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Understanding the Impact of Personal Challenges and Advisor Support on STEM Persistence Among Graduate Women of Color

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Social Cognitive Career Theory (SCCT) posits that contextual supports and barriers can either promote or inhibit academic and career progress. However, little is known about how challenges outside of the academic setting impact academic persistence of women of color (WOC) in advanced STEM degrees. This study aims to understand the personal challenges experienced by WOC in STEM doctoral programs and their perceptions of related support from faculty advisors. A constant comparative qualitative examination was conducted using semi-structured interviews with 11 WOC who either chose to complete or discontinue their STEM doctoral programs. Two overarching themes emerged from the data: personal challenges (i.e., difficulties experienced outside of the academic setting) and advisor support (i.e., the degree to which participants perceived their advisors' actions as supportive). Personal challenges included financial difficulties, family challenges, romantic relationship difficulties, personal health challenges, adjustment to U.S. culture, and challenges related to pregnancy and childcare. Participants also discussed whether they chose to share these challenges with their advisors and the type of support received (i.e., instrumental support or emotional support). The findings of this study highlight the personal challenges experienced by WOC in STEM doctoral programs and the role of advisor support in mitigating or exacerbating the impact of these challenges on academic persistence. Lastly, implications for future research and academic programs are discussed.


Keywords: women of color, STEM, personal challenges, advisor support, SCCT


Women of Color (WOC) in science, technology, engineering, and mathematics (STEM)—traditionally described as Black/African American, Latinx, and Native American/Indigenous women—are underrepresented across all levels, including K-12, undergraduate, and graduate education, as well as in various entry, mid, and senior career positions (Carlone & Johnson, 2007; Corneille et al., 2019; Ong et al., 2011). According to the most recent data available from the National Science Foundation (2019), only 8% of all science and engineering doctoral degrees were awarded to WOC in 2016. Exacerbating this underrepresentation is that WOC tend to leave doctoral programs in the physical sciences and engineering at higher rates than their White male counterparts (Sowell et al., 2015). Research shows that the 7-year attrition rate is 34% for WOC in STEM, including half of those withdrawing from their doctoral studies in the first 2 years of their program (Sowell et al., 2015).


Among other factors, researchers attribute this underrepresentation to WOC's daily experience of difference (e.g., microaggressions, racism, tokenism, and sexism) as they navigate a predominantly White male STEM environment (Carlone & Johnson, 2007; Ong et al., 2011). Despite the extant evidence citing academic-related factors as deterrents to STEM persistence, little is known about the impact of personal challenges on STEM persistence.

Personal challenges are defined as the difficulties or barriers students experience that originate outside of the STEM academic environment (e.g., family difficulties, health complications). To date, illustrations of the impact of personal challenges have been embedded within larger empirical investigations on the underrepresentation of WOC in STEM. For example, in McGee and Bentley (2017), a Black woman STEM student described failing qualifying exams due to serious physical illnesses. Another participant described having a daughter with a disability and no health insurance, in turn making it so she needed to work part-time as a gas station attendant while pursuing her doctorate in engineering in order to support her family (McGee & Bentley, 2017). These participants' experiences highlight the varied ways in which challenges *external* to the STEM academic environment (i.e., personal challenges) might be influencing STEM persistence. Given the significant efforts designed to broaden participation in STEM, more work is needed to understand the types and impact of personal challenges faced by WOC in STEM. Such an examination would not only contribute to a more robust understanding of the factors that impede persistence but would aid in highlighting the ways in which key stakeholders within STEM (e.g., advisors) can mitigate the

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impact of these barriers. Advisor support, or the lack thereof, particularly within the STEM context, has long been shown to play a significant role in graduate women's STEM persistence intentions (Bernstein et al., 2010; Primé et al., 2015; Sheehy, 2019). However, no study to date has examined the role of the STEM graduate advisor in buffering the toll of the personal challenges among WOC.

The current study addresses this gap in the literature by elucidating the personal challenges experienced by WOC in STEM, their perceptions of support from faculty advisors, and the extent to which these challenges and support differed for students who chose to complete, versus discontinue, their STEM doctoral programs. It is well known that broadening participation in STEM improves research quality, fosters innovation and growth, and strengthens the expertise needed to creatively solve grand challenges in STEM (Gibbs et al., 2014; Ong et al., 2011). However, these outcomes will remain unattainable if we are unable to address the continued underrepresentation of diverse voices, such as WOC, in STEM.

Theoretical Framework

The current work is guided by two theoretical frameworks, social cognitive career theory (SCCT; Lent et al., 1994) and intersectionality (Collins, 2002; Crenshaw, 1991). SCCT provides a theoretical basis for explaining educational and career persistence intentions. Further, SCCT has received extensive empirical support, with most studies focusing on undergraduate students in STEM fields and women and students of color (e.g., Byars-Winston et al., 2010; Lee et al., 2015; Navarro et al., 2014). The key predictive elements are self-efficacy, outcome expectations (beliefs about the consequences of one performing specific behaviors), and contextual factors (environmental supports and barriers). From the SCCT perspective, academic and environmental supports and barriers have been characterized as contextual factors that enhance or constrain educational and career progress (Lent et al., 1994). In line with SCCT, we regarded personal challenges and the related support received from faculty advisors as contextual barriers and supports, respectively. To date, personal challenges have not been examined within the context of SCCT as it applies to WOC in STEM. Consequently, the current examination represents an extension of this theoretical approach.

Intersectionality makes explicit the nuanced ways in which marginalization is rooted in dynamics of difference and sameness with regards to axes of power and privilege (Crenshaw, 1991). Collins (2002) further characterized this intersectional experience as a "matrix of oppression," whereby the structures of race, class, and gender create disadvantages for those holding multiple marginalized identities and provide unacknowledged benefits for those who are at the top of these hierarchies. Given their intersecting identities as both women and People of Color in STEM environments that privilege dominant cultures predicated by White, heteronormative, continuing generation, and upper- or middle-class men, WOC are often rendered simultaneously invisible and hypervisible (Wilkins-Yel, Hyman, et al., 2019). WOC simultaneously contend with race- and gender-based experiences, including racism, sexism, microaggressions, lack of belonging, and isolation (Alexander & Hermann, 2016; Espinosa, 2011; McGee & Bentley, 2017).

Several studies have illustrated the myriad of ways in which the lived experiences of WOC in STEM are characterized by a "double

bind" (Malcom et al., 1976; Ong et al., 2011). For example, eight African American graduate women in a study by Alexander and Hermann (2016) described perpetual experiences of belittlement and being forced to prove their credibility to White male peers and professors. Similarly, a sample of 39 WOC in Ong et al. (2018) endorsed significant experiences of isolation and microaggression in STEM. Charleston et al. (2014) found that the constant sense of isolation played a critical role in African American women considering withdrawal from their STEM programs. Undoubtedly, the multiplicative effect of these marginalizing encounters uniquely impacted WOC's interest, self-efficacy, and decisions to persist. Despite the plethora of studies highlighting these experiences, little is known about the impact of personal challenges on graduate WOC's STEM persistence specifically.

