Differences in Perceptions of Stigma, Mentoring Support, and Achievement Potential between Stigmatized and Non-stigmatized Doctoral Students

by

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Abstract

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Despite increases in enrollment at the doctoral level, Ph.D. attainment among Black and Latino Americans continues to lag behind that of White Americans. A number of research questions were posed to address the relationships among academically stigmatized and non-stigmatized doctoral students' perceptions of stigma, their potential to complete the Ph.D., and their perceptions of mentoring and peer support as a way to explain this gap in Ph.D. achievement. Several significant relationships emerged. Importantly, perceptions of stigma and mentoring support did not interact in their effects on intention to complete the Ph.D. for stigmatized participants. In contrast, perceptions of mentoring support fully mediated the relationship between perceptions of stigma and intention to complete for non-stigmatized students. Differences between stigmatized and non-stigmatized doctoral students also emerged when the effects of peer support on achievement potential were examined, and when the effect of the interaction between mentoring support and peer support on achievement potential was examined. Overall the data showed that the experiences of academically stigmatized and non-stigmatized doctoral students are different, and that additional factors should be considered in order to fully explain the gap in Ph.D. attainment observed between the two groups.

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Minority women and men are underrepresented at every level of the academy from the undergraduates taking courses to the graduate students and faculty teaching them (Bowen & Bok, 1998; Bowen & Rudenstine, 1992; Woodrow Wilson National Fellowship Foundation, 2006). How Americans of color progress through this academic pipeline has been well examined, and has yielded many explanations for why degree attainment remains low among undergraduates of color (Bowen & Bok, 1998; Bowen & Rudenstine, 1992; Massey, Charles, Lundy, & Fischer, 2006) but few explanations for why doctoral students of color leak from the pipeline are available. The general purpose of the current dissertation is to explore one possible explanation for why Ph.D. completion among Americans of color remains low.

Why Study Doctoral Students of Color?

In general, Americans who hold the doctorate comprise just 1.1% of the total U.S. population 25 and older (i.e. those most likely to have earned a doctorate). Americans of color (i.e. all racial/ethnic minorities in the U.S.) make up only 0.21% of Americans who hold the doctorate, but comprise 28% of the total U.S. population 25 and older (United States Census Bureau, 2000; U.S. Department of Education, National Center for Education Statistics, 2005). This underrepresentation exists not only in science and technology fields, where Americans of color have been historically underrepresented, but throughout the academy in general (U.S. Department of Education, National Center for Education Statistics, 2005; Woodrow Wilson National Fellowship Foundation, 2006; Attiyeh, 1999; Bowen & Rudenstine, 1992; Nelson & Norman, 2005; Zwick, 1991). In 2005, Black and Hispanic/Latino Americans received 6.4% and 4.9%, respectively, of all doctorates earned by U.S. citizens at U.S. institutions. However, according to data from

the 2000 Census they each comprised approximately 12% of the general U.S. population (Grieco & Cassidy, 2001). In contrast, White Americans were slightly overrepresented, making up just over 75% of the general population but earning 79% of the doctorates earned in 2005 (Grieco & Cassidy, 2001; Hoffer et al., 2006). Asian Americans were also overrepresented among individuals receiving doctorates in 2005. Although they earned 5.6% of these degrees, they made up 3.6% of the total U.S. population (United States Census Bureau, 2000; U.S. Department of Education, National Center for Education Statistics, 2005)

Enrollment numbers offer further insight into the underrepresentation of Americans of color at the doctoral level. In 2002, Black and Hispanic/Latino students made up 8.8% and 6.4% respectively of all American doctoral students enrolled in U.S. institutions (U.S. Department of Education, National Center for Education Statistics, 2005) indicating a gap between enrollment and degree completion for these groups. This gap exists even though graduate enrollment increased 5% for Black Americans and 6% for Hispanic/Latino Americans during the period 1986 to 2005 (Brown, 2006). Contrastingly, White American students made up 69.2% of American doctoral students enrolled in U.S. institutions and showed no increases in enrollment during the period 1986 to 2005. Asian American students comprised 8.1% of U.S. citizens enrolled in U.S. institutions in 2002 and showed a 5% increase in enrollment during the period 1986 to 2005.

These data strongly suggest that despite increases in the overall *enrollment* of Americans of color in doctoral programs (Bowen & Rudenstine, 1992; Brown, 2006), their Ph.D. *attainment* continues to lag behind the Ph.D. attainment of White Americans.

This underrepresentation not only deprives society of diversity among its current doctorates, but also has the potential to impede the production of future doctorates of color. A recent study on the academic pipeline in psychology, for example, suggests that faculty diversity is critical to facilitating the recruitment, retention and degree completion of students of color at both the undergraduate and the graduate level (Maton, Kohout, Wicherski, Leary, & Vinokurov, 2006), a notion that applies to other fields. Moreover, a recent report by the Woodrow Wilson Foundation (2006) highlights the negative impact of the underrepresentation of doctoral students of color on the diversity of America's entire intellectual sphere. Understanding why Ph.D. attainment has not kept pace with the increases in enrollment observed among doctoral students of color is therefore a critical step toward increasing and maintaining diversity throughout the academic pipeline and across America's intellectual domains.

Why Study the Mentoring Relationships of Doctoral Students of Color?

Reasons why so few Americans of color complete doctoral study are still poorly understood but some researchers have suggested that as a result of their minority status, DSOC may receive insufficient mentoring support particularly at predominately white institutions (Bowman, Kite, Branscombe, & Williams, 1999; Cohen & Steele, 2002; Davidson & Foster-Johnson, 2001; Frierson, Hargrove, & Lewis, 1994; Hill, Castillo, Ngu, & Pepion, 1999; Moses, 1989; Ortiz-Walters & Gilson, 2005; Smith & Davidson, 1992). I examine this proposition here.

Predominately white institutions (PWI) are granted a spotlight because they are responsible for educating the majority of racial/ethnic minorities seeking a post-secondary degree. According to the U.S. Department of Education (U.S. Department of Education, National Center for Education Statistics, 2005), 80% of Black American, 79% of Hispanic/Latino American, and 96% of Asian American students attend a college or university where they make up less than 50% of the student body. Moreover, at the doctoral level, attending a minority serving institution may not be a viable option for all students. Among the 317 accredited doctoral granting institutions listed by the Carnegie Foundation for the Advancement of Teaching as offering degrees in a range of fields, only 32 are classified as minority serving institutions (MSI). Moreover, only 10 of these MSI have comprehensive degree offerings in science, technology, engineering, math, social science, the humanities, and the arts (Carnegie Foundation for the Advancement of Teaching, 2006). Because so many students of color attend PWI and/or may have little choice in what type of doctoral institution they attend, it is important to understand how

DSOC view the impact of their minority status on their mentoring relationships and how these perceptions shape their potential for degree completion.

DSOC's *perceptions* of their mentoring support is the focus here because even the strongest social-ecological and personality factors may be moderated by individual perceptions (Allport, 1979). Factors such as program structure and funding, mentors' attitudes and behavior, possible prejudice toward students of color, racial/ethnic composition and climate of doctoral program, general social support, personality, and stress and coping are all critical components of understanding the relationship between minority status, mentoring support, and degree completion (Attiyeh, 1999; Bair, 1999; Baird, 1996; Blackwell, 1983; de Valero, 2001; Lovitts, 2001; Lovitts & Nelson, 2000; Nerad & Cerny, 1991; Nerad & Miller, 1996; Nettles, 1990; Tinto, 1993; Weidman, Truale, & Stein, 2001; Zwick, 1991). However, the impact they have on students' experiences in a doctoral program is largely shaped by how students perceive and react to them. As it stems from interpersonal relationships, the extent to which mentoring support promotes degree completion particularly depends on students' own lived experiences of it. An analysis focused on students' perceptions may thus be the most appropriate approach to the investigation of the low Ph.D. completion rate observed among Americans of color.

This approach is consistent with the practice of examining stereotypes, prejudice, discrimination, and their consequences from the "target's perspective". This practice avoids marginalizing minority groups in psychological research while simultaneously attending to their unique perspectives and lived experiences (Swim & Stangor, 1998). In addition, this approach allows for a close interrogation of the assertion that minority

status (and by implication some deficit among students of color) leads DSOC to experience insufficient mentoring support that is so deeply imbedded in much of the relevant literature (Blake, 1999; Bowman et al., 1999; Cohen & Steele, 2002; Cohen, Steele, & Ross, 1999; Ellis, 2001; Frierson et al., 1994; Hill et al., 1999; Moses, 1989; Ortiz-Walters & Gilson, 2005; Smith & Davidson, 1992).

One goal of this dissertation is to test the hypothesis that minority status is associated with inadequate mentoring support in a theoretically grounded way. To this end, I designed a survey study based on the notion of social stigma (Crocker, Major, & Steele, 1998; Goffman, 1963; Jones, 1984; Major & O'Brien, 2005). Social stigma has been shown to disrupt both cross-race relationships and academic achievement (Aronson, 2002; Blascovich, Mendes, Hunter, & Lickel, 2000; Brown & Pinel, 2003; Cohen, Steele, & Ross, 1999; Crocker et. al., 1998; Hebl, Tickle, & Heatherton, 2000; Pinel, 1999). It may explain how minority status could interfere with the support DSOC perceived from their mentoring relationships. Another goal of the current study is to examine how perceptions of mentoring support affect the relationship between DSOC's perceptions of stigma and their potential for completing the Ph.D. To this end, I explore DSOC's perceptions of mentoring support as a potential mediator and examine several ways in which stigma might lead to low completion rates for DSOC.

I begin by discussing the positive outcomes associated with mentoring support, then examine how perceptions of and concerns about stigma might shape perceptions of mentoring support, giving close attention to the concepts of sensitivity to race-based rejection and stigma consciousness. Finally, I offer a conceptual model to explain how

perceptions of stigma might affect the achievement potential of DSOC and briefly explore the role of peer support.

It should be noted here that the discussion of mentoring and stigma in the following sections focuses largely on the experiences of Black and Latino American doctoral students. As cited earlier, along with Native American doctoral students, are underrepresented. In addition, the majority of studies on the impact of stigma on academic outcomes are conducted with Latino and Black Americans. This is not to exclude other minority groups, particularly Asian Americans. However, the fact that the stereotypes regarding the intellectual abilities and academic achievement of Asian Americans are very different from those leveled at Latino and Black Americans (Aronson & Steele, 2005; Cheryan & Bodenhausen, 2000; Kawai, 2005; Shih, Pittinsky, & Trahan, 2006; Steele, Spencer, & Aronson, 2002; Wu, 2002) and the fact that Asian American students are not underrepresented at the doctoral level (United States Census Bureau, 2000) must be carefully considered.

Positive Outcomes Associated with Mentors and Mentoring Support

A wealth of definitions for a "mentor" exist but I define it here as a more advanced scholar, typically a faculty member, who provides encouragement, academic and career guidance, and develops an emotional connection that is reciprocated by the student being mentored (Cusanovich & Gilliland, 1991; Green & Bauer, 1995; Noe, 1988; Tennenbaum, Crosby, & Gliner, 2001). Although mentors and advisors share many of the same functions and a student's advisor is often her or his mentor, the two roles are distinct. According to Cusanovich and Gilliland (1991):

> "Mentoring is distinct from advising because it becomes a personal relationship. It involves professors acting as close, trusted and experienced colleagues and guides. . . It recognizes that part of what is learned in graduate school is not cognitive; it is socialization to the values, norms, practices and attitudes of a discipline and university; it transforms the student into a colleague." (p. 1).

Mentors share a deep interpersonal relationship with their protégés that often continues beyond a student's degree completion and provide a number of benefits. They can show students "the ropes" of their specific department of study and larger academic field, help students navigate the formal and informal requirements of earning the Ph.D., and facilitate networking with other scholars. Such functions are typically categorized as "instrumental support".

Instrumental support from a mentor encompasses the socialization described above as well as role-modeling, providing academic guidance, and assisting with students' career development (Green & Bauer, 1995; Noe, 1988; Tennenbaum et al., 2001). Other potential functions filled by a mentor may be broadly defined as

psychosocial or social support. Social support from a mentor includes, but is not limited to, functions such as encouraging students to pursue their academic interests, helping students address academic and personal difficulties, and showing concern for a student's well-being and personal development (Davidson & Foster-Johnson, 2001; Noe, 1988; Tennenbaum et al., 2001). Both types of support can help students develop a sense of belonging in and satisfaction with their graduate programs and have been linked to high scholarly productivity (i.e., participation in research and professional activities) as well as students' intentions to complete the Ph.D. (Bair, 1999; Girves & Wemmerus, 1988; Golde, 2000; Lovitts, 2001; Maher et al., 2004). In addition, having a mentor has been long recognized in the literature as an important factor in Ph.D. completion, (Bair, 1999; Blackwell, 1983; Girves & Wemmerus, 1988; Lovitts, 2001; Weidman, Truale, & Stein, 2001). Despite this, few studies have closely examined the experiences of doctoral students. Those that have, however, demonstrate an array of positive outcomes associated with mentoring support.

Past researchers have found that doctoral students who report having mentoring support make more timely progress toward their degree and show greater scholarly productivity than do students without a mentor and that a relationship with a mentor is directly related to degree completion (Bair, 1999; Ellis, 2001; Girves & Wemmerus, 1988; Lovitts, 2001; Lovitts & Nelson, 2000; Maher et al., 2004). For example, a study conducted by Maher, Ford, and Thompson (2004) showed that participants who finished their degree in six years or less cited a positive working relationship with their mentor as a primary facilitating factor. Conversely, negative consequences have been found for those doctoral students who report poor mentoring support. Lovitts (2001) found that

doctoral students who reported a poor relationship with their mentor or advisor or had no mentor at all were also those most likely to show poor degree progress or to drop out of their programs of study altogether.

Mentoring and Race

Studies such as those of Lovitts (2001) and Maher et al. (2004) imply that mentoring is an important factor in the successful completion of doctoral study. However, little of the previous literature focuses specifically on DSOC. This is important because in addition to the interpersonal complexities typical of mentoring relationships, the mentoring relationships of DSOC may also involve concerns related to race and minority status (Bowman et al., 1999; Davidson & Foster-Johnson, 2001; Hill et al., 1999; Moses, 1989; Myers, 2002; Ortiz-Walter & Gilson, 2005; Smith & Davidson, 1992) which broader studies of mentoring may overlook. Some researchers have speculated that because of their minority status DSOC may not be mentored in the same numbers as their White peers and may perceive inadequate mentoring support when they are mentored (Bowman et al., 1999; Davidson & Foster-Johnson, 2001; Hill et al., 1999; Moses, 1989; Myers, 2002; Ortiz-Walters & Gilson, 2005; Smith & Davidson, 1992). For example, in a study of 182 African American graduate and professional students attending a predominately white institution, Smith and Davidson (1992) found that only one-third of participants reported having a mentor and an equal one-third reported having no substantial faculty support at all.

Although compelling, Smith and Davidson's (1992) findings are problematic. Their study was conducted with students from a single institution, included both Master's and doctoral students, and was primarily descriptive in nature. Additionally, in a mixed-

race sample of graduate students, Kelly and Schweitzer (1999) also found that approximately one-third of students reported having no mentor. Their data suggest that Smith and Davidson's (1992) finding that only one-third of graduate students of color report having a mentor may be normative for graduate students in general rather than an indication of the under-mentoring of graduate students of color. Kelly and Schweitzer's (1999) study, however, shares the same limitations as Smith and Davidson's (1992). Their sample was limited to a single institution and included both doctoral students and Master's students.

