressing microaggressions and intersectional invisibility. First, participants recommended focusing on the factors that are in one's control. So, if one encounters a harsh or less than welcoming environment in the graduate program, participants suggested managing one's urge to educate others and finding outlets to process negative experiences. One participant shared:

I know sometimes you don't want to educate people about stereotypes that are rude, racist, etc. because you've heard it too much lately or they are just that ignorant, I get it. People suck sometimes. You can walk away, that's fine. But don't let it stay inside too long because it will just make you angry. I suggest that you write it down and/or talk about it with someone you trust.

Other participants recognized that women of color may feel moved to address perpetrators and acknowledged how cathartic such confrontations may feel. One participant noted:

You can approach that person later and tell them that their comment was hurtful, rude, or incorrect and that you wish that they don't use it again. It can be a daunting task to do, especially if it's your advisor or professor, but that's when it matters the most.

In keeping with the recommendation to focus on the factors that are in one's control, participants suggested letting your work speak for itself.

Even if you are in a class with majority white male, do not be afraid. Even if you feel that they are not taking you seriously, you'll prove to them that you can be taken seriously through the work you have done and the ideas you bring to class. Be confident and know that you are just as good as they are.

Above all else, participants suggested establishing a trustworthy support network. Women consistently cited the importance of support from peers, colleagues, and faculty. One student said, "everything seems less intimidating when you can connect with other people." Another participant shared:

The most valuable tool for success in a STEM graduate program is a strong support system. It is imperative to have a circle of mentors, colleagues, friends, and mentees that you can talk to about your academic and career goals, as well as obstacles you face that are not directly related to science.

Participants noted the challenge in finding a support network within STEM departments and suggested that students look outside of their departments instead. One student suggested, "[g]et[ting] involved in minority/women's professional groups." Another recommended "social media [communities] such as *Vanguard: Conversations with Women of Color in STEM*." Several students also cited conferences and networking events as good places to cultivate support systems. Participants' also noted that it was high time that women have a girls' club that would parallel men's boys' club. One student shared the following:

[It's] vital that we as women of color support, include, and try to forge bonds with each other even when we feel uncomfortable or scared to do so. Men have their STEM boys club and we should try to build our own STEM girls' club so we can support and give each other the opportunities that males (and even other females) hold back from us, because I've seen that this boys club becomes more powerful, critical, and exclusive in the work world.

Finally, as a testament to focusing on the factors in one's control, participants' encouraged women of color to stand in the knowledge that they are connected to a community that is bigger than any one classroom, department, or campus. Furthermore, they can rest assured knowing that there are other women of color who share similar struggles and who stand in solidarity with them. As one participant offered, "[a]lways remember me and [the] countless others [who] will always be in your corner!"

#### 3.2.2. Recall your strengths: remember, you have what it takes

This theme draws on the character strengths that women of color in STEM already possess and could strengthen. Participants noted that admission into a STEM graduate program is an experience shared by few, and is an accomplishment that reflects hard work, dedication, and proven abilities to succeed. Therefore, it is important for future women of color to believe in themselves, their

abilities, skills and talents, despite the challenges. As one participant suggested:

The doubts of others about your strengths and your abilities, both academic and otherwise, may pile on top of the doubts that you may have about yourself. But you did NOT get here by accident. You are smart, you are strong, and you are capable.

Another participant stated:

If someone (\*especially faculty or your advisor) tells you “You’ll never get a PhD,” “You don’t belong here”... don’t listen to them and run. They don’t know you like you know yourself. So, don’t let someone’s false judgment of you shift you away from your goals.

Participants voiced awareness of feelings of self-doubt and imposter syndrome but reminded future women of color that “you earned everything you have right now, and you deserve it.” Another participant noted the following:

The moment you think that you’re under some imposter syndrome or that you note your differences from your peers, you’ll start to psyche yourself out. Focus on your progress and know that people learn in different ways.

Women in the current study also noted that for graduate students to have gotten this far, then they most certainly possessed an array of character strengths. These included characteristics such as resilience, determination, strength, and assertiveness. One participant said, “The most important thing is to have mental fortitude and a passion for what you want to do.” Another shared the following:

If I could give you one piece of advice, it would be to have confidence in yourself and your abilities. Because when you have this, everything changes, and every obstacle and setback becomes a challenge to solve and not a challenge on your worth.

Above all else, participants stated, “do not let anyone demotivate you.” Another added, “As the iconic Latino educator from East L.A., Jaime Escalante would say: ‘It takes ganas!’ or ‘You have to want it!’”