Personal and Academic Challenges as Contextual Barriers

In this article, we focus explicitly on the personal challenges experienced by WOC in STEM doctoral programs and how those challenges relate to their persistence decisions. Past research illustrates that personal challenges include work-life balance (Kachchaf et al., 2015), personal and familial health (McGee & Bentley, 2017), and cultural difficulties (Wilkins-Yel, Bernstein, et al., 2019). Researchers regard career-life balance as a major deterrent to STEM persistence. Holmes et al. (2008) found that women in STEM faced acute work-life balance stressors after the birth of their child. Given the "ideal worker" norms that plague male-dominated STEM environments (e.g., long hours on the job and the need to be constantly available and visible), it is no surprise that work-life balance is a challenge. In McGee and Bentley's (2017) qualitative examination of the experiences of three Black women in STEM, one participant highlighted the ways in which serious illness and challenging familial circumstances affected her STEM persistence intentions. Similarly, in a qualitative study that examined the influential factors on WOC's STEM persistence, three Latina graduate students described pressures to adhere to cultural norms as contributors to decreased STEM persistence (Wilkins-Yel, Bernstein et al., 2019). These norms included frequent remarks about starting a family and questions about the need to pursue a PhD. One participant noted that her family's questions and comments caused her to second guess her decision to pursue a PhD. WOC face the compound effect of navigating the typical academic challenges (e.g., long hours in the lab), gendered and racialized experiences inside the STEM department, as well as personal challenges outside the STEM environment. The combination of these challenges is likely to levy a significant toll on students' well-being and academic success. Although some literature does highlight the type and toll of personal challenges, there remains a need for more research to understand the personal challenges that WOC in STEM face and the ways in which faculty advisors support students as they navigate these challenges.

Advisor Support as a Contextual Support

As a protective factor against the impact of personal and academic challenges, research suggests that support from one's graduate advisor is crucial to promoting long-term success (Primé et al., 2015; Sheehy, 2019). Advisor support has been shown to be especially important in advancing graduate students' academic satisfaction,

productivity, and degree completion (Barnes & Austin, 2009; Bernstein, 2011; Cabay et al., 2018; Golde, 2005; Lovitts, 2001; Nettles & Millett, 2006; Primé et al., 2015; Sheehy, 2019).

Two types of graduate advisor support are shown to be salient to student success: *instrumental* and *psychosocial* support (Kram 1983; Primé et al., 2015). Instrumental support encompasses direct, active, material, and operational assistance in academic, career, or personal domains such as providing financial help, giving practical advice, collaborating, showcasing, sponsoring, introducing or protecting the student, and assisting with domestic or caretaking duties. Psychosocial support includes providing encouragement, affirmation, recognition, comfort, empathy, and safety for open expression (Dawson et al., 2015; Kram, 1983; Sheehy, 2019; Wong, 2015). Students who reported receiving psychosocial support from their advisors rated their graduate experience with higher degrees of satisfaction (Tenenbaum et al., 2001). Receipt of both instrumental and psychosocial support has been linked to faster degree progression and greater satisfaction with the advising relationship (Lunsford, 2012; Sheehy, 2019). Despite these findings, more work is needed to understand the ways in which the advising relationship buffers the deleterious toll of personal challenges within a sample of WOC in STEM specifically.

The Current Study

The work presented here is part of a larger NSF-funded study within the CareerWISE (CW) research program (CW) that aims to understand and strengthen the persistence of women in STEM doctoral programs. The larger study within which the current study lies aims to provide rich data about the nature of support episodes, and also the sources, types, and timing of interpersonal support that were most effective (or ineffective) in mitigating discouragement and residual stresses from difficulties experienced by diverse women doctoral STEM students. The current study aims to more specifically address the following research questions: (RQ1) What personal challenges are experienced by WOC in STEM doctoral programs? (RQ2) What are the perceptions of related support from faculty advisors? (RQ3) In what ways do these experiences of challenges and support differ between WOC who completed their STEM PhD program and those who chose to discontinue prior to completion? This study will elucidate from the vantage point of WOC how they could have been better supported in navigating personal challenges during their STEM doctoral programs. Having a

participant sample inclusive of both individuals who discontinued prematurely and those who completed their degrees will generate insight into both supports and barriers affecting STEM persistence.

Method

Participants

Data reported here were collected from 11 graduate women, six of whom completed a PhD and five of whom discontinued PhD doctoral programs in STEM. These participants were from 10 universities in the United States and ranged in age from 29 to 33. Participants included women who identified as Black or African American ($N = 4$), Latinx ($N = 4$), and bi/multiracial ($N = 3$), and represented six different STEM fields in engineering, biological sciences, physical sciences, and mathematics. Participant demographic information is included in Table 1.

Procedure

Participants first completed a screening and demographic survey. Eligible participants for this study were Black/African American and/or Latinx women who either completed their STEM doctoral degrees or chose to leave prior to completion since 2015. We were specifically interested in participants who identified as Black/African American and/or Latinx women because they are among those most minoritized in STEM based on gender and race. Participants who completed their degrees were recruited from academic departments, professional associations, minority STEM organizations, professional listservs, and alumni networks, while participants who discontinued their PhD programs were recruited using snowball sampling and referrals from academic departments and professional networks. Recruitment materials (e.g., fliers distributed through emails and social media postings) invited eligible participants to reflect on the instances of interpersonal support they experienced or would like to have experienced while in their STEM PhD program.

Eligible participants then participated in a 60–90 minute semi-structured interview via Zoom video conferencing platform. Five questions and related probes were designed to elicit participants' perceptions of support episodes at challenging times during their STEM doctoral programs. Supporting probes included questions such as "Did you talk to anyone about it then? If so, to whom?" and

Table 1
Participant Demographic Information

Pseudonym	Race/ethnicity	PhD completion status	Degree field
Giselle	Latinx	Did not complete	Biological sciences
Rosa	Latinx	Completed	Biological sciences
Lola	Latinx, European American	Completed	Biological sciences
Kyla	African American, Biracial	Completed	Biological sciences
Angela	African American	Did not complete	Engineering
Melia	African American, Latinx	Completed	Engineering
Mya	African American	Completed	Engineering
Gloria	Latinx	Did not complete	Mathematics
Nina	Latinx	Did not complete	Mathematics
Vanessa	African American	Did not complete	Mathematics
Tanja	African American	Completed	Physical sciences

Note. Pseudonyms were created to maintain participants' anonymity.

“How was this helpful/not helpful to you?” Participants were also asked about the role of various identities in their perceptions of support, using the probe “In what ways do you think gender, race, ethnicity or other identity aspects played a role in who you talked with/what they said?”

A commercial transcription service was used to transcribe the interviews. Following transcription, electronic copies of the transcript were sent to each participant both to ensure that the interview data accurately represented their perception of their experiences and to give participants an opportunity to redact anything from the interview they no longer wished to include in the research data. This participant check provided support for the credibility of the research process (Morrow, 2005) and concluded participant involvement in the study. Upon completion of the study, participants received a \$50 Amazon gift card.

Positionality Statement

The coding and data analysis team consisted of the first three authors of this study. The first author identifies as a Black immigrant woman who is an assistant professor in counseling psychology. Her positionality was informed by her experiences as Black woman working and residing in predominantly white spaces, her expertise as a trained counseling psychologist, and her intersectional approach to promoting holistic persistence among graduate WOC in STEM. The second author is an associate professor in engineering who identifies as a White woman and a mother. She brings her current (as a faculty member) and past (as a doctoral student) experiences as a woman in engineering to this work, along with several years spent researching the experiences of graduate women in STEM. The third author identifies as a White cisgender woman who is a master’s level counselor and doctoral student in counselor education. Her experiences in the mental health field inform her understandings of systemic factors that influence well-being, which guided some of

her perspectives on this manuscript. Our larger research team, which was involved in some data collection and analysis, also included a biracial WOC, a Black woman, and two White women. Together, our interdisciplinary lens and diverse lived experiences helped promote multiple ways of looking at the experiences shared by participants and helped manage the prior understandings we brought to the data analysis activities.