The lack of empirical data specifically on doctoral students (Bowen & Rudenstine, 1992; Nerad & Miller, 1996) and DSOC in particular, make it difficult to determine if Smith and Davidson's (1992) findings would generalize to DSOC at other universities. Given the importance of mentoring to doctoral study specifically, it seems unlikely that as many as one-third of doctoral students of color would report having no mentor. However, the sociocultural history of discrimination against and underrepresentation of Americans of color at the doctoral level and throughout the academy (Woodrow Wilson National Fellowship Foundation, 2006; Bowen & Bok, 1998; Bowen & Rudenstine, 1992; Brown, 2006; Hoffer et al., 2006; Nelson & Norman, 2005), as well as hegemonic institutional norms (Collins, 2000; Tierney, 1997) and stereotypes about the intellectual abilities of students of color (Aronson, 2002; Kawai, 2005; Steele, 1997; Steele et al., 2002), certainly lend credence to the idea that DSOC might *perceive* inadequate support from their mentoring relationships, particularly when these relationships form across racial lines. Race may play at least some role in determining whether or not DSOC find a mentor, who mentors them, and what support

they perceive from their mentoring relationships. Ortiz-Walters and Gilson (2005) found that DSOC working with mentors of color reported greater instrumental and social support from their mentors than did those working with White mentors. This finding is important because it raises the question of *how* and *why* mentor's race influences DSOC's perceptions of mentoring support. Ortiz-Walters and Gilson's (2005) study used a limited sample, however. They collected data only from doctoral students enrolled in business programs who were also members of a national association.

To fully explore how race may impact the mentoring relationships and degree completion of DSOC, the generalizability of Ortiz-Walter and Gilson's (2005) findings must be both confirmed and expanded. Confirming their findings is a challenging task because further empirical data on the mentoring relationships of doctoral students of color is limited. One way to gain a better sense of how generalizable their findings are is to examine similar studies in contexts outside the academy. Studies of the mentoring relationships of protégés of color conducted in corporate settings do not yield consistent findings, however. For example, Ensher and colleagues have found evidence that supports the finding that protégés of color with mentors of color perceive greater mentoring support than those working with White mentors, and evidence that refutes it. Ensher and Murphy (1997) found that protégés with a same race mentor reported greater instrumental support than their peers working with different race mentors did. In contrast, Ensher, Grant-Vallone, and Marelich (2002) found that being matched on race was not related to perceptions of mentoring support. Furthermore, neither study offers a strong theoretical explanation for *why* a relationship with a same race mentor might lead to greater perceived mentoring support than one with a different race mentor.

Another way to confirm the generalizability of Ortiz-Walters and Gilson's findings is to replicate them. This will both establish the generalizability of the finding that mentor's race can influence protégés' perceptions of mentoring support and confirm that the finding holds for participants in the current study. To this end I posit:

- *Hypothesis 1a: DSOC working with a mentor of color will report greater instrumental support from mentor than will those working with a White mentor.*
- *Hypothesis 1b: DSOC working with a mentor of color will report greater social support from mentor than will those working with a White mentor.*

Alone, these hypotheses simply attempt to replicate Ortiz-Walters and Gilson (2005). However, they provide a foundation for exploring the relationship between mentor's race and DSOC's perceptions of mentoring support. The following section begins the work of expanding past literature on the mentoring of DSOC and offers a more detailed discussion of how and why mentor race and students' perceptions of stigma may affect their perceptions of mentoring support.

Stigma and Perceptions of Mentoring Support

Although the definition has evolved somewhat since Goffman's (1963) seminal work, in general, stigma may be defined as a relationship between an attribute that is marked as negative in a particular social context and the stereotypes, assumptions, and normative expectations held about individuals who possess that attribute (Crocker et al., 1998; Goffman, 1963; Major & O'Brien, 2005). Stigma and the social construction of stigmatizing characteristics can lead to social interactions between individuals who belong to dominant and minority groups that are wrought with tension and anxiety, especially for members of the stigmatized group (Blascovich, Mendes, Hunter, & Lickel, 2000; Crocker et al., 1998; Frable, Blackstone, & Scherbaum, 1990; Hebl, Tickle, & Heatherton, 2000; Ickes, 1984; Jones, 1984; Major & O'Brien, 2005; Major, Spencer, Schmader, Wolfe, & Crocker, 1998; Miller & Major, 2000). In addition to anxiety during intergroup interactions, stigma has been associated with perceptions of threat that can disrupt the flow of intergroup interactions, reduce minority group members' enjoyment of these interactions, and lead them to avoid social interactions with outgroup members entirely (Blascovich et al., 2000; Hebl et al., 2000; Major & O'Brien, 2005; Miller & Major, 2000; Pinel, 2002).

Students' perceptions of their mentor's support may thus be largely influenced by how they perceive the impact of stigma on their outgroup relationships. Concerns about how stigma may shape their mentor's attitudes and behavior toward them may lead DSOC to experience uncertain and complicated mentoring dynamics particularly when they and their mentor do not belong to the same racial group (Cohen & Steele, 2002). Concerns about stigma may pose a special challenge to DSOC attending PWI. The

dearth of faculty of color means that, at some point, the majority of DSOC at these institutions will need to work with a White mentor regardless of their personal concerns. Moreover, they must do so in a setting that, because of its history of discrimination and exclusion, may heighten awareness of the stereotypes and prejudice often aimed at students of color (Blascovich et al., 2000; Crocker et al., 1998; Miller & Major, 2000; Moses, 1989; Pettigrew, 1998; Steele, 1997; Steele et al., 2002). It seems possible that DSOC's perceptions of their mentoring support as well how they experience their relationships with their mentors may be affected by their mentors' race. This raises the question: Do DSOC experience their mentoring relationships differently as a function of their mentor's race? Below I discuss several variables that are related to perceptions of stigma and can shape DSOC's experiences of their mentoring relationships as well as their perceptions of mentoring support.

Perceived Similarity, Compatibility and Interpersonal Comfort with Mentor

As suggested above, DSOC may experience greater support from mentors of color simply because they are more comfortable in these relationships. Some past research suggests that working with a mentor of the same race can lead to greater interpersonal comfort with mentor, as well as greater perceptions of compatibility and similarity with mentor, all of which promote perceptions of mentoring support. Turban, Dougherty and Lee (2002) found that *perceived similarity* significantly predicted the amount of support doctoral students reported from their mentors. Similarly, Lankau, Riordan, and Thomas (2005) found that perceived similarity significantly predicted protégés' reports of liking their mentors. These studies suggest that students perceive greater support from and enjoy their mentoring relationships more when they perceive commonalities in

personality characteristics as well as similarity in approaches to work, attitudes, and world-view with their mentors (Ensher et al., 2002; Ensher & Murphy, 1997; Lankau et al., 2005; Turban et al., 2002). Students may be most attracted to potential mentors and experience the most mentoring support, however, when they perceive their mentor as similar to self on visible traits, particularly race (Ensher et al., 2002).

DSOC may also experience greater *compatibility* with their mentors, defined here as a combination of satisfaction, liking, and working style, when working with mentors of color rather than with White mentors (Ensher et a., 2002; Ensher & Murphy, 1997; Turban et al., 2002). DSOC's level of *interpersonal comfort* with their mentors, defined as trust and willingness to share honest views and opinions, may also depend on the race of their mentor (Ortiz-Walters & Gilson, 2005). Past research has found that DSOC working with a mentor of color experienced greater interpersonal comfort with their mentors than did those working with a White mentor (Ortiz-Walters & Gilson, 2005).

As with other past findings on the mentoring of doctoral students of color, this literature may not generalize. Of the studies reviewed in the section, only Turban and colleagues (Turban et al., 2002) and Ortiz-Walters and Gilson (2005) conducted their studies with doctoral students. Hypotheses 2, 3, and 4 are therefore included to explore whether or not past findings on perceptions of similarity, compatibility, and interpersonal comfort generalize broadly to DSOC.

- *Hypothesis 2: DSOC working with a mentor of color will report greater perceived similarity to their mentors than will those working with a White mentor.*
- *Hypothesis 3: DSOC working with a mentor of color will report greater compatibility with their mentors than will those working with a White mentor.*

- *Hypothesis 4: DSOC working with a mentor of color will report greater interpersonal comfort with their mentor than will those working with a White mentor*

Perceived similarity, compatibility, and interpersonal comfort are positively correlated with perceptions of mentoring support and address some aspect of "fit" with mentor. The subtle distinctions between them allow for a full exploration of the subtleties of how race and stigma may influence perceptions of mentoring support. Perceived similarity captures aspects of the mentoring relationship that pertain to how well protégés feel they resemble their mentors; for example whether or not protégé and mentor share the same work style (Ensher et al., 2002; Lankau et al., 2005; Turban et al., 2002). In contrast, compatibility captures more affective features of the relationship such as how much the protégé likes her or his mentor (Ensher et a., 2002; Ensher & Murphy, 1997; Turban et al., 2002) and interpersonal comfort primarily addresses feelings of trust (Ortiz-Walters & Gilson, 2005).

Hypotheses 2, 3, and 4 are each necessary for three additional reasons. First, adding to the findings on perceived similarity, compatibility, and interpersonal comfort will expand the currently limited empirical data on the mentoring relationships of doctoral students. Second, testing these hypotheses will establish a pattern of results for perceived similarity, compatibility, and interpersonal comfort with this population. Third, similarity, compatibility, and interpersonal comfort could mediate the relationship between perceptions of stigma and mentoring support. Consequently, it is necessary to establish that findings on these constructs are reliable among DSOC. Because the variables are so conceptually similar, however, the correlations among them will be closely examined.

Intergroup Anxiety

Stephan and Stephan have coined the term *intergroup anxiety* to describe the feelings of anxiety that arise during social contact with outgroup members and have demonstrated that it can lead students of color to avoid intergroup relations (Stephan & Stephan, 1985; Stephan, Stephan, & Oskamp, 2000). Results from their study of Hispanic undergraduates showed that the greater participants' intergroup anxiety, the less contact they had with White students (Stephan & Stephan, 1985). Although the primary finding of this study is that intergroup anxiety can lead undergraduates of color to avoid interacting with their outgroup peers, it also has implications for cross-race mentoring relationships. If intergroup anxiety leads students to avoid all outgroup members, not just peers, then DSOC high in intergroup anxiety would perhaps feel reluctant to work with White mentors, and could perceive poor mentoring support if they do. As a result, only those with relatively low intergroup anxiety would form relationships with White mentors, suggesting hypothesis 5.

- *Hypothesis 5: DSOC working with a mentor of color will report greater intergroup anxiety than will those working with a White mentor.*

Intergroup anxiety is just one correlate of stigma identified from a rich history of research that has demonstrated that stigma can disrupt intergroup interactions in a myriad of ways (e.g., Farina, Holland, & Ring, 1966; Goffman, 1963; Jones, 1984; Word, Zanna, & Cooper, 1974). The majority of this past research has examined how stigma affects the behavior of members of the dominant group during mixed interactions. In contrast, more contemporary work takes the perspective of the minority group and suggests that intergroup interactions hold greater affective and cognitive consequences for minority group members than they do for members of the socially dominant group (Blascovich et

al., 2000; Major & O'Brien, 2005; Major & Schmader, 1998; Miller & Major, 2000; Shelton & Richeson, 2005; Shelton, Richeson, & Salvatore, 2005; Swim & Stangor, 1998). Studies of attributional ambiguity in particular illustrate one negative consequence that could be especially disruptive to DSOC's perceptions their mentors' support.

Discounting

Attributional ambiguity is a condition that arises when dominant and minority group members interact in a situation in which the former must evaluate the latter (Crocker, Voelkl, Testa, & Major, 1991; Major & Crocker, 1993; Major, Quinton, & McCoy, 2002; Major, Quinton, & Schmader, 2003). The "ambiguity" in question refers to the vague social dynamics characteristic of intergroup interactions. Members of stigmatized groups can rarely be certain of whether or not they will be the target of prejudice or discrimination (Blascovich et al., 2000) Evaluations received from members of the dominant social group could be earned or could be a reflection of their negative stereotypes about the minority group (Major & Crocker, 1993). As a matter of course, DSOC may react to the ambiguity inherent in the feedback received from White professors by *discounting* it; that is attributing the feedback to the professors' assumed bias rather than their own performance (Cohen & Steele, 2002).

Past studies have shown that discounting the negative feedback of a potentially biased evaluator is an adaptive coping strategy that protects self-esteem (Crocker & Major, 1989; Crocker et al., 1991; Major & Crocker, 1993; Major & O'Brien, 2005; Major et al., 2003). It has serious negative implications for cross-race mentoring relationships, however. Cohen, Steele, and Ross (1999) conducted a study in which

Black and White undergraduates received critical assessments of their writing from an evaluator they assumed to be White. They found that unless the criticism was buffered by an explanation that included both an expectation that the participant's future performance could improve and explicit assurance that the participant was fully capable of improving, Black students not only discounted the feedback but also experienced a decrease in task motivation.

Such discounting holds a particularly negative consequence for cross-race mentoring relationships. Much of a mentor's role involves critiquing, coaching, and providing advice. Mentoring support would thus be of limited benefit to students if they regarded their mentor's constructive criticism and recommendations with suspicion or rejected them outright. Nevertheless, the research of Cohen and colleagues suggest that when DSOC work with a White mentor, this would be a strong possibility (Cohen & Steele, 2002; Cohen, Steele, & Ross, 1999). Given their findings, I hypothesize the following:

- *Hypothesis 6: DSOC working with a mentor of color will report less discounting than will those working with a White mentor.*

Unlike perceived similarity, compatibility, and interpersonal comfort neither discounting nor intergroup anxiety are direct measures of fit with mentor. However, both variables help address the question of how DSOC's awareness of, and/or expectations for stigma might influence their perceptions of mentoring support. High levels of both discounting and intergroup anxiety could reduce perceptions of support from mentor, and in turn negatively impact degree completion. Thus, both variables might serve as mediators explaining how perceptions of stigma influence perceptions of mentoring support.

Race-Based Rejection Sensitivity and Stigma Consciousness

Like discounting, *sensitivity to race-based rejection* (RS-race) and *stigma consciousness* (SC) are products of the state of psychological threat imposed by stigma during intergroup interactions. Miller and Major (2000) explain:

> Membership in a stigmatized group can pose a variety of environmental demands on an individual…One is the ever-present possibility that the person will be a target of prejudice or discrimination. [Another] is awareness that others hold specific negative stereotypes about one's social identity. Stigmatized persons are often threatened by these stereotypes even if they give no credence to them (p. 244).

At the surface level, stigma consciousness represents a general awareness of stereotypes and of the demands they may pose. It stems from *concern* that minority status may lead to unfavorable treatment during interactions with members of a dominant or higher status group, and it may be experienced by anyone in any domain in which their group is typically stereotyped (Pinel, 1999, 2002). At the deep level of awareness, RS-race represents a more dispositional orientation toward the potential negative impact of stigma on social relationships. It leads to the chronic *anticipation* of discrimination and poor relational outcomes; its greatest effects are typically observed among those who exhibit the cognition at high levels (Mendoza-Denton et al., 2002). Among undergraduates of color attending PWI, both variables have been found to disrupt cross-race interpersonal relationships and have shown negative relationships with academic achievement (Brown & Lee, 2005; Mendoza-Denton et al., 2002; Mendoza-Denton, Pietrzak, & Downey, 2006b; Pinel, Warner, & Chua, 2005; Shelton et al., 2005).