### 3.2.3. *Changing the field: the reason for your fight*

Though not frequently cited, this theme describes participants’ recommendation that future women of color in STEM stay grounded in the knowledge that their presence, their work ethic, and their spirit is changing the environment for those who will embark on a similar journey. In fact, the continued presence and fight of each woman of color in a STEM graduate program serves to create a slightly wider, more traversed pathway for those women of color who will come after. As one participant shared, “your fight will improve the path for other students of color that come behind you.” Another stated, “your PRESENCE makes a difference, imagine what your FIGHT will do for them.”

## 4. Discussion

Consistent with Purdie-Vaughns and Eibach (2008), the current study moved beyond the traditional focus of examining the additive effects of holding multiple marginalized identities to shedding light on *how* people at the margins experience oppression differently from their counterparts. Not only are women of color in STEM considered non-prototypical representations of both their gender (i.e., women) and their race (i.e., people of color), they are also not regarded as scientists. Such perceived non-prototypicality renders their experiences as simultaneously hypervisible *and* invisible. Consequently, the present study sought to link intersectional invisibility to acts of microaggression and suggest recommendations for coping with these experiences.

The findings of the current study highlighted acts of microaggressions as a salient pathway through which members of the majority group delegitimized the credibility of graduate women of color, questioned their belongingness in STEM, ignored their ideas and opinions, and subjected them to an onslaught of gendered and racialized encounters. Further, the results illuminated the pervasiveness of these occurrences and the extent to which encounters of intersectional invisibility were levied by both individuals (e.g., peers, professors, students) and the institution. Such exclusionary tendencies have been attributed to majority group members overestimating the degree to which they are similar to members of their ingroup and amplifying their difference to those in the non-dominant group (Kanter, 1977). So, as members of the out-group, women of color are raced *and* gendered differently, othered, and seen as ‘deviant’ and thus, subjected to both implicit and explicit microaggressive acts of exclusion (Ryland, 2013). Experiencing such a barrage of microaggressive acts has the potential to be internalized as ‘death by a thousand cuts’ (Sue et al., 2007) which can in turn heighten emotional and psychological distress among women of color. Given the imbalance of power and authority, it is difficult for women of color to reclaim their power and credibility and in turn change the narrative of how they are perceived by the dominant group.

A salient observation from the study’s findings was the frequency in which participants described their gendered and racialized encounters in relation to a single-axis identity versus their intersecting gender-racial identities. In doing so, participants often referenced instances where they experienced *racialized* microaggressions or *gendered* microaggressions. This could be attributed to the fact that microaggressions are often subtle slights which make it difficult to determine whether they are being levied because of one’s gender, ethnicity, or both. Along the same lines, women of color are products of a broader society that historically dichotomizes race and gendered experiences. It follows then that women of color may also think of their experiences in terms of race *or* gender. Yet, the fact that participants responded to the study’s open-ended prompts suggests that they see these experiences as related to their status as women of color, even if sometimes race or gender more strongly influences a particular experience.

#### 4.1. Mitigating strategies to combat microaggressions

Given the pervasiveness of the acts of microaggressions and intersectional invisibility, it is likely that such messages may be internalized by women of color and can in turn erode students' self-confidence. Extant literature on stress and coping has highlighted the myriad of ways in which coping strategies have buffered the impact of various stressors (Folkman, Lazarus, Dunkel-Schetter, DeLongis, & Gruen, 1986). In the current study, participants offered future graduate women of color in STEM several strategies for combatting intersectional invisibility. The study findings highlighted two avenues of coping in particular: individual agentic strategies such as support seeking and focusing on the factors in one's control as well as reframing how one thinks about a difficult experience. It should be noted that strengthening a woman's coping skills does not imply that the challenges she faces are her own. Instead, such skills equip her with a more immediate and empowered approach to maximizing her success versus waiting for systematic institutional change (Bernstein, 2011).

Among the individual agentic strategies suggested by participants in the current study, future STEM women of color were encouraged to cultivate a support network comprised of peers, colleagues, and faculty. The extant literature on STEM retention has emphasized the key role of social support in facilitating persistence, particularly among women of color (Ong et al., 2011). Such a network has been shown to mitigate feelings of isolation and increase feelings of belonging (Carlone & Johnson, 2007; Charleston et al., 2014; Espinosa, 2011; Johnson, 2007; Ko, Kachchaf, Ong, & Hodari, 2013). Ong et al. (2011) cited the importance of same gender and race networks. However, the small number of women of color in a given STEM department can make it particularly challenging to establish these networks in one's program. Participants in the current sample acknowledged this challenge and encouraged future students to seek support from the broader university through campus organizations, national conferences, and online mediums such as *Vanguard: Conversations with Women of Color in STEM*.