Analytic Approach

Underpinning the analysis was a combination of postpositivist and social constructivist paradigms (Creswell, 2018). We detail our process here and point to aspects of the process that supported the trustworthiness markers of credibility, dependability, confirmability, and fairness in our research process.

The analytic approach for this work was a thematic analysis (Braun & Clarke, 2006). We employed a constant-comparative, open coding process on meaningful units of data that represented a code (Glaser, 1965; Leavy & Saldaña, 2014). Statements related to personal challenges expressed by participants were first identified from the transcribed interviews. Second, open coding was used to organize these meaningful units into categories along two dimensions: (a) the types of personal challenges reported by the participants and (b) the nature of support provided by advisors in response to those challenges. The organization of these themes formed the basis of the codebook for this study, which included the codes and definitions shown in Table 2. During independent coding, each member of the research team participated in memoing and was mindful of ways that their own identities may have influenced their interpretation of the data.

Krippendorff’s alpha (α) was used to establish interrater reliability between the coding members of the research team and to support the dependability of the research process (Morrow, 2005). Krippendorff’s alpha (α) was calculated based on coding a subset of three of

Table 2
Codes Used in Data Analysis and Interrater Reliability Values

Code	Definition	Krippendorff’s	
		alpha	p value
Pregnancy and childcare	Challenges related to pregnancy and childcare, including childcare by partner when it explicitly references impact on participant	0.75	.00
Financial difficulties	Challenges related to money or finances	0.84	.01
Adjustment to US culture	Challenges related to international student status or adjustment to U.S. culture that occurred outside of the academic setting	0.80	.02
Romantic relationship difficulties	Relationship break-up, conflict, long-distance relationship, supporting partner with a physical or mental health challenge, counseling related to distress stemming from romantic relationship issues	0.84	.00
Personal health issue	Challenges related to one’s own physical or mental health, even if those symptoms arose because of experiences within the academic setting. Personal health issues must have the potential to impact functioning/well-being	0.80	.01
Family difficulties	Challenges related to one’s family, including parents, siblings, and extended family	0.83	.00
Did discuss with advisor	Data highlighting that a participant <i>did</i> discuss personal challenges with advisor, data providing rationale for why the participant <i>did</i> discuss personal challenge with advisor	0.80	.05
Did not discuss with advisor	Data highlighting that a participant did not discuss personal challenges with advisors, data providing rationale for why the participant did not discuss personal challenge with advisor	0.85	.00
Emotional/psychosocial support	Encouraging words or actions provided by advisor (encouragement, recognition, and emotional support vs. practical and tangible support)	0.81	.02
Instrumental support	Tangible, concrete help provided by advisor (i.e., practical and tangible support vs. encouragement, recognition, and emotional support)	0.76	.02

Note. The acceptable coefficient cutoff was $p < .05$.

the study transcripts using the KALPHA SPSS macro (Hayes & Krippendorff, 2007). Krippendorff's α measures the degree of agreement in the application of a code to each individual unit of data on a scale of 1.00 (perfect agreement) to .00 (perfect disagreement). Minimum acceptable values were $\alpha > .67$ (Krippendorff, 2004). Using 1,000 bootstrapped samples, the probability of failing to achieve a reliability of at least .67 was also calculated for each code, and p values less than or equal to .05 were considered acceptable. For codes that did not meet the desired threshold of interrater reliability, the coding team discussed their interpretations of the data and application of the code within the pilot transcripts. Based on these discussions, adjustments to the codebook were made to improve clarity and to account for previously unconsidered interpretations of data. For codes that required this second round of discussion (i.e., those that did not meet inter-rater reliability standards during the first round of pilot coding), two additional transcripts from the sample were then coded by all members of the coding team. After this second round of pilot coding, all codes reached suitable levels of inter-rater reliability; Krippendorff's α values and p values for each code are in Table 2. Following the establishment of inter-rater reliability, the full set of transcripts was coded for all codes in the codebook. Each transcript was coded by two members of the research team to ensure that multiple perspectives had an opportunity to be captured in the coding process, supporting the fairness of the process in supporting multiple plausible interpretations.

Upon completion of coding, results were then analyzed, by code, across all transcripts included in the study. During this portion of the analytic process, the research team held weekly meetings and engaged in peer debriefing to critically reflect on our coding and interpretative processes. Through this practice, the research team ensured that more than one perspective was brought to and respected in discussions around data analyses, supporting the fairness of the research process. It also supported the confirmability (Morrow, 2005) of the findings by reducing the likelihood that the biases or beliefs of a single researcher were guiding the interpretation more than the data provided by the participants. Finally, in the final stage of our analysis process, the research team was intentional in building upon individual participants' experiences to generate and describe the variability of experiences within identified themes across participants within the context of the STEM doctoral education system.

Results

Two overarching themes emerged from analysis of the participants' data: personal challenges (i.e., difficulties experienced outside of the academic setting) and advisor support (i.e., the degree to which participants perceived their advisors' actions as supportive). Below we delineate the five types of personal challenges endorsed by participants (RQ1) as well as advisor support received (RQ2), with emphasis on the ways these challenges and supports differ for students who completed their STEM doctoral degrees compared to those who discontinued prematurely (RQ3). In the remainder of the study, we use the designation CTC (chose to complete) for participants who completed their degree and the designation CTD (chose to discontinue) for those who left prior to completing their STEM degree programs.

Personal Challenges

Participants described experiencing five different types of personal challenges that presented varying degrees of barriers to their persistence in STEM doctoral programs. These included family challenges, romantic relationship difficulties, personal health issues, adjustment to U.S. culture, and pregnancy and childcare challenges.

Family Challenges

Nine participants (CTC = 4; CTD = 5) endorsed experiencing family difficulties during graduate school. These challenges included navigating illnesses, grieving the loss of a family member, navigating unsupportive parents, and balancing familial and personal demands.

As it pertained to illness and loss, Mya (CTC) discussed her father's bouts of illnesses by saying, "My dad got pretty sick, or severely sick several times between 2016 and 2018, where several times were spent in emergency surgeries." Similarly, Giselle (CTD) shared, "[My dad] had to have an emergency surgery in January . . . and had to get his intestines cut." Lola (CTC) described her mother's battle with cancer in her third year of graduate school and went on to describe the impact of losing her mother a year later. She stated, "She passed away my fourth year of grad school. So that's obviously a lot to deal with for anyone, let alone when you're in grad school." Angela (CTD) also described the loss of a close relative, "My uncle passed away, and he was someone that I was really close to, [someone] who raised me." Consistent with Lola's (CTC) sentiments, mourning the loss of a family member is very challenging and doing so while in graduate school is especially difficult. For Giselle (CTD), losing her mother was a wake-up call. She shared, "I think when I lost my mother, I think what I realized is how much I had neglected my personal life."

Participants also described the ways in which they found it difficult to balance family challenges with the demands of their doctoral programs. Mya (CTC) shared:

I'm definitely a support person for them in different ways. How do I support from afar, but also be physically present? Kind of balance that out, especially like during the holidays and things. Sometimes when he gets sick, I'm on edge, because I don't know . . . You know? Just never know when it's going to happen, and neither does he.