Sensitivity to Race-Based Rejection

In its most general form, rejection sensitivity is the extent to which one anxiously expects to be rejected by socially significant others in a self-relevant domain. Downey and colleagues describe it as a "cognitive-affective processing dynamic" that leaves one vulnerable to perceiving rejection and having intense affective and behavioral reactions to perceived or actual rejection when they occur (Ayduk, Downey, Testa, Yen, & Shoda, 1999; Downey & Feldman, 1996; Mendoza-Denton et al., 2002). Past research has shown that rejection sensitivity which occurs in personal domains (RS-personal) can seriously undermine intimate relationships. Downey and Feldman (1996) found that individuals high in this form of rejection sensitivity also reported lower satisfaction with, and less security in their committed relationships than did their peers with lower RS-personal. In addition, a diary study of couples in serious relationships revealed that rejection sensitivity was a significant predictor of relationship conflict for women high in RS-personal (Ayduk et al., 1999). These women also perceived more rejection from their partners than did women with lower RS-personal and their likelihood of relationship conflict increased as a function of their perceived rejection (Ayduk et al, 1999, study 3).

Doctoral students' relationships with their faculty mentors are clearly different from those one would experience with a romantic partner. However, because the constructs are similar, the negative affective and behavioral consequences of high RS-personal are likely to generalize to RS-race. Indeed, Mendoza-Denton and colleagues (Mendoza-Denton et al., 2002; Mendoza-Denton, Page-Gould, & Pietrzak, 2006a) found that individuals high in RS-race reacted to perceived rejection in a manner similar to individuals high in RS-personal.

RS-race stems from the historic discrimination of and structural barriers against members of stigmatized groups. It arises when the anxious expectation and hypervigilance for rejection that characterize rejection sensitivity are triggered by interactions with members of a high-status or socially dominant group (Mendoza-Denton et al., 2002). Like RS-personal, high sensitivity to race-based rejection has a negative impact on interpersonal relationships. African American undergraduates with high levels of RS-race (i.e., those who score in the 75 percentile of the scale) perceived more negative experiences related to their race, reported greater feeling of alienation and rejection following such experiences, and showed less positive affect toward outgroup professors than did those with lower levels of RS-race (Mendoza-Denton et al., 2002). If high RS-race exerts similar effects on doctoral students of color, it could inhibit their perceptions of mentoring support, leading to hypotheses 7a and 7b.

- *Hypothesis 7a: RS-race will be negatively related to perceptions of instrumental support from mentor.*
- *Hypothesis 7b: RS-race will be negatively related to perceptions of social support from mentor.*

It is important to note that minority group members may come to expect rejection not only from individual members of the dominant group, but also from institutions affiliated with or controlled by that group (Mendoza-Denton et al., 2002; Mendoza-Denton et al., 2006a). As representatives of a specific doctoral program or the broader academic environment that DSOC may assume is biased against them, faculty of color could be suspected of evaluating students based on their minority status just as White faculty are. Consequently, the negative effects of RS-race could inhibit perceptions of mentoring support regardless of mentor's race. Different predictions are therefore not

made here for DSOC working with White mentors and those working with mentors of color. However, this issue will be explored in the results section.

Stigma Consciousness

Similar to research on sensitivity to race-based rejection, studies of stigma consciousness have shown that stigma can negatively impact interpersonal relationships between minority and dominant group members. Pinel (2005) describes stigma consciousness (SC) as "individual differences – either dispositional or situationally induced – in the extent to which targets of widespread stereotypes focus on their stereotyped status and believe it pervades their life experiences" (p. 482). Studies of SC show that, as with RS-race, the higher an individual's level of SC the less likely she or he is to interact with outgroup members and the less likely she or he is to have positive relationships with outgroup members when intergroup interactions do occur (Pinel, 1999, 2002, 2004). Pinel (2002) asked female undergraduates to complete a decision making task with a non-romantic male partner and found that women with high levels of SC rated their male task partners less favorably. Furthermore, these women perceived less compatibility with their male task partners than did women with lower levels of SC. Studies have also found that the higher participants' level of SC was, the more likely they were to hold negative beliefs about members of the dominant group in general and to avoid situations in which they could be stereotyped by them (Pinel, 1999, 2004).

Although many SC studies have focused on gender, past findings show that it may be experienced by members of any group (Brown & Lee, 2005; Pinel, 1999; Pinel et al., 2005). For example, Shelton and colleagues (Shelton et al., 2005) found that among students of color with White roommates, the higher participants' level of SC, the more

negative affect they experienced when interacting with their roommate. In addition, while different groups have different subjective experiences of their stigmatized status, behavioral manifestations of SC seem to be common across groups (Pinel, 1999). Thus like RS-race, SC could reduce the support DSOC perceive from their mentors, giving rise to hypotheses 7c and 7d.

- *Hypothesis 7c: SC will be negatively related to instrumental support from mentor.*
- *Hypothesis 7d: SC will be negatively related to social support from mentor.*

It should be noted that SC is not posited to extend to institutions and their surrogates at large in the way that RS-race is. However, because the constructs are similar, I predict that SC could also impact relationships with individuals and institutions seen as associated with the dominant group. Thus, no separate predictions for those DSOC working with White mentors and those working with mentors of color are offered here.

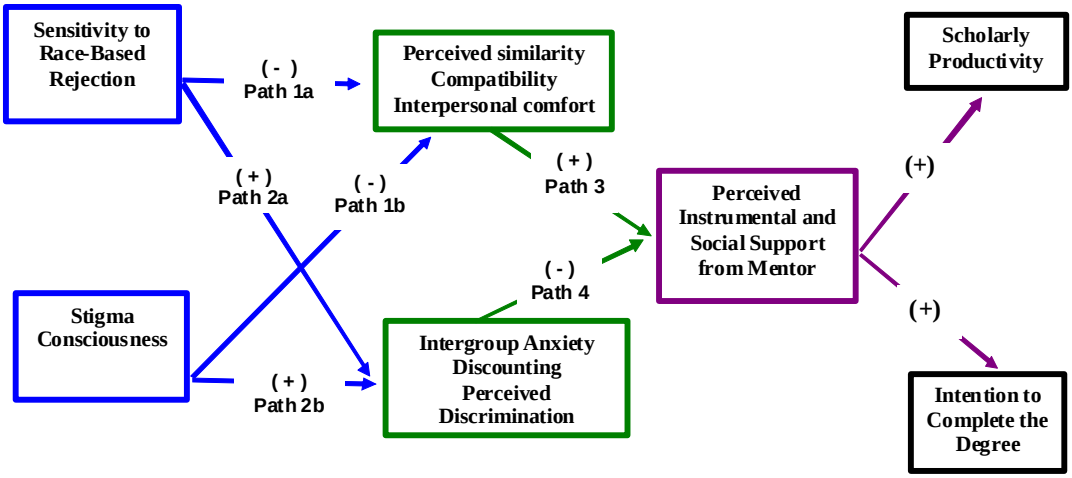
It should be further noted that much of the literature on RS-race and SC suggests that how DSOC perceive the potential for stigma in their doctoral programs in general, and not just their relationship with their mentors, might influence their perceptions of mentoring support. Past literature shows that both RS-race and SC are positively related to perceived discrimination (Mendoza-Denton, 2002; Pinel, 2002; Shelton, 2005), but negatively related to positive perceptions of outgroup relationships (Shelton, 2005). Past research has also found that graduate students of color (M.A. and Ph.D.) who report having a mentor perceive less discrimination in their departments of study than those who do not have a mentor (Kelly and Schweitzer, 1999). Thus, perceptions of discrimination may mediate the relationship between DSOC perceptions of stigma and

their perceptions of mentoring support. RS-race and SC may lead to greater perceptions of discrimination, which in turn may lead to lower perceptions of mentoring support.

Potential Indirect Effects of RS-race and SC

Broadly, the above literature suggests that perceptions of mentoring support may mediate the relationship between perceptions of stigma and DSOC's potential for Ph.D. completion. Perceptions of stigma depress the support and fit DSOC perceive from their mentors which in turn reduces their achievement potential. More specifically, sensitivity to race-based rejection and stigma consciousness may reduce perceptions of mentoring support through a number of mediated relationships. Perceived similarity to mentor, compatibility with mentor, interpersonal comfort with mentor, intergroup anxiety, discounting, and perceived discrimination could all function as mediators of the relationship between RS-race, SC and perceived mentoring support, further explaining how RS-race and SC depress potential to complete the Ph.D. Figure 1 shows this conceptual model.

Figure 1. Conceptual model of factors affecting the relationship between stigma, mentoring and academic outcomes for DSOC.



Perceived similarity and compatibility with mentor may mediate the effects of RS-race and SC on perceived mentoring support. Because they lead to the anticipation of poor relationships, high levels of RS-race and SC could reduce the degree to which DSOC perceive themselves as similar to their mentors, in turn reducing perceived mentoring support. Given the relevant literature on these topics (Ensher et al., 2002; Ensher & Murphy, 1997; Lankau et al., 2005; Turban et al., 2002) and Pinel's (2002) finding that high levels of SC lead to low levels of perceived compatibility with dominant group members, it seems possible that both perceived similarity and compatibility with mentor could mediate the negative relationship between SC and perceived mentoring support. Similarly these variables might also mediate the proposed negative relationship between RS-race and mentoring support. Findings on interpersonal comfort suggest that it too might mediate the proposed negative relationship between perceived mentoring support and SC and RS-race, respectively. Paths 1 and 3 on figure 1 show these relationships.

Because all three factors are triggered by stigma-related threat, it seems logical that intergroup anxiety could mediate the proposed negative effects of RS-race and SC on perceived mentoring support. Discounting is likewise of interest as a secondary mediator. Mendoza-Denton and colleagues (Mendoza-Denton et al., 2002) found that Black students high in RS-race did not seek academic help as often as their low RS-race peers. This finding suggests that discounting may be at work. Discounting may make it difficult to recognize and receive constructive criticism from outgroup mentors (Cohen et al., 1999); it should also have the potential to reduce help seeking behavior. It follows that discounting may bolster the effects of RS-race as well as SC. In the case of both discounting and intergroup anxiety; RS-race and SC may lead to higher levels of these variables, which in turn might negatively affect perceived mentoring support. These relationships are shown by paths 2 and 4 on figure 1.

Perceived support from mentor may itself act as a mediator, explaining how RS-race and SC depress scholarly productivity and intention to complete the degree (i.e. achievement potential). As noted above, high levels of RS-race and SC may lead to reduced perceptions of instrumental and social support from mentor, which in turn may reduce scholarly productivity and impede intentions to complete the Ph.D. The finding that RS-race has the potential to reduce achievement by reducing help-seeking behavior (Mendoza-Denton et al., 2002) supports this idea, as do studies of SC that have found that it is significantly and negatively related to achievement (Brown & Lee, 2005; Pinel et al., 2005). For example, Brown and Lee (2005) found a significant negative relationship between level of SC and grade point average. In addition, some evidence suggests that in psychologically threatening environments, such as a predominately white institution,

students of color may experience an increase in SC over time, as well as a comparable decrease in academic achievement (Pinel et al., 2005). Thus, RS-race and SC may depress achievement potential by reducing perceptions of instrumental and social support from mentor that in turn reduces intention to complete the degree and scholarly productivity. This relationship is important because it suggests how perceptions of stigma might lead to the relatively low Ph.D. completion numbers observed for Americans of color.

The formal hypotheses for this section (hypotheses 8 – 16) are summarized in Appendix A. They are included for the sake of fully exploring and understanding the relationships among the variables discussed above, which to some degree all tap DSOC's lived experiences of stigma and perceptions of their mentoring relationships. Essentially, these hypotheses explore how stigma might affect DSOC's perceptions of their mentoring relationships, and investigate whether perceptions of mentoring support might mediate the relationship between perceptions of stigma and achievement potential.

Peer Relationships and Perceptions of Stigma

Mentoring relationships are not the only interpersonal relationships that facilitate the productivity and degree completion of doctoral students. Peer relationships also play an important role (Lovitts, 2001; Weidman et al., 2001). Like mentoring relationships, cooperative peer relationships help doctoral students make sense of their program's culture and norms as well as manage formal requirements like coursework and qualifying exams (Lovitts, 2001; Wiedman, Truale, & Stein, 2001). Positive interpersonal relationships with fellow doctoral students can also create a sense of camaraderie, belonging, and a non-competitive scholarly environment, as well as help reduce school-related stress (Grant-Vallone & Ensher, 2000; Miller & Irby, 1999; Ulku-Steiner, Kurtz-Costes, & Kinlaw, 2000; Weidman et al., 2001). Moreover, past studies have shown that peer relationships are an additional source of social and instrumental support that may promote achievement (Allen, McManus, & Russell, 1999; Grant-Vallone & Ensher, 2000; Weidman & Stein, 2003; Weidman et al., 2001). For example, Weidman and Stein (2003) found that interactions with peers correlated positively, albeit not significantly, with scholarly productivity. Among the sparse research on peer support in doctoral programs few studies make explicit distinctions between instrumental and social support. Thus, I do not distinguish between them here.

Also similar to mentoring relationships, DSOC's peer relationship may be negatively affected by perceptions of stigma. Stewart and Dottolo (2006) found that in order to cope with perceived prejudice and discrimination in their programs of study DSOC limited their interactions with their White classmates. Furthermore, among undergraduates of color, high levels of RS-race and SC have been associated with less

positive affect toward, and fewer relationships with White peers (Mendoza-Denton et al., 2002; Shelton et al., 2005). Such findings strongly suggest that perceptions of stigma in general, and RS-race and SC in particular, may lead DSOC to avoid relationships with White peers, and to have poor relationships with them when they do occur.

This past research raises two questions regarding the role of peer support in the experiences of DSOC; (1) Does peer support have the same positive relationship with achievement potential as mentoring support? (2) Do DSOC's perceptions of their peer support vary by the race of their peers? To explore these questions I posit:

- *Hypothesis 17: Peer support will be positively related to scholarly productivity.*
- *Hypothesis 18: DSOC will report greater support from peers of color than from White peers.*

These questions also address the broader issue of whether the peer support of DSOC functions in a manner parallel to the proposed role of their mentoring support, and gives rise to a third question; (3) Does peer support mediate the relationship between perceptions of stigma and scholarly productivity?

Although limiting relationships with White peers may present a necessary and effective coping strategy for dealing with perceptions of stigma in one's doctoral program, it can be problematic for DSOC attending predominately white institutions. In doctoral programs, peers assist each other in scholarly activities that are often discipline-specific such as preparing for qualifying exams and completing research papers and projects. Consequently, the peers in the best position to be supportive are those in one's own program of study. However, the low representation of students of color at the doctoral level (U.S. Department of Education, National Center for Education Statistics,

2005) means that few DSOC are likely to have a critical mass of students of color present in their own doctoral program, or even in their general area of study. Some DSOC may successfully connect with DSOC in other programs of study and/or at other institutions. However the numerical reality is that for the majority of DSOC attending PWI, seeking peer support exclusively from other DSOC may be not only impractical, but also detrimental to their scholarly productivity.

Perceptions of stigma could lead to reduced support from White peers, which may in turn depress scholarly productivity. Suggesting hypothesis 19:

- *Hypothesis 19*: *The proposed negative relationship between perceptions of stigma and scholarly productivity will be mediated by peer support*.