Participants also encouraged women of color to reframe self-defeating thoughts that arise in difficult encounters. For example, participants encouraged future women of color to internalize messages that reaffirmed their character strengths. The positive impact of strength-focused thinking (versus problem-focused) on human functioning is well-documented among positive psychology researchers (Seligman & Csikszentmihalyi, 2014; Sheldon & King, 2001). As it pertains to women of color in STEM, Ko et al. (2013) found that participants who recognized their strengths felt more equipped with the tools for success and employed more growth-promoting behavioral strategies. It follows then that recommendations such as engaging in more positive self-talk, focusing on one's individual successes rather than social comparison, and writing out one's abilities and accomplishments can have far-reaching implications on one's success. It goes without saying that supporting a strength-focused approach is not to the exclusion of the reality of one's challenges, instead it promotes the recognition of one's strengths amidst adversities.

Another strategy for reframing difficult experiences is staying grounded in the reason for pursuing one's chosen career. For many, this includes paving the way for the next generation of graduate women of color in STEM. Several researchers have demonstrated the relationship between advocacy engagement and feeling empowered to overcome adversities (Goodley, 2000; Grover, 2005). Similarly, Johnson (2007), Espinosa (2011), and Ko et al. (2013) cited humanistic goals (e.g., being a role model for girls of color; making a difference in society; giving back to their community) as tools for persisting in STEM.

A common theme that cuts across all of the aforementioned strategies is the focus on increasing STEM persistence among women of color, and in turn their visibility. In so doing, women of color may have a greater chance of contributing to the dismantling of the stereotypical view of who belongs in STEM; thus, paving the way for more black and brown women in STEM. However, increased visibility is not without its downfalls. Students are likely to face further marginalization, scrutiny, and pressure to prove their legitimacy. As is evident from our findings, these experiences can have negative psychological and emotional consequences. Nonetheless, the strategies outlined above include seeking support from women of color in similar fields, which has the potential to buffer the impact of interactions with the dominant group.

#### 5. Limitations

Though unique, this study is not without its limitations. First, the online data collection method allowed for a relatively large number of open-ended responses which contributed to the generalizability of the findings. However, individual qualitative interviews are likely to facilitate a deeper understanding of students' experiences. Second, the results presented here are only a snapshot of these students' experiences. It is possible that students provided recommendations based on their personal experiences which may change as they progress through their programs. Future research should longitudinally examine the experiences of graduate women of color over time to determine the consistency of their experiences beyond a single timepoint.

#### 6. Implications and conclusions

Despite the limitations, the results of this study have brought into sharp focus the myriad of microaggressions experienced by a nationwide sample of graduate women of color across an array of STEM fields. Given the onslaught of these oppressive experiences, the findings of this study illuminated the enormous time and energy that is needed to *survive* STEM environments that is above and beyond *doing* STEM. One salient implication that emerged from the findings was the need to facilitate programmatic changes in STEM through ongoing cultural competency training for the faculty, staff, and students. These trainings could promote the development of awareness, knowledge, and skills (Sue et al., 2007) such that faculty, staff, and students could recognize the impact of their behaviors, take actions to rectify them, and increase their understanding of working with diverse groups. Furthermore, such training could improve bias awareness and dismantle the societal stereotypes that one needs to be white and male to be considered a prototypical

scientist. By addressing the experiences of women of color, programs will now make *visible* the often, invisible, and nuanced experiences of individuals who reside at the margins of both gender and race/ethnicity (i.e., women of color).

To counter feelings of microaggressions and invisibility, the study findings also shed light on several agentic ways in which women of color could both survive *and* thrive in STEM. In keeping with these findings, programmatic efforts that provide women of color with same race and gender networks could be fostered. Such a support system was cited as instrumental to STEM persistence. Furthermore, efforts to facilitate community outreach, particularly to minority girls, need to be encouraged versus shunned given the salient role of mentoring the next generation of STEM women of color. As the United States continues to position itself as a world leader in science and engineering, it will be in our best interest – economically, socially, and technologically – to retain and advance the success of all our human resources, an important portion of whom are women of color.

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