Angela (CTD) shared, "That was really hard for me, to feel like I wasn't a good enough daughter, I wasn't a good enough sister, I wasn't a good enough granddaughter, because I was neglecting my family." Giselle (CTD) described the psychological toll and regret that stemmed from such neglect. She stated:

And what bothered me was because of all this, excuse me, because of all this shit, I had neglected communicating with my mom, we didn't talk as much, and the day she passed away, the night before, I was so stressed out from just bullshit, and I said, "Mom I don't have time to talk. I'll talk to you some time." "Okay." I go to my class the next day, she passed away in her sleep. And at that moment . . . I was like, "This is not cutting it. This is not cutting it."

In addition to navigating family illnesses, loss, and neglect, participants described struggling with family members' unfamiliarity with the graduate school process. A number of the participants were the first in their family to pursue graduate education, which meant many family members were unfamiliar with graduate school

demands. Angela (CTD) shared, “No one in my family has been through a PhD program before, and they don’t understand the intricacies of those relationships and those assignments and responsibilities.” For some, this inability to understand graduate education manifested in hostility toward the graduate students. Kyla (CTC) experienced this hostility firsthand. She shared:

I consider myself basically estranged from my family. And that started around undergrad and grad, where I thought I was making them proud. I’d come back and find out that like, “Oh, they’re talking about me saying Kyla thinks she’s better than everyone else ‘cause she’s talking about embryos. Or like, “Oh, Kyla thinks she’s so cool.” I started hearing that, yeah. And so I felt super alienated.

An additional family challenge that exacerbated students’ distress was the pressure that came from not wanting to disappoint their families. Angela (CTD) shared concerns about how failing prevented her from leaving her PhD earlier. She stated:

I was afraid to fail. So, my thing is, my family has been such huge cheerleaders and everyone is so excited that I’m in this PhD program, and I’m at such a great school. I can’t let them down and tell them that I actually don’t know what I’m doing. Like I’m the one who has . . . Like I’m the one who always knows what she’s doing, and so there was just this image that I thought I needed to project of just like assuredness and intelligence. So, I couldn’t admit that I didn’t know. I felt like it was too late to admit that.

Giselle (CTD) shared similar worries by stating, “I just didn’t want to disappoint [them], because I was going to be the first one to have a PhD in the family. I was the only one in grad school from all my family.”

It is evident that WOC who chose to prematurely discontinue their doctoral degrees (CTD) encountered a myriad of family difficulties (e.g., feeling as though they were neglecting their family, the loss of loved ones, and the fear of not fulfilling their family’s expectations). The cumulative toll of these experiences often contributed to students’ decisions to discontinue.

Romantic Relationship Difficulties

Seven participants (CTC = 4; CTD = 3) reported difficulties in their romantic relationships that had the potential to impede degree progress. These difficulties were characterized by relationship break-ups, infidelity, maintaining long-distance relationships, balancing academic responsibilities with personal life, and caring for a partner with mental illness.

Several participants reported that romantic relationship difficulties arose due to challenges balancing academic and personal obligations. For example, Melia (CTC) reported difficulty balancing her upcoming wedding and honeymoon with studying for her comprehensive exams. She stated, “Trying to plan a wedding over the phone and then trying to see each other as much as possible . . . and then, of course you’re not going to get any work done when you are seeing or hanging out with that person.” She continued:

I ended up failing [comprehensive exam], and I realized because I failed that, I would have to take another [comprehensive exam] that was scheduled 1 week after I got back from our honeymoon because I didn’t expect myself to be taking comps for that long.

Tanja (CTC) also described the challenges of balancing her research obligations with caring for her partner with mental illness. She stated, “I can’t say much to my PI, I can’t say much to my lab mates. But they do know that I am on a schedule because I need to make certain that I’m home, perhaps at a certain time so he’s getting his meds.”

For many participants, romantic relationship difficulties occurred in conjunction with other life challenges. For example, Giselle (CTD) reported that infidelity in her romantic relationship exacerbated her already mounting distress. She said, “I was like, ‘Oh great. My mom died. My career is shit. I have not [progressed] on my project. And now my fiancé cheated on me.’”

Additionally, Nina (CTD) reported that her decision to discontinue her program was influenced by a variety of factors, including her recent engagement. She stated:

At the time, I was recently engaged . . . I wanted to get married and I wanted to buy a house, I wanted to start making money . . . I needed a change and I was just so depressed with school. All of that and then this conversation I had with my advisor. I was ready.

The cumulative impact of these challenges intensified participants’ distress and had the potential to interfere with degree completion.

Personal Health Issues

Eight participants (CTC = 4; CTD = 4) reported that personal health issues, either physical or psychological, served as barriers during their doctoral studies. For example, Mya (CTC) reported receiving a diagnosis during her doctoral program that had the potential to interfere with degree completion. She said:

I ended up getting shingles . . . I talked to the doctor, and they said that they saw it as a commonality for people who formerly had chicken pox but were experiencing stress. That was my first big challenge in that it was just learning to protect myself.

Similarly, Kyla (CTC) reported that her mental health concerns interfered with her ability to fulfill her academic obligations. She stated, “I was depressed. That actually is what pushed me into seeing a therapist there. I felt like I was dragging my bones to work. I had no motivation, or energy, or enthusiasm, or desire to do this.”

In several instances, personal health issues arose in conjunction with other challenges. For example, Giselle (CTD) reported that family and relationship challenges were detrimental to her mental health challenges. She stated:

First rotation happened, second rotation happened. My mom passed away. Third rotation happened. I join the third rotation lab. Partner cheated. I was still in that third rotation and I had to take a leave of absence, because I couldn’t deal with it. I had to take a break. I wasn’t sure if I wanted to leave the program, but I got to the point that if I had not left, I would have probably start considering suicide, just because it was overwhelming.

Personal health issues also had the potential to impact persistence in one’s doctoral studies. Four participants reported that mental health concerns contributed to their decision to discontinue their doctoral programs. Nina (CTD) stated, “I was depressed. I was ready for a change, I needed to get out of there.” Angela (CTD)’s personal

health issues were also a factor in her decision to discontinue her doctoral studies. She reported:

I acknowledged the pain that I was going through as bad pain. That was enough motivation for me to say, "Okay, I'm choosing myself at this point. I don't want to have these negative thoughts about myself. I don't want to feel this way about myself anymore." I associated my graduate experience with the feelings that I had about myself, so... that was enough justification for me to walk away without making me feel like I was quitting. It was me saving myself.

Regardless of the physical or psychological nature, personal health challenges had the potential to derail participants' academic progress.

Adjustment to U.S. Culture

Three participants (CTC = 1; CTD = 2) endorsed challenges related to international student status or adjustment to U.S. culture. These challenges were characterized by culture shock, language barriers, homesickness, and difficulties navigating U.S. culture. For example, Giselle (CTD) described wishing she had more experiences getting acclimated to the acculture. She shared "Looking back, I just needed probably a little bit more... perhaps a better way to assimilate [to] the change in culture, and language." Gloria (CTD) also disclosed experiencing anxiety about her accent as a teaching assistant. She shared, "... because English is my second language, I don't feel that confident speaking in English in a full classroom. Gloria (CTD) went on to attribute the difficulties she experienced while adjusting to the United States to the age that she moved to the United States. She noted:

I'm a first generation. I'm an immigrant, so I wasn't born here. I lived for almost 21 years in [my home country], and I moved here when I was obviously older, so maybe that's why the change took me a little bit more to assimilate and the language difference.

Rosa (CTC), on the other hand, described challenges related to adjustment to U.S. culture specifically around the challenges of receiving childcare and finding the necessary health care needed to support her pregnancy.