This is not to suggest that DSOC cannot be successful without the support of their White classmates. However, it is possible that seeking peer support primarily from other doctoral students of color could make the path to the Ph.D. more challenging to travel for some than for others.

Method

Participants

Participants were asked to complete an online survey. The survey was open for data collection from mid-May to late-September, during this time 379 doctoral students responded to it. Of these, 86 survey respondents were eliminated because they self-identified as international students or as a member of more than one racial/ethnic group, leaving 293 students in the final sample. Participants ranged in age from 21 to 56 (M = 30.2, SD = 7.1). With regard to area of study, 43.0% reported that their area of study was social science, 22.2% reported that it was physical or life science, 20.8% reported that they were pursuing their degree in the humanities, and 13.6% reported they were pursuing it in math or engineering. Half of participants, 50.2%, reported that they were currently working on their dissertation, 17.1% reported that they had completed their course work, but not yet proposed their dissertation, and 32.4% reported that they were in their first year of doctoral study.

Just over two-thirds of the sample, 67.9%, was female. Consistent with national averages, White American students made up the largest racial/ethnic group comprising 73.7% of the sample. Black/African American students made up the second largest group comprising 11.4% of the sample. Despite over-sampling among graduate students of color, Asian American students made up only 3.6% of the sample, much below the national average for this group (U.S. Department of Education National Center for Education Statistics, 2005). The remaining participants were distributed across Hispanic/Latino American students and Native American students (See Table 1).

Table 1. Racial/ethnic composition of sample compared to national enrollment for doctoral students.

Group	N	% Participants	% National enrollment [a]
African/Black American	33	11.4	8.8
Asian American	10	3.6	8.1
Hispanic/ Latino American	21	8.1	6.4
Native American	4	2.3	0.7
White American	225	73.7	69.2
Total	293		

[a] Source: U.S. Department of Education, National Center for Education Statistics (2005).

Recruitment and Procedure

Participants were recruited by distributing the online survey to 26 accredited doctoral-granting institutions across the United States. These institutions were randomly selected from a list compiled from the Carnegie Foundation for the Advancement of Teaching (Carnegie Foundation for the Advancement of Teaching, 2006) and all 26 were classified as predominately white institutions. Seven schools were selected from states in the Northeast, eight schools from states in the Midwest, eight schools from states in the Southeast, and three schools from states on the West coast.

At each school, I contacted the head representative, generally a president, vice-president, or secretary of the "Graduate Student Council" or the equivalent student organization by email, and asked that a link to the survey be distributed to its members. I provided the representative who responded to my request with a brief message explaining the study as well as a link to the survey.

Because sufficient participation among students of color was a concern, additional steps were taken to over-sample them. At each institution included in the study, head

representatives from any organization that specifically targeted the needs of graduate and professional students of color were separately contacted and asked to distribute the survey among their members in the same way that representatives of the general graduate student organizations were. The majority of these organizations targeted graduate students of color in general or African/Black American students specifically (e.g., Black Graduate Student Association, Graduate Students of Color Network). Across the 26 institutions, at least one organization targeting the needs of each major racial/ethnic group included in the study was contacted (e.g., American Indian Graduate Student Association, Asian Pacific American Caucus for Graduate and Professional Students, Chicano Graduate Student Colectiva).

The link to the survey's website was distributed to the graduate student population at each of the randomly selected institutions by the means deemed most appropriate by the contact handling my request. At 20 of the institutions the survey link was distributed by email. At 3 schools the link was posted to the graduate student organization's website. At the final 3 schools the link was posted to a graduate student listserv.

Once students received a link to the survey they were free to complete it in their own time. Students were asked to complete 13 measures related to the study hypotheses as well as a set of general demographic questions.

Survey Measures

The major constructs of interest included in the survey were perceived mentoring support, perceived similarity to mentor, interpersonal comfort with mentor, compatibility with mentor, intergroup anxiety, discounting, sensitivity to race-based rejection (RS-race), stigma consciousness (SC), scholarly productivity, intention to complete the degree and perceptions of race-based discrimination (perceived discrimination). The survey also included two measures of peer support. Detailed descriptions of each of these constructs are provided below and the specific measures used for each are provided in Appendix B.

Perceived mentoring support. A 19-item "mentoring functions scale" taken directly from Tennebaum, Crosby, and Gliner (2001) was used to assess the amount of social support and instrumental support participants perceived from their mentors. Participants were asked to rate the extent to which they felt their mentors fulfilled instrumental support functions (e.g., To what extent has your mentor helped you improve your writing skills?), social support functions (e.g., To what extent has your mentor served as a role model?), and networking functions (e.g., To what extent has your mentor helped you meet other people in your field at the University?) using a 5-point scale (1 = not at all, 5 = to a very large extent). Tennenbaum et al. (2001) defined instrumental support and social support as they have been used throughout the current study; the degree to which mentors provided career and psycho-emotional help and guidance, respectively. Networking functions were defined as the degree to which mentors "helped students make connections within the field" (p. 332). These three subscales were submitted to a factor analysis. The results of this analysis and the resulting scales are discussed in detail in the Results section.

Perceived similarity, compatibility, and interpersonal comfort with mentor. The measures of perceived similarity, compatibility, and interpersonal comfort with mentor were constructed by selecting relevant items from scales used in a number of past studies on mentoring (Ensher et al., 2002; Ensher & Murphy, 1997; Ortiz-Walters & Gilson, 2005; Tennebaum et al., 2001). Participants responded to all three measures using the same 6-point scale (1 = strongly disagree, 6 = strongly agree).

The measure of perceived similarity to mentor was drawn from items used in two studies of the effect of perceived similarity on mentoring relationships conducted by Ensher and colleagues (Ensher et al., 2002; Ensher & Murphy, 1997). It consisted of 7 items (e.g., My mentor and I analyze problems in a similar way) and showed high reliability within the present dataset ($\alpha = .88$). The interpersonal comfort scale was taken directly from Ortiz-Walters and Gilson's (2005) study of the mentoring relationships of doctoral students of color. This measure also consisted of 7 items (e.g., I feel I can discuss personal issues with my mentor) and showed strong reliability ($\alpha = .93$).

The measure of compatibility with mentor had 9 items. These items were selected from scales used by Ensher, Grant-Vallone, and Marelich (2002) and Tennenbaum et al. (2001). Compatibility was defined as the degree to which participants felt they were satisfied with their mentor (e.g., My mentor meets my expectations), how much they liked their mentor (e.g., I enjoy spending time with my mentor), and how effective they felt their working relationship with their mentor was (e.g., I can resolve disagreements with my advisor). The four items measuring satisfaction and three items measuring liking of mentor were drawn from Ensher et al. (2002). The two items that addressed working relationship with mentor were taken from Tennenbaum et al. (2001). Despite

the fact that the items were drawn from separate studies and were not intended to measure a single construct, this measure showed a reliability of .94 within the current dataset.

Intergroup anxiety. Stephan and Stephan's (1985) original scale was employed as the measure of intergroup anxiety. This 11-item questionnaire required participants to rate the degree of various negative emotions they might experience during contact with outgroup members (e.g., I would feel awkward) on a 10-point scale (1 = not all, 10 = to a very large extent). The scale showed an alpha coefficient of .90 within the current dataset.

Discounting. The discounting scale was adapted from Major and Schmader's (1998) measure, which asks participants to rate how fairly evaluated they feel in their academic domains. Because the original scale was intended for use with undergraduates, some items were slightly re-worded to be more relevant to the evaluative experiences of graduate students (e.g., I feel that the academic requirements in my department are a good measure of my competence as a graduate student). Participants responded to the 4 items on the measure using a 7-point scale (1 = strongly disagree, 7 = strongly agree), and the reliability obtained for this measure was moderate ($\alpha = .75$).

Sensitivity to race-based rejection. The RS-race measure was taken directly from Mendoza-Denton and colleagues' (2002) original 12-item scale. Four items were removed from the original scale due to concern that they might be relevant to populations only in specific geographic setting (i.e., urban, rural, suburban), leaving an 8-item measure. These four items were: (1) It's late at night and you are driving down a country road you're not familiar with. Luckily, there is a 24-hour 7-11 just ahead, so

you stop there and head up to the counter to ask the young woman for directions. (2) Imagine you are riding the bus one day. The bus is full except for two seats, one of which is next to you. As the bus comes to the next stop, you notice a woman getting on the bus. (3) Imagine you are driving down the street and there is a police barricade just ahead. The police are randomly pulling people over to check drivers' licenses and registrations. (4) Imagine you are at a pay phone on a street corner. You have to make a call, but you don't have change. You decide to go into a store and ask for change for your bill. In addition, one item, "Imagine that a new assistant dean is selecting graduate students for a scholarship fund that you really want. He has only one scholarship left and you are one of several students that are eligible for this scholarship", was slightly re-worded to be more relevant to graduate student experiences.

For each item, participants were required to evaluate a scenario in which they might be judged negatively (see example above). After reading the scenario, participants rated how concerned they would be that a negative outcome might occur due to their race (e.g., How concerned would you be that the dean would not pick you because of your race?) on a 6-point scale (1= not at all concerned, 6 = very concerned) and the likelihood that the outcome would be due to their race (e.g., How likely do you think it would be that the dean would not select you because of your race?) also on a 6-point scale (1 = not at all likely, 6 = very likely). Using the procedure outlined in Mendoza-Denton et al. (2002), for each item, participants' responses to the concern and likelihood questions were multiplied and the average product score across items was used as the RS-race measure. This shortened version of the RS-race scale showed an alpha coefficient of .89 within the current dataset.

Stigma consciousness. The stigma consciousness measure was taken directly from Pinel's (1999) scale. Items on the scale were worded to be relevant to participants from any racial/ethnic group (e.g., Most people outside my group have a lot more prejudiced thoughts than they actually express), rather than some specific ingroup. Participants responded using a 6-point scale (1 = strongly disagree, 6 = strongly agree). Consistent with Pinel's (1999) original measure, the alpha coefficient obtained for the scale was moderate ($\alpha = .73$).

Perceptions of race-related discrimination. A measure of participants' perceptions of race-related discrimination in their doctoral programs was also included in the survey. This 9-item scale was drawn from a past survey of graduate student experiences conducted at a large research institution (Schweitzer & Brookover, 1995). Participants were required to rate their feelings about various aspects of the racial climate in their department of study (e.g., I feel faculty in my department discriminate against students from some racial/ethnic groups.) on a 6-point scale (1 = strongly disagree, 6 = strongly agree). This scale showed an alpha coefficient of .92.

Scholarly productivity. The measure of scholarly productivity was adapted from Weidman and Stein (2003). Participants completed a checklist of activities and accomplishments common to graduate students (e.g., Have you presented a poster at a conference or convention?). In order to cover a broader range of non-research related activities nine items were added to Weidman and Stein's (2003) original measure. The resulting scale consisted of a 20-item checklist. Participants responded to each item by indicating whether or not they had ever engaged in the activity described using a yes/no dichotomous scale.

Intention to complete the degree. Because all participants were still engaged in doctoral study, intention to complete the Ph.D. rather than Ph.D. completion itself was measured. The measure of intention to complete was drawn from a study of attrition among African American high school students (Davis, Ajzen, Saunders, & Williams, 2002). This scale required participants to rate their attitudes toward their prospects of degree completion (e.g., I am confident in my ability to complete my degree) on a 6-point scale (1 = strongly disagree, 6 = strongly agree) and was based on the theory of planned behavior. The theory of planned behavior predicts the likelihood that an individual will complete a given action based on her or his intention to do so, and has been applied to a variety of behaviors (Ajzen, 1991). Thus, intention to complete served not only as a proxy for degree completion, but also as a potential indicator of actual degree completion. Although originally intended for use with high school students, the alpha coefficient obtained for the scale was relatively high ($\alpha = .80$).

Peer support. Peer support was measured in two ways. The first measure was a 10-item scale which asked participants to assess the *degree* of support they perceived from other doctoral students in their department of study, regardless of race. Five items asked participants to evaluate instrumental support functions (e.g. To what extent do other students in your department provide you with academic help?) on a 5-point scale (1 = not at all, 5 = to a very large extent). The remaining five items asked participants to evaluate social support functions (e.g. Other students in my department provide emotional support that helps me to cope with the challenges of graduate school) on 6-point scale (1 = strongly disagree, 6 = strongly agree). All 10 items were broadly designed to mirror the support functions associated with mentoring. Because

instrumental support and social support were not expected to play distinct roles, the social support items were re-scaled into a 5-point scale (1= low social support, 5 = high social support) and averaged with the instrumental support items to create a measure of overall peer support. This measure showed an alpha of .94 and was used to evaluate the relationship between peer support and scholarly productivity (see hypothesis 17) and the potential mediating role of peer support (see hypothesis 19).

The second measure of peer support was a single item that assessed how participants attributed their perceived peer support across groups of peers by peer race. Participants were asked to rate the support they felt from peers belonging to their own racial/ethnic group (same race peers), peers of color belonging to a different racial/ethnic group than themselves (different race peers of color), and White peers in terms of percent. They were instructed that they could assign any percent value from 0 to 100 to each group, but that the three ratings had to add up to 100%. The resulting percent ratings were used as the measure of amount of support from each of the three groups participants were asked to assess (see hypothesis 18).

Revision of Theoretical Model and Study Hypotheses

Assessment of Mentoring Functions, RS-race, and SC Scales

Before any hypotheses were tested, the mentoring functions, RS-race, and SC scales were submitted to factor analysis. The mentoring functions scale was assessed because the scale items have been adapted several times since their initial inception (Noe, 1988; Dreher, 1990; Tennenbaum, 2001) and there was some question as to whether the scale would show a one-, two-, or three-factor structure. Given that sensitivity to race-based rejection (RS-race) and stigma consciousness (SC) showed a strong correlation for doctoral students of color ($r = .60$, $p \leq .001$) a factor analysis was conducted to determine if they function as two separate constructs or as related components of the same construct[1].

Mentoring functions scale. The factor structure of the mentoring functions scale has been inconsistent across past studies (Dreher & Ash, 1990; Noe, 1988; Tennenbaum et al., 2001). The origin of the scale items may be traced back to the work of Noe (1988) who developed a 21-item scale to assess the mentoring relationships of teachers aspiring to administrative positions. Using a principal factor analysis with varimax rotation, he found that the items loaded onto two factors, one reflecting career (i.e., instrumental) support and one reflecting psychosocial support. Dreher and Ash (1990) modified the language of some of these items and reduced the scale to 18 items to study gender differences in the mentoring relationships of business school graduates. They recognized

[1] Factor analyses were conducted with only doctoral students of color. All DSOC who reported that they had a mentor were included in both factor analyses (N = 99), including those who self-identified as multiracial and international status. The decision to exclude these participants from hypothesis testing was made after these initial factor analyses were conducted.

that the items captured two forms of related support. However, they did not confirm this by factoring the items, but instead averaged them to create a total mentoring score.

Tennebaum and colleagues (Tennenbaum et al., 2001) adapted Dreher and Ash's (1990) scale to examine gender differences in the mentoring relationships of graduate students. They eliminated three items irrelevant to graduate study and added four new ones to create a 19-item scale. Using principal component analysis with an orthogonal rotation to factor the items , they found three distinct factors, one reflecting instrumental support from mentor, one reflecting social support from mentor, and one reflecting networking support from mentor.