Pregnancy and Childcare Challenges

Two participants (CTC = 1; CTD = 1) experienced challenges related to pregnancy and childcare. Among these participants, pregnancy and childcare came up 23 times in the course of the interviews. One of the most salient aspects of pregnancy during graduate school was its impact on persistence decisions. Rosa (CTC) clearly articulated this when she said the following about her feelings after unexpectedly becoming pregnant during her first year in graduate school:

... I was like, I just have to finish my degree. It's just going to be it. ... but even though I had this idea, it wasn't grounded on solid ground. I think it could be easily shaken if I didn't get the right feedback ... When I told my mom, she's like, "Uh, well if you can't finish it, you can always finish over here." And I was like, "Why is she panicking?" Feeling of that panic made me more unsure, but something inside me was like, I just have to finish. I was afraid to get that feedback from my mentors because if they feel I can't do it, then maybe there's something I don't know, right?

Rosa (CTC) ultimately completed her degree and had two children during graduate school. The quote below describes her framing of research (and so persistence in her program) as an opportunity to be free of some of the moment-to-moment responsibilities of motherhood.

The lab is ... That's where I came to relax because home was all these babies and all the stuff and everyone needs me and then you need to feed them, and to change them and I have to cook and at lab I can be by myself. It was freeing. Nobody needs ... I don't need to change a diaper. If I don't like my e coli, I just bleach them. They're dead. Compared to motherhood, research was my get away. That's where I felt happy.

Vanessa (CTD) also expressed the influence of pregnancy on her persistence decisions. Before she was pregnant, she had already been considering leaving; in the quote below, she describes how getting pregnant influenced her final decision to leave.

I probably could have made it [continuing in the degree program] happen, but at that point it had just been too long. It had been too long. And I also ended up getting pregnant with my daughter, and I was just like, "I'm not about to try to figure this out with a baby, that's going to make it even longer." I just thought of all the things that would have to happen in a perfect scenario and what finishing would look like, and it was not appealing to me. So, I left.

Both participants also expressed challenges related to pregnancy and childcare in relation to the geographic location in which their PhD program was located. Vanessa (CTD) was the first Black PhD student in her program, and that program was located in a city with very few Black people, as evidenced by her description of her advisor as follows, "I don't think he knew how to talk to me. I don't think he had ever met a regular ass black girl in his life." With this context as a backdrop, Vanessa (CTD) describes her concern about raising her child in that same environment, underscoring how it related to her ultimate decision to leave her program.

I was like, I am not about to be fuckin' trying to raise a newborn in [university location] and my, well my partner, now husband lived about two and a half hours from there, so I would have been commuting, and it just, it wasn't going to be feasible.

In summary, the above findings demonstrated that personal challenges were a significant contributor to WOC choosing to discontinue their doctoral degrees in STEM. Within the SCCT framework, these challenges were contextual barriers capable of derailing WOC STEM persistence intentions. For many WOC, personal challenges were the "final straw" in their decision-making process. This was evident in the case of Giselle (CTD), who decided to discontinue after the sudden passing of her mom, as well as Nina (CTD) and Angela (CTD), who chose to leave after encountering mental health concerns, and Vanessa (CTD), who was protective of raising her unborn child in a predominantly White neighborhood with no family in close geographic proximity. Another noteworthy phenomenon is that decisions to discontinue one's doctoral pursuits were often precipitated by an accumulation of challenges versus spurred by any one challenge.

Advisor Support

The second of the two overarching themes that emerged from participants' responses was advisor support—the degree to which

participants perceived their advisors' actions regarding their personal challenge as supportive. This result is consistent with the SCCT (Lent et al., 1994) framing of this work, whereby support and coping has a longstanding history of countering the debilitating effects of negative encounters (Estrada et al., 2019; Primé et al., 2015; Wilkins-Yel, Simpson, et al., 2019). Advisor support consisted of four codes: whether the participants discussed their personal challenges with their advisor or not, and if they did, the type of support received (instrumental support vs. psychosocial support).

Did Not Discuss Personal Challenges With Advisor

Nine participants (CTC = 5; CTD = 4) indicated that they did not discuss at least one of their personal challenges with their academic advisors. Six of these participants reported that they chose not to discuss personal challenges with their advisors out of concern for possible negative consequences of doing so. For example, Mya (CTC) reported that she did not share challenges with her advisor because she did not want him to be disappointed. "I didn't want to bring these struggles [to my advisor] because I was like, 'Oh, I'm going to disappoint him. I don't want to disappoint him.' [So] I just kept it to myself." Similarly, Angela (CTD) reported concerns that she would be perceived as less competent if she were to discuss personal challenges with her advisor. She stated:

I felt like it would betray the confidence that I tried to project. If I admit to you that I'm insecure, then I'm vulnerable, and I didn't feel safe being vulnerable with them, all the time . . . I had been through all of these consequences, like, "Oh, they'll learn I'm a fraud, and then what'll I do?"

Other participants reported that they did not discuss personal concerns with their advisor because of previous unsupportive interactions. For example, Angela (CTD) reported that she did not seek support from her advisor after a negative interaction with another program staff member: "Because I didn't get a satisfactory response, I just decided that it wasn't worth talking to anyone else. That was how I dealt with it at the time." Gloria (CTD) shared a similar experience in which she was discouraged from discussing personal challenges with her advisor. She reported, "I just simply tried to avoid [sharing] any problems to the professors to whom I was taking classes, because I tried once and it didn't go well." These previous interactions led participants to feel that it was futile to discuss personal challenges with their advisors and therefore served as barriers to seeking support.

The decision not to discuss personal challenges with one's advisor was also influenced by participants' racial and gender identities. Nina (CTD) reported that she did not discuss personal challenges with her advisor due to communication barriers stemming from their different cultural backgrounds. She stated, "He wasn't that easy to talk to. We had a little bit of a language barrier. Every time we would meet, it was just not really personal, and so I just never felt very comfortable." Similarly, when asked if she felt that race or gender played a role in seeking support from her advisor, Vanessa (CTD) reported:

Yeah I do. I don't think he knew how to talk to me, I don't think he knew how to communicate with me or to connect with me. He was Chinese, and I learned later that all of his students had been Chinese also, so I just think that he was accustomed to communicating with people that were from the same place that he was from.

The lack of shared identities between participants and their advisors resulted in a sense of disconnection and presented barriers to students seeking support when personal challenges arose.

Did Discuss Personal Challenge With Advisor

Seven participants (CTC = 5; CTD = 2) stated that they discussed at least one of their personal challenges with their advisors. Note that the total number of students who chose to disclose personal challenges ($N = 7$) and those who did not ($N = 9$) is larger than the study sample ($N = 11$). This discrepancy stemmed from participants endorsing both options. That is, the same participant chose to disclose certain personal challenges to their advisors and not others, or they were initially hesitant to share but eventually disclosed at a later date. For example, Mya (CTC) shared that she was initially hesitant to discuss her personal challenges with her advisor. However, she noted that she started to "reevaluate his human characteristics" after his mother passed away and she had to provide support for his class.

Women who completed their degrees comprised the majority of participants who chose to disclose their personal challenges to their advisor, and only two CTDs chose to confide in their advisor about their personal challenges. Of those who discontinued their PhD programs, Angela (CTD) described feeling distrustful of the encouraging support from her advisor because of feeling as though he did not really know her or "know all the things going on with her." At the same time, she referenced feeling motivated by his humanizing response when she ultimately did open up to him. In the end, Angela (CTD) felt she waited until she was already thinking about leaving before opening up to her advisor, and now wondered if opening up sooner would have made a difference in her persistence. She stated, "But that was on me to actually put myself in that vulnerable position, and if I had [an] inkling of safety doing that, then I feel like it would have been . . . Things would have been different." Even Gloria (CTD), who ultimately ended up making the difficult decision to leave her program, felt that her advisor's response allowed her to evaluate what she wanted and if she truly found joy in the work she had been doing in her STEM PhD program.

Choosing to discuss a personal challenge with one's advisor often overlapped with participants' perceptions of how their race and gender were perceived in STEM spaces. For example, Mya (CTC) aptly discussed the challenges of being a WOC in STEM and ways many WOC have to question the extent to which their race and/or gender contributed to interpersonal interactions with others in STEM.

I think we as a people thought that at one point that color and race did not matter, until we woke up . . . and found out that all of a sudden that it does. The reality is that in academia, it always mattered. If you were a woman, and a woman of color, you were experiencing what the double bind is, it always mattered, because you felt it . . . sometimes, you couldn't tell if it was [because of] sexism, or if it was racism.

These results are consistent with the study's intersectional framework and highlights the added work of navigating both gendered and racialized encounters. Navigating these multiplicative encounters shaped who and how WOC spoke about their personal challenges in the STEM environment. For instance, Rosa (CTC) described feeling more comfortable going to female faculty members to discuss personal challenges related to pregnancy and

childcare. She noted that men were uncomfortable with the topic and women responded more emphatically and compassionately. She stated, "When it came to female faculty, they always came with understanding and an understanding that I would finish [my STEM PhD]. I tried [talking to] the male faculty, but they just couldn't . . . They showed too much fear." These experiences made it clear that support seeking greatly depended on the ability for advisors to respond compassionately and caringly.

Similarly, Melia (CTC) stated that when considering who she wanted as an advisor in the PhD program she took into consideration the fact that her male advisor had experience working with women. She could tell that he was committed to equity and inclusion within the program and was concerned with outreach initiatives. This seemed to give her a sense of comfort to work with that advisor, which may have also impacted her willingness to discuss personal challenges with him.

Instrumental Support

Six participants (CTC = 4; CTD = 2) described receiving instrumental support from their advisors. This support manifested in multiple ways, including promoting WOC's professional development, providing work/research accommodations and flexibility, and providing advocacy in response to challenging situations. Giselle (CTD), for example, described her advisor's interest in making sure she had opportunities to learn and to apply for available resources and professional development opportunities. She noted:

. . . if he heard of something, he would always say "Giselle, you should apply to this [opportunity]." He also encouraged all of us to kind of explore things and got a lot of money for [his students] to get experiences in bioinformatics, which is a field that a lot of, especially minorities . . . they need that type of people because they're not getting as many applicants with that background.

Advisors providing work flexibility and accommodations was another way in which advisors provided instrumental support. One example of this is when Mya's (CTC) advisor "allowed [her] to go home for 3 weeks and spend time with [her] family" after Mya (CTC)'s father became critically ill. Similarly, when Lola (CTC)'s mother become ill, her advisor encouraged her to "take as much time as [she] needed." Lola (CTC) "took about a month to go [home] and be there while [her mom] recovered from surgery." Other types of flexibility included setting meeting times that permitted women to meet their personal obligations. Tanja (CTC), for example shared that "[her PI and lab mates] do know that she is on a schedule because [she] needs to make certain that [she] is home at a certain time." Rosa's (CTC) advisor also provided tangible, supportive accommodations by sharing her office while she was on sabbatical. Rosa (CTC) stated:

One thing that my PI did, she went to do a sabbatical for a year and she let me use her office to pump because the lactation room was on a bridge between two high rise buildings in the middle of winter and it was freezing. So, I'm just like, I can't express any milk because it's freezing in this room. So, she just let me have her office . . . It was always helpful a lot.

Participants also reported instrumental support in the form of advocacy. For instance, Rosa (CTC) noted that her advisor supported and advocated for her in response to a difficult interpersonal

situation where a White female student in the lab started spreading rumors about the father of Rosa's unborn child. She shared:

Well, first I tried to ignore it. So, I was like, okay, well people are people. Not everyone has to like me and so I was fine. But then, I was a year into it, I was like, I've had enough. I was like, something has to be done. I did think . . . I was like, well. Let's sit down with some PIs and have a conversation to why you feel like you need to make these comments around me. But the PIs were like, No, no. We'll handle it. And I guess they talked to her and then she completely ignored me and didn't say anything else and that was fine.

It is important to note that among those who endorsed receiving interpersonal support, only two participants who chose to discontinue their STEM PhD were among those who described receiving such support. After being denied a fellowship for a reason that her advisor felt was inappropriate, Gloria (CTD) shared that her advisor responded by saying, "I'm going to share the reviews with the graduate coordinator and I want him to notice that this is wrong." Gloria (CTD) described feeling supported by her response and stated, "I know, of course, that I didn't get the fellowship, but that made me feel very supported, like she's doing something." When Gloria (CTD) was making the difficult decision to leave her PhD program in math, her advisor helped her think through possible alternative career plans. She stated, "[my advisor] started coming up with all these different ideas so that I didn't feel this fatalistic feeling of 'it's over.'"

Psychosocial Support

Seven participants (CTC = 4; CTD = 3) described experiencing psychosocial support from their advisors. Based on these participants' experiences, it was evident that their advisors' support started with care and understanding. Gloria (CTD) described the impact of this experience by saying, "She cares. I think that's a big point for me with her, that she cares, that she shows that she's there and she cares, which is something that I didn't see from any other professor." In varying degrees, all seven participants talked about the ways in which their advisors cared about their well-being, as well as their future success, both inside and outside of STEM.

This tendency to care for their advisees contributed to advisors engaging in perspective taking—the ability to see and understand another's experience. Both Melia (CTC) and Nina (CTD) described instances of being "seen." Meila (CTC) stated:

I know that he could see when I was really struggling and I think I tried to come to his office to quit multiple times, but he's never actually let me because I'll come in and be like, "Okay." I had all these things planned to say and he's like, "Okay. And so, what's the game plan for this? We're going to do this, and this, and this." By the end of the meeting, I'm like, "Wait. I didn't even get to say what I wanted to say." I'll walk out. I'm just like, "Okay. Well, I guess I have a game plan. I guess I have to follow through."

Nina (CTD) shared similar sentiments:

He could tell I was struggling. Even though I did not open up to him as much, I think he just could see that research wasn't for me and I was exhausted. I was there so long and still needed so much more time there. He understood.

For some advisors, perspective taking stemmed from navigating similar challenges to their advisees. For example, Lola's (CTC)

advisor had a similar experience of losing a parent. So, her advisor was empathetic to her needs as she mourned the loss of her mother. She shared:

My graduate advisor, the person whose lab I eventually ended up joining, his own father passed away the year or so prior to my mom getting sick. And so he actually had a lot of empathy and compassion, I think probably because he could relate . . . he was just really supportive and understanding of any time I needed to take.

This perspective taking translated to participants feeling understood. For Nina (CTD), being understood to this degree led to her feeling secure in her decision to discontinue her PhD program. She went on to share, “Just being understood and finally making a decision when I had so much doubt the whole time . . . just felt free.”

Advisors’ care and understanding often resulted in explicit communication of support as evidenced by their responses to students’ challenges. For Angela (CTD), her advisor’s response communicated the ways in which he saw her as a whole person, not just as a student.