This 19-item scale was used in the current study. However, it was unclear if items on the "networking" subscale (e.g. To what extent has your mentor helped you meet others in your field elsewhere?) would stand on a separate factor. In past studies this subscale has not been related to important outcomes such as working relationship with mentor and interpersonal comfort with mentor (Ortiz-Walters and Gilson, 2005; Tennenbaum et al., 2001). Moreover, the content of the networking items (see Appendix B) did not seem conceptually distinct from the content of the items measuring instrumental support. Thus, a confirmatory factor analysis (CFA) was performed to test whether or not the three-factor structure found by Tennenbaum et al. (2001) would emerge in the current study.

The three-factor structure reported by Tennenbaum et al. (2001) did not fit the data, $X^2(132) = 254.47$, $p \leq .001$, RMSEA = 0.09. To determine if an alternative 3-factor structure would present a better fit, an exploratory principal component analysis was conducted using an oblique (promax) rotation and asking that three factors be extracted.

However, the resulting factor structure (Factor Structure 1 in Appendix C), was radically different from the one found by Tennenbaum et al. (2001). Furthermore, the factor structure that emerged was also inconsistent with the theoretical construction of the scale. The items measuring social support and those measuring instrumental support did not load onto discrete factors. In addition, the items measuring networking support did not load onto a unique factor.

A second exploratory factor analysis was performed using an extraction criterion of "eigenvalues greater than 1". This analysis yielded a two-factor structure in which the items corresponding to the social support subscale and those corresponding to the instrumental support subscale loaded onto discrete factors. The items from the networking subscale loaded on the instrumental support factor. This two-factor structure (Factor Structure 2 in Appendix C) was submitted to CFA, but showed a poor fit with the data, $X^2(134) = 266.62$, $p \leq .001$, RMSEA = 0.10. A one factor model was also tested and did not fit the data. Thus, the empirical evidence was inconclusive regarding the factor structure for the mentoring functions scale.

RS-race and SC scales. Because the sensitivity to race-based rejection (RS-race) and stigma consciousness (SC) scales are conceptually similar and were strongly correlated, exploratory factor analysis (EFA) was conducted to determine if they actually functioned as two separate constructs. Exploratory rather than confirmatory factor analysis was performed first in this case because no unitary factor structure for these two scales has been posited in past literature. A principal component analysis using an oblique (promax) rotation and extraction criterion of "eigenvalues greater than 1"was conducted on the 8 items from the RS-race scale and the 10 items from the SC scale.

This EFA yielded four factors, two consisting of SC items and two consisting of RS-race items. Confirmatory factor analysis showed that this four-factor model did not fit the data, however, $X^2(129) = 256.26$, $p \leq .001$, RMSEA = 0.10. A CFA testing a similar factor structure which combined RS-race and SC but loaded their items onto two respective factors, rather than four, also did not fit the data, $X^2(134) = 400.89$, $p \leq .001$, RMSEA = 0.14. A confirmatory analysis testing a two-factor structure for RS-race alone did not fit the data, $X^2(19) = 64.01$, $p \leq .001$, RMSEA = 0.15, nor did a two-factor structure for SC alone, $X^2(19) = 67.37$, $p \leq .001$, RMSEA = 0.10. Tables D1, D2, and D3 in Appendix D show the item loadings and factor structures for these factor models.

Reduction of Key Variables

The factor analysis results raised several questions about whether or not it would be possible to test the stated study hypotheses with the given data. Not only did the data fail to confirm any of the potential factor structures for the mentoring functions scale, the correlations among the variables revealed a strong relationship between this measure and the other scales assessing mentoring support (perceived similarity, compatibility, interpersonal comfort). Similarly, results from the factor analysis showed that RS-race and SC were closely related to each other. Correlations among the variables showed that they were also strongly related to intergroup anxiety and perceptions of race-related discrimination, two of the other scales measuring perceptions of stigma. This pattern of correlations emerged both when the relationships among the variables were examined only for DSOC, and when they examined for DSOC and White American doctoral students together. Table 2 below shows the correlations among the key variables for all participants.

Table 2. Correlations among key variables - all participants (N = 293).

		Mean	SD	1	2	3	4	5	6	7	8	9	10	11
1.	Mentoring functions	3.25	.76	--	.55**	.72**	.75**	-.03	-.11	.12*	.12*	-.03	.33**	.19**
2.	Perceived similarity	4.21	.87		--	.58**	.65**	-.06	-.12*	.06	.04	-.10	.31**	-.004
3.	Interpersonal comfort	4.45	1.12			--	.86**	-.14*	-.10	-.01	.04	-.11	.35**	.07
4.	Compatibility	4.65	1.01				--	-.13*	-.14*	-.04	-.04	-.14*	.37**	.01
5.	Intergroup anxiety	4.08	1.49					--	.23**	.35**	.37**	.37**	-.20**	-.11
6.	Discounting	3.07	1.15						--	.20**	.22**	.41**	-.21**	.07
7.	Rejection sensitivity	5.66	6.19							--	.63**	.53**	-.11	-.09
8.	Stigma consciousness	3.66	1.14								--	.57**	-.10	.03
9.	Perceptions of discrimination	2.02	.86									--	-.15*	-.01
10.	Intention to complete	4.28	.95										--	.19**
11.	Scholarly productivity	9.97	3.83											--

*Correlation significant at $p \leq .05$.
**Correlation significant at $p \leq .001$.
Note: Shading marks conceptually related variables.

The high correlations among the key variables led to concerns about multicollinearity and the power of the study. To address these concerns, the explanatory variables were collapsed into two conceptual groups: variables measuring perceived stigma and variables measuring perceived mentoring support. The shaded areas of Table 2 illustrate these groups, and the pattern of correlations strongly suggested that the explanatory variables might be reduced into two more parsimonious variables reflecting these conceptual groupings. To confirm this reduction of the variables, however, the mentoring functions, perceived similarity, compatibility, interpersonal comfort, intergroup anxiety, RS-race, SC, and perceptions of discrimination scales were submitted to a secondary factor analysis using an oblique (promax) rotation and an extraction criterion of "eigenvalues greater than 1". Because of its weak correlations with both RS-race and SC, the discounting scale was excluded from this analysis.

The secondary factor analysis yielded two factors. The four scales measuring perceptions of mentoring support loaded onto the first factor and the four scales measuring perceptions of stigma loaded onto the second factor. Table 3 shows the loadings for each scale on the two factors. Based on the results of the secondary factor analysis, two new variables were created. Participants' mean scores on the scales measuring perceived stigma were standardized (i.e. converted to z-scores) and summed to yield the variable *perceptions of stigma*. Likewise, participants' mean scores on the scales measuring perceived mentoring support were standardized and summed to yield the variable *perceptions of mentoring support.* For both variables, higher scores indicate higher levels of the given construct.

The two measures of potential to complete the Ph.D., intention to complete and scholarly productivity were not combined. Although significant, their correlation was weak ($r = .19$, $p \leq .001$). In addition, an exploratory factor analysis showed that the two scales loaded onto separate factors, indicating that they were separate constructs. To be consistent with perceptions of mentoring support and perceptions of stigma, however, both variables were standardized.

Table 3. Item loadings and factor structure for secondary factor analysis of mentoring support and stigma variables.

Scale	Factor 1[a] Perceptions of Mentoring Support	Factor 2[b] Perceptions of Stigma
Mentor functions	**.855**	.026
Perceived Similarity	**.749**	-.064
Compatibility	**.936**	-.149
Comfort	**.899**	-.066
Stigma consciousness	-.006	**.855**
RS-Race	.036	**.838**
Intergroup anxiety	-.095	**.583**
Perceived discrimination	-.168	**.823**

[a] The two factors shown explain 68.36% of the variance. Factor 1 explains 38.3% of the variance and has an eigenvalue of 3.07.
[b] Factor 2 explains 30.0% of the variance and has an eigenvalue of 2.40.

Research Questions

The original study hypotheses pertaining to mentoring support focus on the relationships between the many subtle aspects of perceptions of stigma and mentoring support. Collapsing these variables into more parsimonious factors, therefore, necessitated taking a broader approach to these hypotheses. Critical to this revised approach was carefully considering the relationship between participants' membership in an underrepresented group and perceptions of stigma. The preceding discussion attempts to treat doctoral students of color as a generally uniform group equally susceptible to the negative impact of perceptions of stigma on academic achievement and mentoring support based on their minority status. However, past literature, particularly studies of stigma consciousness, underscores the relationship between membership in an *underrepresented* group, specifically, and the effects of perceptions of stigma (Brown & Lee, 2005; Brown & Pinel, 2003; Pinel et al., 2005). In fact, Pinel, Warner and Chua (2005) define underrepresented students at the undergraduate level (i.e., Black, Latino, and Native Americans) as *stigmatized* and found significant differences in perceptions of stigma between these students and their *non-stigmatized* (i.e., Asian and White American) peers, as well as different effects of perceptions of stigma on achievement for the two groups. Their findings suggest that belonging to an underrepresented group heightens group members' awareness of stigma as well as their vulnerability to its potential negative impact on performance and interpersonal relationships in a way that general minority status may not, especially at predominately white institutions.

Collapsing the variables measuring perceptions of stigma into a single factor emphasized the relevance of these past findings to current study. If the stigmatized/non-stigmatized dichotomy holds at the doctoral level, then participants' membership in an underrepresented group, or *stigma status*, rather than their general minority status becomes critical to understanding the relationship among perceptions of stigma, mentoring support, and Ph.D. completion. To this end, I shifted the classification of participants from the more objectively defined doctoral students of color (DSOC) and White American doctoral students to Pinel's dichotomy. Black, Latino, and Native American students were categorized as stigmatized, White and Asian American students were categorized as non-stigmatized, and differences between the groups were examined.

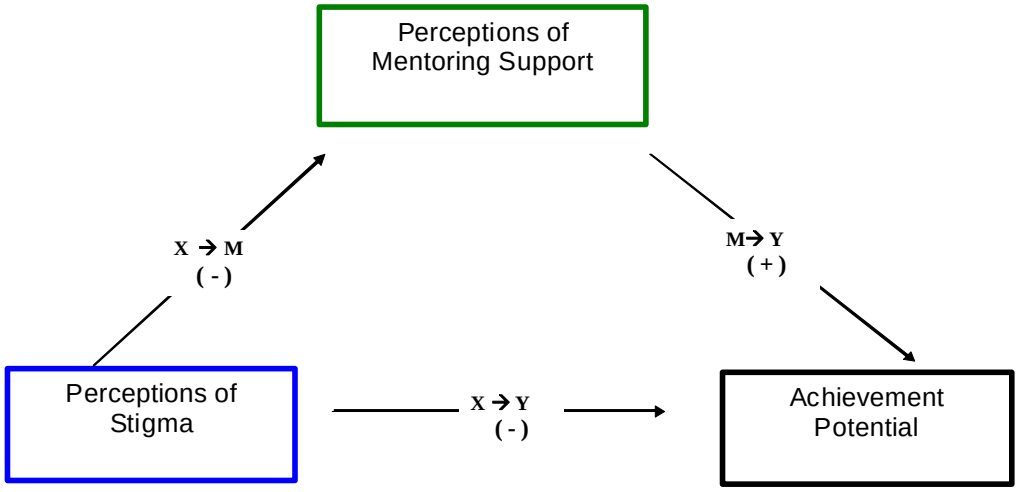
Five research questions which encompass the relationships that were expected to emerge were posed. The first two questions address how the experiences of stigmatized doctoral students might vary by race of mentor and take the place of hypotheses 1 – 6 (see Appendix A).

- Research Question 1: *Do stigmatized students working with an underrepresented mentor perceive greater mentoring support than do those working with a White Mentor?*
- Research Question 2: *Do stigmatized students working with an underrepresented report lower perceptions of stigma that do those working with a White mentor?*

The remaining three questions collectively address the proposed mediation role of mentoring support, and take the place of hypotheses 7 – 16. Figure 2 shows the proposed relationship among perceptions of stigma, perceptions of mentoring support, and achievement potential. Essentially this model represents the basic relationships expected to emerge from the conceptual model presented in figure 1.

- Research Questions 3: *Do stigmatized students' perceptions of stigma negatively affect their achievement?*
- Research Question 4: *Do stigmatized students' perceptions of stigma negatively affect their perceptions of mentoring support?*
- Research Question 5: *Do stigmatized students' perceptions of mentoring support mediate the relationship between their perceptions of stigma and achievement potential?*

Figure 2. Proposed relationship between perceptions of stigma, mentoring support, and achievement potential.



Taking a broader approach to the relationships expected to emerge from the data also leads to two additional research questions related to mentoring support. The primary assumption underpinning the study is that the mentoring relationships of stigmatized doctoral students are fundamentally different from those of non-stigmatized doctoral students. To explicitly examine this notion however, I pose research question 6.

- Research Question 6: *Are there differences in perceptions of stigma, perceptions of mentoring support, and achievement potential between stigmatized and non-stigmatized doctoral students?*

Another assumption central to the current study is that doctoral students with a mentor have greater potential to complete the Ph.D. than do those with no mentor, regardless of race or stigma status. This assumption leads to research question 7.

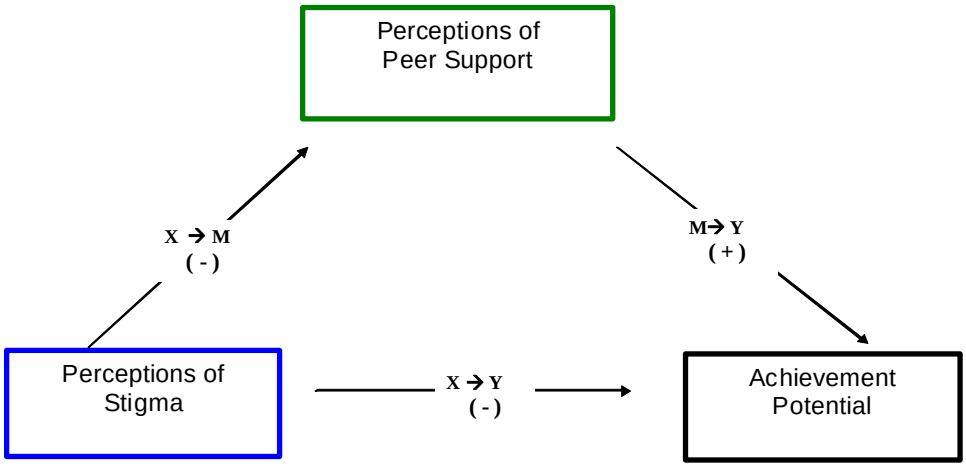
- Research Question 7: *Regardless of race or stigma status, do doctoral students with no mentor show different achievement potential than those with a mentor?*

Reducing the study's key variables also affected how the questions pertaining to the role of peer support were addressed. Recall that there are there are three primary questions related to peer support (hypotheses 17, 18, and 19 in Appendix A). These questions translated into research questions 8, 9, and 10, respectively.

- *Do stigmatized doctoral students perceive greater support from peers of color than from White peers?*
- *Is peer support positively related to achievement?*
- *Does peer support mediate the relationship between perceptions of stigma and achievement?*

Essentially, the affect of peer support on the relationship between perceptions of stigma and achievement potential was expected to closely mirror that of mentoring support. To this end, Figure 3 shows the proposed relationship among these variables.

Figure 3. Proposed relationship between perceptions of stigma, peer support, and achievement potential.