I got to a breaking point, where ultimately, I had to open up and share, and one thing that really touched me about my advisor, was the fact that he . . . When I did finally open up that communication, it was just like . . . it was a big relief. . . Like he told me, “Family first.” He understands that you’re not just a grad student, you’re a person and you have needs, and you demand purpose, and that is a completely reasonable thing . . . [He] recognized my humanity and showed compassion when I opened up to him.

This support was not only conveyed by *what* was said, but also in *how* it was said. In Rosa’s (CTC) case, she found out during her second rotation that she was pregnant. Although this was unexpected, her advisor’s support reaffirmed her intentions to persist compared to other professors’ responses to her pregnancy.

. . . halfway through my second rotation, I got pregnant. Completely unexpected and so now I’m in a situation where it’s like, I have to tell people, this is really hard and so I told my boss . . . I went up to her and I was like, “I’m pregnant.” She’s like, “Congratulations.” And I think that was really big for me because first of all she congratulated me. She didn’t look at me like sad, like it’s going to be terrible and then the next thing she did is that she continued talking science with me. She says, it was perfectly normal thing for me to have a child. So, we never really even dwelled on it. She just said congratulations and then it was just assumed that I would continue. There wasn’t any negative feedback.

On the other hand, the way in which another professor expressed support was perceived as disingenuous. Rosa (CTC) shared:

I think it was [his] body language . . . he tensed up and he said the right words, but you could feel it was just uncomfortable. In contrast to my PI, when I told her, she gave me a hug. There’s an immediate difference in how . . . Even though the words, they’re right, the body language was off.

For women who decided to discontinue their STEM PhDs, they all noted receiving psychosocial support for their advisors around their decisions. For Gloria (CTD), her advisor—another Latina—saw the emotional toll that the particular STEM environment was taking on Gloria and suggested, from a place of care and concern, that she pursue her PhD at an alternative institution. It should be noted that these suggestions were made after her advisor had made

several attempts to advocate for systems-level changes on Gloria’s behalf. Gloria (CTD) shared:

She started giving me options, like “You know what? I noticed that the department has [broken] a lot of students before, I have seen it before. I don’t want that to happen to you, but you can just finish your master’s and we can get you [into] another program and we can keep working. I know that you can keep doing what you like, because you like doing research . . .” She started giving me all [these] kind of options to go if I decided, because I guess she noticed that what kept me hesitant about making [the] decision was like what I’m going to do next.

In summary, advisors’ psychosocial support was characterized by genuine care and concern for an advisee’s success, coupled with the capability to engage in perspective taking. This demonstration of care and engagement in perspective taking was explicitly communicated through words of affirmation, validation, and understanding. Overall, an advisor’s support (vs. the lack thereof) was especially helpful in navigating personal challenges.

Discussion

To date, extant efforts designed to address the underrepresentation of WOC in STEM have focused primarily on academic factors. However, such a singular approach renders invisible the challenges that exist beyond the walls of the institution. Countering this limited focus requires a 360-degree approach, with an emphasis on the student as a “whole person,” and an understanding that nonacademic factors can influence and exacerbate students’ decreased intentions to persist in STEM. The current study sought to understand the personal challenges experienced by WOC who chose to complete or discontinue their pursuit of STEM doctoral degrees. We also sought to understand the ways in which these personal challenges influenced STEM persistence, as well as the perceived related support (or lack thereof) WOC received from their STEM advisors.

The current study draws on intersectionality theory and the results highlight how the interlocking systems of power, privilege, and marginalization influence the experiences of WOC along both gendered and racialized lines. We also frame the work within SCCT (Lent et al., 1994), focusing on contextual barriers and support to characterize the relationship between personal challenges, advisor support, and STEM persistence. SCCT posits that environmental agents, defined as contextual barriers and support, exert a significant influence on career choice behavior (Lent et al., 1994). The results underscore the ways in which personal challenges, similar to academic challenges, present such contextual barriers to students’ intentions to persist in STEM.

Participants’ narratives highlighted the personal challenges both contributed to and exacerbated the difficulties experienced during graduate school. Of the five categories of personal challenges (family challenges, romantic relationship difficulties, personal health issues, adjustment to U.S. culture, and pregnancy and child-care challenges), those oriented to relationships with significant others, particularly family members, proved to be most frequently endorsed. Results indicated that participants who chose to discontinue their PhD pursuits reported encountering a greater number of family challenges. In fact, navigating family illnesses and loss and the resulting guilt of not being able to be with their families during these difficult times were salient factors in students’ decision-making process. These results are consistent with Ong et al. (2011), who

noted that “familial support can also be seen as a force that pulls women away from STEM” (p. 186). Though family challenges are not unique to WOC, the sociocultural context of many communities of color contribute to exacerbating the effect of these challenges. African and Latinx communities have long been known to value interconnectedness and collectivism (Sue et al., 2019). Examples of Latinx cultural values include *familismo* (i.e., commitment, dedication, and loyalty to family), *respeto* (i.e., respect), *confianza* (i.e., trust), and *personalismo* (i.e., a preference for warm yet formal relationships; Sue et al., 2019). Though these values are held by many within the community, they are also likely gendered and, as a result, affect WOC differently (e.g., expected to marry early and start a family; Rodriguez et al., 2019).

For some, family challenges were also influenced by participants’ intersecting identities as first-generation students. WOC who were also the first in their family to obtain a PhD had to contend with hostility from family members who were unfamiliar with the graduate school process. This is consistent with previous research that found that these difficulties were particularly salient for students from Chicana/Latinx backgrounds (e.g., Valenzuela, 2006). On the other hand, participants also described feeling pressured to continue their PhD programs, despite wanting to discontinue, because of the immense pride their families felt toward their academic achievements. So, the disappointment that would accompany decisions to discontinue their doctoral studies became a source of stress for some. These “push and pull” experiences were also consistent with the experiences of graduate WOC in Wilkins-Yel, Bernstein, et al. (2019), where one participant aptly stated, “If I fail, then I’m failing everyone” (p. 10). It is evident from these results that familial challenges were salient contributors to WOC’s STEM persistence intentions.

The results of this study also shed important light on the ways in which mental health contributed to WOC’s decisions to discontinue doctoral pursuits. Participants’ narratives highlighted the cumulative psychological toll that resulted from navigating multiple academic and personal stressors. Specifically, participants who decided to leave often referenced having reached their breaking point, which resulted in needing to leave their programs before the effects of the stress led to further psychological distress (e.g., considering suicide). These results come at a time when many are calling attention to the mental health “crisis” that is plaguing STEM graduate education (Evans et al., 2018; Levecque et al., 2017; Nagy et al., 2019; Nature, 2019; UC Berkeley Graduate Assembly, 2014). Not only does the accumulation of stressors, versus a single stressor, contribute to decisions to leave one’s program, the cumulative effect also seems to contribute to elevated psychological distress. Given the cumulative toll that these stressors exerted on students, each stressor provides a viable entry point for advisors, programs, and departments to support students. It is likely that early intervention and support at these crucial moments would mitigate the likelihood of these stressors becoming insurmountable, ultimately leading to the choice of discontinuing one’s program.