In sum, as a result of the high correlations among the key variables, the data were restructured to better assess the questions underlying the study. The variables measuring perceptions of stigma and perceptions of mentoring support were standardized and combined into two more parsimonious variables and participants were categorized as stigmatized and non-stigmatized. In addition, the 19 original hypotheses were collapsed into 10 research questions. Table 4 summarizes the research questions posed and show how they map onto the original study hypotheses.

It should be noted that all the research questions were examined separately for the two measures of achievement potential, intention to complete and scholarly productivity. In addition, the research questions were examined with both stigmatized and non-stigmatized participants.

Table 4. Research questions emerging from restructuring of study data.

	Research Question	Encompasses Original Hypotheses
1.	Do stigmatized students working with an underrepresented mentor perceive greater mentoring support than do those working with a White Mentor?	1 – 4
2.	Do stigmatized students working with an underrepresented mentor report lower perceptions of stigma that do those working with a White mentor?	5 – 6
3.	Do stigmatized students' perceptions of stigma negatively affect their perceptions of achievement potential?	7 – 16
4.	Do stigmatized students' perceptions of stigma negatively affect their mentoring support?	7 – 16
5.	Do stigmatized students' perceptions of mentoring support mediate the relationship between their perceptions of stigma and achievement potential?	7 – 16
6.	Are there differences in perceptions of stigma, perceptions of mentoring support, and achievement potential between stigmatized and non-stigmatized doctoral students?	--
7.	Regardless of race or stigma status, do doctoral students with no mentor show different achievement potential than those with a mentor?	--
8.	Do stigmatized doctoral students perceive greater support from peers of color than from White peers?	17
9.	Is peer support positively related to achievement?	18
10.	Does peer support mediate the relationship between perceptions of stigma and achievement?	19

Results

Characteristics of Participants' Mentoring Relationships

All participants were asked to report a number of characteristics about their mentors and their mentoring relationships including, mentor's race, their mentor's position, and how their relationship was initiated. The majority of participants (87.4%) reported that they had a mentor, which was defined in the survey as "a faculty member who uses their experience and position to offer guidance, advice, and support". Non-stigmatized students reported that they had a mentor in slightly higher numbers (88.1%) than did stigmatized students (84.5%), but this difference was not significant (see table 5). In both the stigmatized and non-stigmatized groups, the majority of participants with a mentor reported that their mentor was either their academic advisor, or another faculty member in their department of study. Similarly, a majority of participants in both groups reported that they either asked if their mentor would work with them, or reached a mutual agreement with their mentor to work together. Participants in the stigmatized group reported that their mentor initiated the relationship in noticeably greater numbers (13.8%) than did participants in the non-stigmatized group (6.0%), however. Table 5 provides the exact figures for these characteristics of participants' mentoring relationships by stigma status.

Participants' mentoring relationships were further examined by the race/ethnicity of their mentors. To be consistent with the way students were grouped by race, mentors were divided into two categories: underrepresented mentors (Black, Latino, and Native American) and Asian and White American mentors, based on participants' reports of their mentor's race/ethnicity. Participants in the stigmatized group reported that they

were working with an underrepresented mentor in far greater numbers (50.0%) than did participants in the non-stigmatized group (9.8%).

It should be noted that all the analyses relevant to the relationships among stigma, mentoring support, and achievement were conducted using only the 49 stigmatized and 207 non-stigmatized participants who reported that they had a mentor.

Table 5. Characteristics of participants' mentoring relationships by stigma status.

Characteristic of interest	Group: Stigmatized (N = 58)		Non-stigmatized (N = 235)		χ^2
	N	*%*	*N*	*%*	
Students with mentor	49	84.5	207	88.1	.07
Race of mentor					
Black, Latino, Native American	28	50.0	23	9.8	41.84*
Asian, White American	21	34.5	184	78.3	10.45*
Mentor's relationship to student					
Academic advisor	23	39.7	162	68.9	5.37*
Another faculty member in student's department of study	15	25.9	29	12.3	6.41*
A faculty member in another department at student's university	3	5.2	4	1.7	2.73
A faculty member at another university	1	1.7	2	0.9	.33
Other	7	12.1	10	4.3	5.15*
Initiation of mentoring relationship					
Student asked mentor if she or he would mentor them	15	25.9	71	30.2	.17
Mentor offered to mentor student	8	13.8	14	6.0	4.25*
Student and mentor mutually decided to work together	14	24.1	75	31.9	.65
Mentor and student were matched by a third party	6	10.3	25	10.6	.002
Other	6	10.3	22	9.4	.08

χ^2 significant at $p \leq .05$.

Preliminary Analyses by Stigma Status

Before any of the research questions were explored, means for the key variables perceptions of stigma, perceptions of mentoring support, intention to complete and scholarly productivity were compared across stigma status. An initial test of perceptions of stigma with ANOVA revealed that the homogeneity of variance assumption was violated, *Levene's statistic* = 16.46, $p \leq .001$. When this assumption is violated and group sizes are unequal, ANOVA results are unreliable. In contrast, the results of linear regression are reliable even when group sizes vary greatly (Jaccard & Becker, 1997). As a result, these preliminary analyses were conducted with linear regression rather than submitted to a One-way Analysis of Variance.

Stigmatized participants showed higher perceptions of stigma than did non-stigmatized participants, $F(1, 222) = 124.82$, $p \leq .001$. However, the groups showed no significant difference for perceptions of mentoring support, $F(1, 229) = 2.71$, $p = .10$. In addition, no significant differences emerged between the groups on intention to complete, $F(1, 254) = .66$, $p = .42$ or scholarly productivity, $F(1, 254) = .67$, $p = .41$. Table 6 shows the means for these key variables by stigma status. Differences on the key variables were also examined by participants' race/ethnicity. These results are discussed in detail in a later section.

Table 6. Means for key variables by stigma status.

Variable	Group				
	Stigmatized		Non-Stigmatized		*F(df)*
	M	*SD*	*M*	*SD*	
Perceptions of Stigma	3.53	3.43	-1.09	2.07	124.82(1, 222)*
Perceptions of Mentoring Support	.62	3.58	-.34	3.45	2.71(1, 229)
Intention to Complete	.10	.91	-.03	1.04	.66(1, 254)
Scholarly Productivity	-.04	1.05	.09	.93	.67(1, 254)

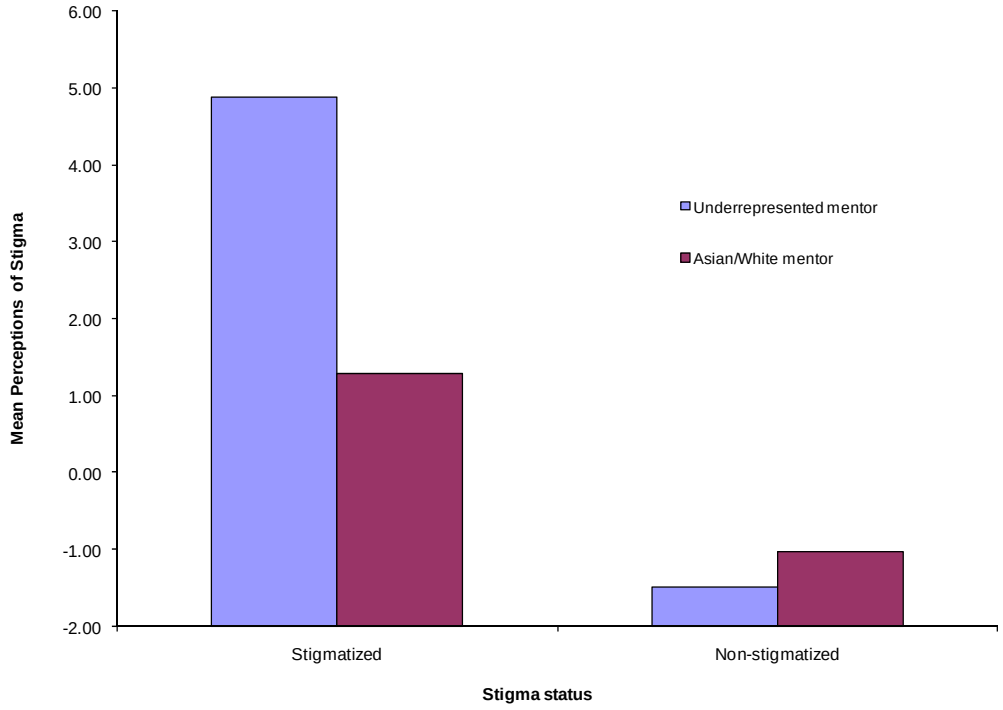
*$p \leq .001$; higher scores indicate higher levels of the given construct.

Differences by Race of Mentor

To explore research question 1, which suggested participants' perceptions of stigma would vary by race of mentor, a simultaneous linear regression was conducted on perceptions of stigma with stigma status (coded 0 for stigmatized, 1 for non-stigmatized), race of mentor (coded 0 for underrepresented mentor, 1 for White/Asian mentor), and their interaction as predictors. This regression was significant, $F(3, 220) = 54.05$, $p \leq .001$, $R^2 = .42$, and revealed main effects for both stigma status, $\beta = -.83$, $t(220) = -9.42$, $p \leq .001$, and race of mentor, $\beta = -.49$, $t(220) = -4.89$, $p \leq .001$, that were qualified by a significant interaction, $\beta = .61$, $t(220) = 4.46$, $p \leq .001$. Figure 4 shows this interaction. Higher scores indicate higher levels of perceptions of stigma. Because the variable is z-scored, negative values are possible.

Separating participants by stigma status revealed that in the stigmatized group, those working with an underrepresented mentor showed stronger perceptions of stigma than did those working with an Asian or White American mentor, $F(1, 38) = 13.72$, $p \leq .001$, $R^2 = .25$. In contrast, in the non-stigmatized group, no significant difference emerged in perceptions of stigma between those working with an underrepresented mentor and those working with an Asian or White American mentor, $F(1, 182) = .87$, $p = .35$, $R^2 = -.001$.

Figure 4. Interaction between stigma status and race of mentor on perceptions of stigma.



Research question 2, which suggests that participants' perceptions of mentoring support vary by race of mentor, was also explored with a simultaneous linear regression that included stigma status, race of mentor and their interaction as predictors. None of the predictors emerged as significant, $F(3, 227) = 1.92$, $p = .13$, $R^2 = .01$, however.

The interaction between stigma status and race of mentor was further examined for the two outcome variables. Neither intention to complete, $F(3, 252) = .30$, $p = .82$, $R^2 = -.01$, nor scholarly productivity, $F(3, 252) = .58$, $p = .63$, $R^2 = -.01$, yielded significant findings. Table 7a provides a summary of the regression analyses conducted (interactions), and Table 7b shows the mean comparisons on the key variables by stigma status and race of mentor (main effects).

Table 7a. Summary of regression analyses predicting key variables from the interaction between stigma status and race of mentor.

Variable	B	SE B	*β*	*t*	*df*
Perceptions of stigma ($F(3,220) = 54.05$*)					
Stigma status	-6.37	.67	-.83	-9.42*	220
Race of mentor	-3.06	.74	-.49	-4.89*	220
Interaction	4.06	.91	.61	4.46*	220
Perceptions of mentoring support ($F(3,227) = 1.92$)					
Stigma status	-.51	1.03	-.06	-.50	227
Race of mentor	-1.26	1.08	-.14	-1.16	227
Interaction	.20	1.36	.02	.14	227
Intention to Complete ($F(3, 252) = .30$)					
Stigma status	-.03	.29	-.01	-11	252
Race of mentor	-.002	.29	.00	-.007	252
Interaction	-.11	.37	-.05	-.30	252
Scholarly Productivity ($F(3, 252) = .58$)					
Stigma status	.00	.27	.00	-.001	252
Race of mentor	-.29	.28	-.12	-1.03	252
Interaction	.29	.35	.14	.83	252

*$p \leq .001$

Table 7b. Means differences between groups for key variables by race of mentor.

Variable	Race of Mentor: Underrepresented Mentor		Race of Mentor: Asian/White Mentor		*F(df)*
	M	*SD*	*M*	*SD*	
Perceptions of Stigma					
Stigmatized	4.88	3.10	1.28	2.75	13.72(1, 38)*
Non-stigmatized	-1.50	2.45	-1.04	2.03	.87(1, 182)
Perceptions of Mentoring Support					
Stigmatized	1.12	2.90	-.14	4.41	1.28(1, 41)
Non-stigmatized	.60	3.20	-.46	3.47	1.70(1, 186)
Intention to Complete					
Stigmatized	.10	.96	.10	.86	.00(1, 47)
Non-stigmatized	.07	.91	-.04	1.05	.25(1, 205)
Scholarly Productivity					
Stigmatized	.09	1.03	-.20	1.06	.89(1, 47)
Non-stigmatized	.08	.82	.09	.95	.00(1, 205)

*$p \leq .001$; higher means indicate higher levels of the given construct.

Relationship between Stigma, Mentoring Support, and Achievement Potential

Research questions 3, 4, and 5 explored whether mentoring support would mediate the relationship between perceptions of stigma and achievement potential (see Figure 2). These questions were explored with linear regression, and Baron and Kenny's (1986) four-step method was used to determine if mediation was present. By these criteria, mediation is present if: (1) the predictor variable is significantly related to the outcome variable, (2) the predictor is significantly related to the mediator, (3) the mediator is significantly related to the outcome variable, and (4) when both the mediator and the predictor variable are included as predictors, only the mediator is significant. If the first three criteria are met, and the effect for the predictor weakens, but remains significant when both it and the mediator are included as predictors, then partial mediation is present (Baron & Kenny, 1986; Kenny, 2008).

Because preliminary analyses showed that participants' perceptions of stigma varied significantly with their stigma status, the interaction between perceptions of stigma (mean-centered) and stigma status (coded 0 for stigmatized, 1 for non-stigmatized) was included in the test of the potential mediation role of mentoring support. Kenny (2008) suggests that when the interaction between two variables is suspected of affecting the outcome variable (i.e. a moderator effect may be present), the interaction between the two variables be treated as the predictor of interest, and the two main effects be treated as covariates.

The data failed to meet the first criteria for mediation for both intention to complete and scholarly productivity. The regression predicting intention to complete from stigma and stigma status was significant, $F(3, 220) = 5.67$, $p \leq .001$, $R^2 = .06$.

However, the critical interaction between stigma and stigma status was not significant, $\beta = -.01$, $t(220) = -.11$, $p = .92$. The regression predicting scholarly productivity from stigma and stigma status did not show any significant effects, $F(3, 220) = .47$, $p = .70$, $R^2 = .01$. These data precluded the potential for mediation using Kenny's (2008) suggested method. As an alternative, stigma status was removed as a predictor and the criteria for mediation were examined separately for the stigmatized and non-stigmatized groups. Although this approach allowed for a full investigation of the potential mediation role of mentoring support, it raised concerns about power. To this end effect sizes, as Cohen's f^2 (Cohen, 1992), are provided for the analyses below.