Consistent with the existing literature (Primé et al., 2015), instrumental and psychosocial advisor support played a salient role in buffering the impact of personal challenges on WOC’s STEM persistence. A salient factor that contributed to participants choosing to discuss these challenges was seeing and experiencing prior encounters where their advisors demonstrated care and concern for them as humans (i.e., whole-person approach) versus just

students (Gross et al., 2015; O’Meara et al., 2013). Advisors who demonstrated care and support often served as an antidote to offset potential program-altering decisions. This support manifested in both instrumental (i.e., active and direct acts of support toward academic and professional goals) and psychosocial or emotional forms of support (i.e., provision of encouragement, affirmation, and care). These results aligned with past research on psychosocial and instrumental support (Cabay et al., 2018; Lovitts, 2001; Primé et al., 2015; Sheehy, 2019). Additional factors that contributed to participant’s decision to discuss personal challenges included sharing similar identities (e.g., race, gender, cultural background) with their advisors or observing past instances where their advisors advocated for equity and inclusion. These results align with the SCCT (Lent et al., 1994) framework whereby contextual supports promote academic success and persistence.

Although some participants felt comfortable discussing personal challenges with their advisors, others shared considerable hesitation. Those who chose to discontinue their STEM pursuits were less likely to discuss personal challenges with their advisors. These participants described being met with unsupportive responses when they attempted to discuss personal challenges in the past. These unsupportive interactions then diminished the participants’ desires to put themselves in positions where they could be met with a similar response. Those who discontinued also referenced race and culture as a deciding factor as to why they did not discuss their personal challenges. Lastly, fear of negative consequences led to students deciding not to disclose their personal challenges. These results are unsurprising. Given their intersecting identities as both women and People of Color, WOC must often navigate a myriad of difficult experiences within STEM (Alexander & Hermann, 2016; Ong et al., 2011). It follows then that WOC would be less inclined to openly discuss personal challenges in an already unsupportive STEM environment. The likelihood of discussing these challenges may be further diminished when WOC have to work twice as hard to prove their legitimacy and credibility in environments that privilege the dominant white male culture. Opening up about their challenges may lead others to doubt WOC’s capability to succeed in STEM (McGee & Bentley, 2017).

Another aspect of the dominant culture that might deter students from openly discussing personal challenges is the stark personal and professional divide present in many STEM departments. For example, only 16% of graduate students in one of the largest chemistry programs nationwide endorsed feeling comfortable discussing mental health and other personal challenges with their advisors (Mousavi et al., 2018). These researchers noted that this low percentage highlights the stigma that accompanies discussions related to mental health and other personal challenges (Mousavi et al., 2018). These results are also consistent with Li et al. (2018), where one graduate woman stated her advisor tended to “run away” when confronted with difficult advisee challenges (e.g., personal challenges). This participant noted that this reaction made her concerns feel “illegitimate or unimportant.” It is likely that stark personal–professional divides among advisors are fueled by discomfort in handling certain personal challenges. Nonetheless, the results of the current study highlight the ways in which this divide and discomfort thwart advisors’ capabilities to offer support at crucial moments, which in turn deter efforts to broaden participation in STEM.

Limitations

The data collected here are retrospective in nature and reliant on participant recall. As a result, it is possible that the data are biased based on what participants remember from their doctoral experiences. Future research may utilize a longitudinal approach to data collection in an effort to study participants' experiences of stress and perceived support in real time. Additionally, this analysis considers the experiences of WOC collectively, rather than disaggregating their experiences. There are almost certainly some differences in the experiences of these groups of women that this study did not differentiate. Furthermore, this sample of WOC only consisted of Black, Latinx, and multiracial participants and does not include ethnic groups such as women of Asian American or Indigenous descent. Future research needs to include the voices of these WOC and may focus on understanding the distinct experiences of specific racial/ethnic groups of women in STEM.

Implications

Despite the noted limitations, the current study has several practical implications for faculty advisors in STEM. We focus on STEM faculty, particularly advisors, because advisors are stewards of the profession—they are among those most uniquely positioned to inform the type of culture present in a given STEM environment (Golde, 2005; Primé et al., 2015). Consequently, advisors are capable of promoting or discouraging advisees' willingness to openly discuss personal challenges. The results of this study shed light on several concrete steps advisors can implement to support graduate WOC. First, advisors are encouraged to adopt a "whole-person" approach (Gross et al., 2015). In doing so, advisors would recognize that advisees are more than just students; they come with intersecting privileged and marginalized identities, unique socio-cultural backgrounds, and individualized needs. A "whole-person" approach requires simple, yet powerful acts—including demonstrating care and understanding for the ways in which *both* personal and professional factors influence students' academic and professional success. Such an approach is even more salient for advisors working with students from marginalized backgrounds. As evidenced in the current study, WOC were more likely to discuss personal challenges with advisors who had a history of offering care and support or a track record of engagement in equity and inclusion efforts. Given the myriad of difficulties WOC encounter within STEM, advisors must enact tangible acts of care and support to counter feelings of hesitation students might experience because of past encounters.

In addition to adopting a "whole-person" approach, institutions can offer mentorship training that increases advisors' comfort and competency with dealing with difficult emotions and personal challenges (e.g., mental health). Both current and past research indicates that an advisors' hesitation or discomfort in discussing these topics can invalidate a student's concern (Mousavi et al., 2018; Li et al., 2018). Participants in the current study were less likely to seek out advisor support if they had had a prior unsupportive experience. Advisor discomfort may manifest in stark personal-professional boundaries that deter discussions outside of the professional realm. Mousavi et al. (2018) noted that rendering certain topics as "taboo" in STEM negatively affects student success in that students are unable to request the support they need. It follows then that broadening participation in STEM requires recognition of the

ways in which restrictive definitions of what is deemed a "professional topic" further marginalizes disenfranchised groups. In fact, it may be doubly difficult for members of marginalized groups to behave in ways that counter the established norms of professionalism (i.e., disclosing personal challenges) if they are already working to disprove stereotypes and biases regarding their capability and aptitude to succeed in STEM. It is for this reason that deciding to vulnerably disclose a personal challenge to an individual who holds a tremendous amount of power over one's professional success (i.e., an advisor), may be a significant risk, hence the necessity of approaches steeped in care and concern that view students as whole people.

Lastly, the results of the current study shed light on the toll that comes from navigating multiple stressors. Results indicated that the cumulative effect of personal challenges tended to weigh on students more heavily than a single specific stressor, which was a key contributor to students deciding to discontinue their PhDs. Inherent in this phenomenon is that each stressor presents an opportunity for advisors to offer support to students. These actions are likely to lessen the extent to which these stressors become insurmountable. Early intervention may also counter the likelihood of students waiting until they have reached their "breaking point" before openly discussing their personal challenge. As was evident in this study, graduate WOC were likely to continue seeking out support from advisors if they saw that they were responsive and understanding in past encounters.

Conclusion

The findings in this study demonstrate the clear impact that personal challenges can have on the experiences of WOC in STEM doctoral programs. Other studies have highlighted the ways in which academic challenges can negatively affect STEM persistence (e.g., Ong et al., 2011); the current study builds on these findings by demonstrating that personal challenges can also deter STEM persistence. Participants reported encountering five salient categories of personal challenges while pursuing their doctoral degrees: family challenges, romantic relationship difficulties, personal health issues, adjustment to U.S. culture, and pregnancy and childcare challenges. Despite recognition that the challenges were impacting their academic performance, participants reported not feeling comfortable disclosing their personal challenges to their advisors. Participants who ultimately discussed their personal challenges with their advisors, including those who ultimately chose to prematurely discontinue their programs, reported that both associated instrumental and psychosocial support were important in mitigating the negative impact of the stressors.

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