Stigmatized group. The data for the stigmatized group failed to meet the criteria for mediation for both intention to complete and scholarly productivity. Both perceptions of stigma and perceptions of mentoring support were significantly related to intention to complete, meeting the first and third criteria for mediation; $F(1, 38) = 8.32$, $p \leq .01$, $R^2 = .16$, $\beta = -.42$, $f^2 = .19$ and $F(1, 41) = 8.03$, $p \leq .01$, $R^2 = .14$, $\beta = .40$, $f^2 = .17$, respectively. The second criterion was not met, however. Perceptions of stigma was not significantly related to perceptions of mentoring support, $F(1, 35) = .07$, $p = .80$, $R^2 = -.03$, $\beta = -.04$, $f^2 = -.03$. Results for scholarly productivity showed that neither perceptions of stigma nor perceptions of mentoring support were significantly related to it, $F(1, 38) = .11$, $p = .74$, $R^2 = -.02$, $\beta = -.05$, $f^2 = .-02$, and $F(1, 41) = 1.76$, $p = .19$, $R^2 = .02$, $\beta = .20$, $f^2 = .02$, respectively, further eliminating the possibility of mediation.

The non-significant relationship between perceptions of stigma and perceptions of mentoring support excluded the presence of either full or partial mediation. To fully explore the relationship among stigma, perceptions of mentoring support, and the two

measures of achievement potential, a model including perceptions of stigma, perceptions of mentoring support, and the interaction between them predicting intention to complete was tested. The main effects found for perceptions of stigma and perceptions of mentoring support on intention to complete suggested that this model might yield significant results. This model was significant, $F(3, 33) = 9.00$, $p \leq .001$, $R^2 = .40$, $f^2 = .17$. Only main effects for perceptions of stigma, $\beta = -.42$, $t(33) = -3.14$, $p \leq .01$, and perceptions of mentoring support, $\beta = .39$, $t(33) = 2.02$, $p \leq .05$, were found, however. A more complex model including race of mentor as well as the three-way interaction between it, perceptions of stigma, and perception of mentoring support was also tested. Although significant, this model also showed only main effects for perceptions of stigma and perceptions of mentoring support (data not presented).

Although no significant relationship was found between either perceptions of stigma or perceptions of mentoring support and scholarly productivity, this model was also tested for scholarly productivity. No significant relationships emerged, however, $F(3, 33) = .50$, $p = .68$, $R^2 = -.04$, $f^2 = -.04$.

Non-stigmatized group. Different results were found for intention to complete and scholarly productivity when the mediation criteria were examined for the non-stigmatized group. All four criteria for mediation were met for intention to complete. Perceptions of stigma was significantly related to intention to complete, $F(1, 182) = 10.10$, $p \leq .01$, $R^2 = .05$, $\beta = -.23$, $f^2 = .05$ (criterion 1). Perceptions of stigma was significantly related to mentoring support, $F(1, 166) = 8.69$, $p \leq .01$, $R^2 = .04$, $\beta = -.22$, $f^2 = .05$ (criterion 2). Perceptions of mentoring support was significantly related to intention to complete, $F(1, 186) = 37.11$, $p \leq .001$, $R^2 = .16$, $\beta = -.41$, $f^2 = .19$ (criterion 3).

Finally, when both it and perceptions of stigma were included as predictors, $F(2, 165) = 20.61$, $p \leq .001$, $R^2 = .19$, $f^2 = .23$ the effect of perceptions of mentoring was significant, $\beta = .40$, $t(165) = 5.65$, $p \leq .001$, but the effect of perceptions of stigma was not, $\beta = -.12$, $t(165) = -1.72$, $p = .08$, indicating full mediation.

Results for scholarly productivity showed that, as with the stigmatized group, neither perceptions of stigma, nor perceptions of mentoring support were significantly related to it, $F(1, 182) = 1.16$, $p = .28$, $R^2 = .001$, $f^2 = .001$, and $F(1, 186) = .54$, $p = .46$, $R^2 = -.002$, , $f^2 = -.002$ respectively, precluding mediation.

Differences on Key Variables by Race/Ethnicity

Preliminary analyses of the key variables showed differences between the stigmatized and non-stigmatized groups. However, the possibility that differences might also emerge *within* these groups was also explored. To this end, means for both the stigmatized and the non-stigmatized groups were disaggregated by race/ethnicity and compared descriptively. Racial groups were not statistically compared because of the small size of some groups and the differences between group sizes.

Disaggregated means for perceptions of stigma revealed that Native American participants reported higher perceptions of stigma than any other group ($M = 4.52$, $SD = 2.02$). It should be noted that Asian American participants reported higher perceptions of stigma ($M = .14$, $SD = 3.58$) than did White American participants ($M = -1.13$, $SD = 2.01$), but markedly lower perceptions of stigma than did any of the groups classified as stigmatized. Disaggregated means for perceptions of mentoring support showed that Hispanic/Latino American participants reported the highest perceptions of mentoring support ($M = .2.42$, $SD = 3.14$). Hispanic/ Latino American participants also showed the

highest means for intention to complete (M = .33, SD = .86), and scholarly productivity (M = .18, SD = 1.20). Table 8 shows the means for all the groups on the key variables.

Table 8. Means for key variables by racial/ethnic group for participants with mentors.

	Variable							
Racial/ethnic group	Perceptions of Stigma		Perceptions of Mentoring Support		Intention to Complete		Scholarly Productivity	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Black American (N = 28)	4.28	2.41	-.35	3.72	.004	.91	.01	.85
Hispanic/Latino American (N = 17)	2.07	4.62	2.42*	3.14	.33*	.86	.18*	1.20
Native American (N = 4)	4.52*	2.02	.38	1.49	-.18	1.11	-1.31	1.00
Asian American (N = 10)	.14	3.58	-.30	4.16	-.37	.71	.04	1.02
White American (N = 197)	-1.13	2.01	-.35	3.42	-.01	1.05	.09	.93

(*)Asterisk marks the group with the highest mean on the given variable. Higher numbers indicate higher levels of the given construct.

Participants Without a Mentor

A key assumption of the study was that mentoring support is critical to doctoral student achievement; therefore it was important to investigate the experiences of those participants who reported that they did not have a mentor (research question 7). Thirty-seven participants (28 White American, 5 Black American, 4 Hispanic/ Latino American) reported that they did not have a mentor. Participants without a mentor were more evenly distributed on gender than were all participants (45.9% male, 54.1% female). However, they did not differ dramatically from all participants in terms of age (M = 31.2, SD = 7.86) or discipline (43.2% social science, 5.4% physical or life science, 35.1% humanities 13.5% math or engineering). Although a slightly higher percent of participants without a

mentor reported that they were in their first year of doctoral study (35.1%), the percentage of participants who had completed coursework, but not yet proposed the dissertation (16.2%), and the percent of those working on the dissertation (48.6%) were both similar to numbers for all participants.

Because of the small group size, and the fact that not all the racial/ethnic groups were represented among those participants without mentors, their means on the key variables were examined by race rather than stigma status and only compared descriptively. These means suggest that, regardless of race, all participants without a mentor reported markedly higher perceptions of stigma than their counterparts with mentors did (see Table 8 above). Both Black and Hispanic American participants showed notably lower intention to complete and scholarly productivity than their counterparts with mentors did. Interestingly, White American participants showed slightly higher intention to complete than did their counterparts with mentors. Because of the small group sizes, these results must be interpreted with caution, however. Table 9 shows the means for these variables by race/ethnicity for those participants who reported that they did not have a mentor.

Table 9. Means for perceptions of stigma and achievement potential by racial/ethnic group for participants with no mentor.

	Variable					
Racial/ ethnic group	Perceptions of Stigma		Intention to Complete		Scholarly Productivity	
	M	*SD*	*M*	*SD*	*M*	*SD*
Black American (N = 5)	5.07	4.08	-.07	1.31	-1.31	.75
Hispanic/Latino American (N = 4)	2.54	2.67	-1.15	.96	-1.50	.53
White American (N = 28)	-.79	2.44	.03	.77	-.38	1.02

Perceptions of Peer support and Race

Research questions 8 – 10 addressed the role of peer support and in contrast to questions 1 – 7 were investigated with all 293 participants not just those who reported that they had a mentor. Recall that there are two measures of peer support. The scale measure of peer support required participants to rate the overall level of support they perceived from their peers, regardless of peer race, on a 6-point scale (1 = strongly disagree, 6 = strongly agree). The second measure asked participants to estimate how much support they received from same race peers, different race peers of color, and White peers in terms of percent of support. This measure was used to address research question 8 which explored whether peers' race would affect perceptions of peer support. Due to the unequal sizes of the stigmatized and non-stigmatized groups, question 8 was explored with regression analyses rather than a One-way Analysis of Variance.

Results showed no significant differences between stigmatized (M = 3.2, SD = .93) and non-stigmatized participants (M = 3.3, SD = .92) in overall perceptions of peer support, F (1, 282) = .33, p = .57. Results also showed no significant differences between stigmatized and non-stigmatized participants in perceptions of support from different race peers of color, F(1, 287) = .61, p =.44. Stigmatized participants attributed significantly less support to same race peers (M = 53.5%, SD = 29.8) than did non-stigmatized participants (M = 69.5%, SD = 26.0), F(1, 287) = 16.36, $p \leq .001$. In contrast, non-stigmatized participants reported significantly less support from White peers (M = 14.2%, SD = 20.4) than did stigmatized participants (M = 26.6%, SD = 26.1), F(1, 188) = 12.36, $p \leq .001$. It should be noted, however, that only 125 (55.5%) of the 225 participants who identified as White American responded to this question. In

addition, examining perceived peer support by participants' race/ethnicity, rather than stigma status somewhat qualified this finding. White American participants attributed only 12.5% of their peer support to White peers, the lowest of all the groups. Furthermore, when support attributed to White peers was excluded, 97.2% of White American participants' total peer support could be accounted for.

Examining participants' perceived peer support by race/ethnicity also showed that participants classified as stigmatized attributed the greatest amount of their peer support (45% to 59%) to same race peers. Moreover, they attributed the majority of their peer support (67% to 80%) to same race peers and different race peers of color. Table 10 compares participants' perceptions of peer support by stigma status, and Table 11 shows their perceptions of peer support by race/ethnicity.

Table 10. Percent peer support attributed to same race peers, different race peers of color, and White peers by participants' stigma status.

	Group				
	Stigmatized		Non-stigmatized		*F*(*df*)
Estimated Peer Support	*M*	*SD*	*M*	*SD*	
% Support Same race peers	53.5	29.8	69.5	26.0	16.36(1, 287)*
% Support Peers of color	23.8	17.5	26.4	22.9	.61(1, 255)
% Support White peers	26.6	26.1	14.2	20.4	12.36(1, 188)*

*$p \leq .001$

Table 11. Percent peer support attributed to same race peers, different race peers of color, and White peers by participants' race/ethnicity.

Racial/ethnic group	Estimated Peer Support					
	% Support Same race peers		% Support Peers of color		% Support White peers	
	M	*SD*	*M*	*SD*	*M*	*SD*
Black American (N = 33)	59.1*	29.8	21.5	14.1	21.4	23.2
Hispanic/Latino American (N = 21)	45.0	28.1	29.0	22.8	34.2	28.0
Native American (N = 4)	50.0	35.4	17.5	5.0	32.5	35.7
Asian American (N = 10)	15.7	12.8	48.8*	33.5	35.5*	32.0
White American (N = 225)	71.9	23.7	25.3	21.7	12.5	18.3

(*) Asterisk marks the group with the highest reported mean support.

Relationship between Peer Support, Stigma, and Achievement Potential

Research questions 9 and 10 both addressed the potential mediation role of peer support. Both questions were examined with the scale measure of overall peer support. This measure was standardized (i.e. z-scored) for these analyses so that it would be consistent with the standardized measures of perceptions of stigma, scholarly productivity and intention to complete. Furthermore, to be consistent with the analyses conducted for mentoring support, the criteria for mediation were examined using Kenny's (2008) method of treating the moderator effect (i.e. the interaction between perceptions of stigma and stigma status) as the predictor of interest. Although the overall regression predicting intention to complete from perceptions of stigma and stigma status was significant, $F(3, 251) = 5.75$, $p \leq .001$, their interaction was not, $\beta = .02$, $t(251) = .24$, $p = .81$, eliminating the potential for mediation using this method. As a result the criteria for mediation were examined separately for the stigmatized and non-stigmatized groups using Baron and Kenny's (1986) method.

Stigmatized group. Different results were found for intention to complete and scholarly productivity when the mediation criteria were examined for the stigmatized group. The data met the first three criteria for intention to complete. Perceptions of stigma was significantly related to intention to complete, $F(1, 46) = 8.46$, $p \leq .01$, $R^2 = .14$, $f^2 = .16$, $\beta = -.39$ (criterion 1). These results are different from those found for the mentoring support analyses because stigmatized participants who reported that they had no mentor (N = 9) are included. Likewise, the relationship between perceptions of stigma and scholarly productivity also show different results from those obtained for the mentoring support analyses.

Perceptions of stigma was significantly related peer support, $F(1, 44) = 4.54$, $p \leq .05$, $R^2 = .07$, $f^2 = .07$, $\beta = -.31$ (criterion 2). Perceptions of peer support was significantly related to intention to complete, $F(1, 51) = 7.26$, $p \leq .01$, $R^2 = .11$, $f^2 = .16$, $\beta = .35$ (criterion 3). The regression testing the final criteria was also significant, $F(2, 43) = 9.34$, $p \leq .01$, $R^2 = .27$, $f^2 = .37$, but showed significant effects for both peer support, $\beta = .33$, $t(43) = 2.48$, $p \leq .05$, and perceptions of stigma, $\beta = -.35$, $t(43) = -2.61$, $p \leq .01$. However, the effect for perceptions of stigma was weaker than it was when it was used to predict intention to complete alone, suggesting partial mediation.

Results showed a significant relationship between peer support and scholarly productivity, $F(1, 51) = 10.50$, $p \leq .01$, $R^2 = .15$, $f^2 = .18$, $\beta = .41$, establishing the relationship between mediator and outcome necessary to support mediation. However, no significant relationship was found between perceptions of stigma and scholarly productivity, $F(1, 46) = .36$, $p = .55$, $R^2 = -.01$, $f^2 = -.01$, $\beta = -.09$, eliminating the possibility of mediation. As an alternative, a model predicting scholarly productivity

from peer support, perceptions of stigma, and their interaction was examined. This model showed only a main effect for peer support, however, $F(3, 42) = 5.39$, $p \leq .01$, $R^2 = .23$, $f^2 = .30$.

Non-stigmatized group. Different results were also found for intention to complete and scholarly productivity when the mediation criteria were examined for the non-stigmatized group. As with the stigmatized group, the first three criteria for mediation were met for intention to complete. Perceptions of stigma was significantly related to intention to complete, $F(1, 205) = 9.61$, $p \leq .01$, $R^2 = .04$, $f^2 = .05$, $\beta = -.21$ (criterion 1). These results are different from those found for the mentoring support analyses because non-stigmatized participants who reported that they had no mentor (N = 28) are included.

Perceptions of stigma was significantly related to peer support, $F(1, 202) = 8.91$, $p \leq .01$, $R^2 = .04$, $f^2 = .05$, $\beta = -.20$ (criterion 2). Perceptions of peer support was significantly related to intention to complete, $F(1, 229) = 3.96$, $p \leq .05$, $R^2 = .01$, $f^2 = .01$, $\beta = .13$ (criterion 3). The regression testing the final criteria for mediation was significant $F(2, 201) = 5.34$, $p \leq .01$, $R^2 = .04$, $f^2 = .04$. Peer support, $\beta = .08$, $t(201) = 1.18$, $p = .24$, not perceptions of stigma, $\beta = -.19$, $t(201) = -2.74$, $p \leq .01$, showed the non-significant effect, however, suggesting that stigma fully mediated the relationship between peer support and intention to complete.

With regard to scholarly productivity, data for the non-stigmatized students failed to meet the criteria for mediation. No relationship was found between perceptions of stigma and scholarly productivity, $F(1, 205) = 1.31$, $p = .25$, $R^2 = .002$, $f^2 = .002$, $\beta = .08$ and no relationship was found between peer support and scholarly productivity, $F(1, 229)$

= .21, p = .64, R^2 = -.003, f^2 = -.003, β = -.03. A model predicting scholarly productivity from peer support, perceptions of stigma, and their interaction was tested as an alternative, but it too showed no significant effects, $F(3, 200) = .73$, p = .54, R^2 = -.004, f^2 = -.004.

Relationship between Perceptions of Peer Support and Mentoring Support

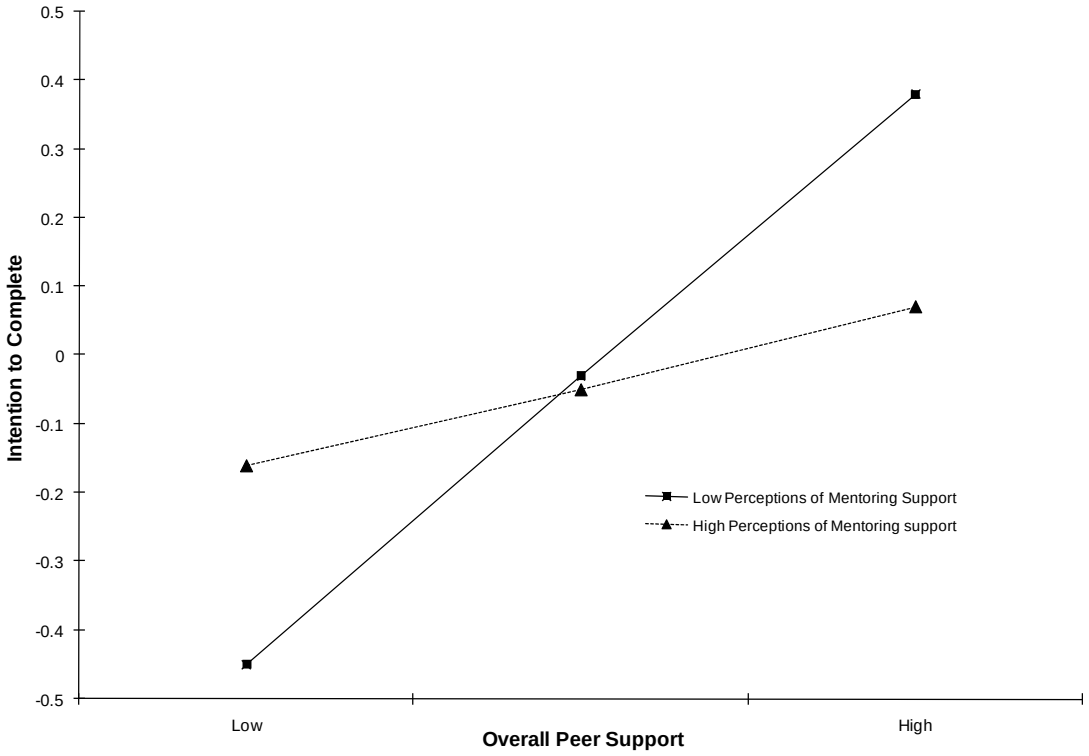
To examine whether peer support and mentoring support would interact in their effects on the two measures of achievement potential, a regression including these two variables and their interaction as predictors was tested for both scholarly productivity and intention to complete[2]. To be consistent with previous analyses, the model was tested separately for stigmatized and non-stigmatized participants.

The model predicting scholarly productivity was not significant for either the stigmatized, $F(3, 36) = 2.48$, p = .08, R^2 = .10, f^2 =.11 or the non-stigmatized group, $F(3, 182) = .37$, p = .78, R^2 = -.01, f^2 = -.01. In contrast, results for the model predicting intention to complete were somewhat different for the two groups. In the stigmatized group, the overall effect was significant, $F(3, 36) = 3.37$, $p \leq .05$, R^2 = .15, f^2 =.18. However, only a main effect for mentoring support emerged, β = .38, $t(36) = 2.50$, $p \leq .05$. The overall effect was also significant for the non-stigmatized group, $F(3, 182) = 13.79$, $p \leq .001$, R^2 = .17, f^2 =.20, and a main effect for perceptions of mentoring support, β = .38, $t(182) = 5.63$, $p \leq .001$, that was qualified by a significant interaction, β = -13, $t(182) = -1.93$, $p \leq .05$, was found.

[2] Models including stigma were also tested. However, models which predicted intention to complete and scholarly productivity from perceptions of stigma, perceptions of mentoring support, peer support, and their interactions, showed only main effects for mentoring support, if any effects at all.

To interpret this interaction, the model was tested at one standard deviation above the mean and one standard deviation below the mean for perceptions of mentoring support. These analyses revealed that at one standard deviation above the mean (i.e. high mentoring support) peer support had no effect on intention to complete, $\beta = -.07$, $t(182) = -.66$, $p = .51$. At one standard deviation below the mean (i.e. low mentoring support), however, peer support showed a significant effect on intention to complete, $\beta = .17$, $t(182) = 2.07$, $p \leq .05$. Figure 5 shows this interaction.

Figure 5. Interaction between peer support and perceptions of mentoring support on intention to complete for non-stigmatized participants.



Discussion

The current study sought to examine how perceptions of mentoring and peer support might affect the relationship between doctoral students of color's perceptions of stigma and their potential to complete the Ph.D. A number of hypotheses pertaining to the subtle aspects of and the many paths between perceptions of stigma and mentoring support as well as the role of peer support were posited to investigate the relationship between these variables and achievement (see Figure 1, p. 27). However, high correlations among the key variables led these hypotheses to be reduced to 10 primary research questions underlying the study (see table 4). Results of the study revealed several interesting relationships and these research questions are examined in turn here.

Differences by Stigma Status, Race, and Race of Mentor

Research question 6 addressed a major theme of the study; whether or not stigmatized doctoral students experience different levels of stigma, mentoring support, and achievement potential than do non-stigmatized doctoral students. Using Pinel et al.'s (2005) definition of stigmatized and non-stigmatized students, participants were compared on the key variables across stigma status. Not surprisingly, stigmatized participants showed significantly higher perceptions of stigma than did non-stigmatized participants. No significant differences emerged perceptions of mentoring support, or for either measure of achievement potential. Importantly, however, participants with a mentor almost uniformly reported higher intention to complete the Ph.D. and scholarly productivity than did their counterparts without mentors, supporting the importance of mentoring support to doctoral achievement in general (see research question 7).

Similar results were found when participants were examined by race/ethnicity. In general, participants classified as stigmatized showed higher perceptions of stigma than did those classified as non-stigmatized, but few differences were observed between groups on perceptions of mentoring support, intention to complete, and scholarly productivity. Interestingly, Latino Americans, the group who generally shows the lowest Ph.D. attainment (U.S. Department of Education, National Center for Education Statistics, 2005), showed both the highest intention to complete and the highest scholarly productivity. Also interesting, Asian American students showed perceptions of mentoring support and achievement potential similar to, or lower than other doctoral students of color, despite being classified as an academically privileged group. Moreover, their perceptions of stigma were notably higher than those of their White American peers. Such findings suggests that, although Asian American doctoral students may not face the same level of negative academic stigma as other DSOC, they may not be completely free from the negative consequences of prejudice and discrimination that often accompany minority status.

Research questions 1 and 2 explored how race of mentor might affect perceptions of mentoring support and stigma. Contrary to the findings of Ortiz-Walters and Gilson (2005), who found that DSOC working with mentors of color reported greater support from their mentors than those working with White mentors did, no significant differences by race of mentor emerged for mentoring support. However, significant differences were found for perceptions of stigma. Contrary to the result suggested by research question 1, stigmatized participants working with an underrepresented mentor showed significantly *greater* perceptions of stigma than did those working with an Asian

or White American mentor. It is possible that stigmatized students with high perceptions of stigma intentionally matched with underrepresented mentors as a way of coping with their heightened stigma attitudes. However, stigmatized participants reported that they asked if their mentor would work with them, or that they and their mentor mutually decided to work together in numbers similar to those for non-stigmatized participants. It is also possible that stigmatized participants working with mentors of color developed heightened perceptions of stigma *as result of* working with an underrepresented mentor. Faculty of color face a number of challenges related to their minority status (Blake, 1999; Bowman et.al., 1999; Myer, 1999) that could serve as environmental cues that increase their protégés awareness of stigma in their academic environment. One way to determine if either explanation fits is to track doctoral students' perceptions of stigma over the course of their mentoring relationships. Pinel and colleagues (2005) have found some effects suggesting that among undergraduates of color attending predominately white institutions perceptions of stigma increase over time. The same may hold true for doctoral students with race of mentor acting as a critical environmental cue.

Mediation Role of Mentoring Support

Research questions 3, 4, and 5 addressed the mediation role of mentoring support (see figure 2). Participants were examined separately by stigma status and mediation was tested separately for the two outcome measures using Baron and Kenny's (1986) well established criteria. Perceptions of mentoring support did not mediate the relationship between perceptions of stigma and scholarly productivity for either the stigmatized or the non-stigmatized group. In fact, scholarly productivity showed no significant relationship to either perceptions of stigma or perceptions of mentoring support for either group.

Furthermore, although the correlation between scholarly productivity and intention to complete was significant, the two variables were only weakly correlated. One explanation for why scholarly productivity may have shown such weak relationships to the other key variables may be the discipline-specific nature of many products of doctoral study. For example, the scholarly products typical of doctoral students in the humanities are very different from those typical of doctoral students in the physical sciences.

All participants completed the same general measure of scholarly productivity regardless of their area of study. It is possible that a more discipline-specific measure might better capture the relationships between scholarly productivity and the other key variables. In the physical and life sciences, for example, scholarly productivity showed significant correlations with perceptions of stigma, perceptions of mentoring support, and intention to complete. However, scholarly productivity showed similar non-significant correlations with the other key variables for students in the humanities, social sciences, and math and engineering, suggesting that the measure may have other shortcomings. Future studies may wish to consider the general utility of the current scholarly productivity measure, as well as alternative ways of measuring scholarly productivity.

Significant effects did emerge for intention to complete, and results showed that the relationships between perceptions of stigma, mentoring support, and intention to complete were different for stigmatized and non-stigmatized doctoral students. The lack of a significant relationship between perceptions of stigma and mentoring support eliminated the possibility of mediation for the stigmatized group; and although both variables were significantly related to intention to complete their interaction was not. Notably, the relationships that emerged did occur in the expected directions. Perceptions

of stigma was negatively related to intention to complete, and perceptions of mentoring support was positively related to intention to complete. Full mediation emerged for the non-stigmatized group. These findings indicate that while perceptions of stigma and mentoring support do not even interact in their effects on intention to complete for stigmatized doctoral students, for non-stigmatized doctoral students, the positive effects of mentoring support completely mitigate the negative effects of perceptions of stigma.

Given the literature, one might expect that the opposite would have occurred, that is that perceptions of mentoring support would fully mediate the relationship between perceptions of stigma and intention to complete for stigmatized students, but that perceptions of stigma and mentoring support would not interact for non-stigmatized students. This raises the question of whether the model posited in figure 2 is actually most appropriate for stigmatized doctoral students. One potential alternative is that perceptions of stigma could act as the mediator stamping out the positive effect of perceptions of mentoring support on intention to complete. However, the lack of a significant relationship between perceptions of stigma and perceptions of mentoring for stigmatized doctoral students also precludes this model. It seems more likely that, as the data indicate, perceptions of mentoring support simply does not impact the negative relationship between perceptions of stigma and intention to complete for stigmatized doctoral students.

Peer Support and Race

Research question 8 concerned how perceptions of peer support would vary by race of peers. Overall, stigmatized participants attributed the greatest amount of their peer support to same race peers. In addition, the vast majority of their peer support could

be accounted for when support attributed to same race peers and support attributed to different race peers of color were considered. For example, Black American participants attributed 80% of their peer support to same race peers and different race peers of color (see table 11). These findings suggest that, despite being at a PWI, stigmatized DSOC found ways to connect with and gain support from not only peers of color in general but from same race peers in particular.

White American participants showed interesting results on the peer support measure. Recall that White American participants attributed only 12.5% of their peer support to White peers (see table 11) and that only 55% of White American participants even responded to this question. Furthermore, the vast majority of White American participants' peer support could be accounted for even without considering support attributed to White peers. These results were likely due to the fact that the question did not fully apply to them. Most White American participants likely recognized that reporting the amount of support they attributed to same race peers and reporting the amount of support they attributed to White peers was redundant and choose to skip the later question.

Mediation Role of Peer Support

Like perceptions of mentoring support, peer support was expected to mediate the relationship between perceptions of stigma and achievement potential (see figure 3). Research questions 9 and 10 both address the mediation role of peer support and were examined separately for the stigmatized and non-stigmatized groups. Mediation was found only for intention to complete. For the stigmatized group, the relationship between perceptions of stigma and intention to complete was partially mediated by overall peer

support. Consistent with the theoretical model posed, when both variables were used to predict intention to complete, the positive affect of peer support moderately attenuated the negative effect of perceptions of stigma.

For the non-stigmatized group, something unexpected occurred. In contrast to the predicted effect shown by figure 3, when the effects of overall peer support and perceptions of stigma on intention to complete were considered together, perceptions of peer support (the mediator) not perceptions of stigma emerged as non-significant. This finding suggests that for non-stigmatized participants, perceptions of stigma may function like the mediator, with the negative effects of stigma cancelling out the positive effects of peer support on intention to complete. The finding is difficult to put into context. Recall that non-stigmatized students attributed the vast majority of their peer support to same race peers, and that the perceptions of stigma variable measured perceived stigma of outgroup members against one's own group. Thus, it is difficult to determine why perceived stigma from *outgroup* members would disrupt the positive relationship between peer support and intention to complete for a group who attributed most of its peer support to *ingroup* members. Furthermore, it is unclear how the non-stigmatized participants interpreted the scales measuring perceptions of stigma.

One way to better understand this finding would be to assess participants' perceptions of overall peer support separately by race of peers. It is possible that for non-stigmatized participants stigma mediates the relationship between peer support and intention to complete for peers of color, but not for White peers. Similarly, full mediation might emerge if the mediation role of peer support was examined separately for White peers and peers of color for stigmatized participants. Unfortunately, this was

not possible with the given data. The overall measure of peer support did not specify peers' race and participants did not fill out the measure separately for White peers and peers of color. Future studies may wish to design measures of overall peer support that also account for race of peers or have participants fill out the measure of overall peer support separately for each group of peers.

Relationship between Mentoring Support and Peer Support

The effects of mentoring support and those of peer support were treated as separate, albeit, parallel processes throughout the study. However, the possibility that the two might interact in their effects on the two measures of achievement potential was also considered. Significant results emerged only for intention to complete. For stigmatized students, only a main effect for mentoring support was found when the interaction between perceptions of mentoring support and overall peer support were used to predict intention to complete. In contrast, a significant interaction emerged for the non-stigmatized group. For those high in mentoring support, peer support had no effect on intention to complete. For those low in mentoring support, however, peer support showed a significant effect. These findings suggest that for stigmatized doctoral students the positive effects of mentoring support "trump" those of peer support, but for non-stigmatized doctoral students the positive effects of peer support may compensate for weak mentoring support. These findings emphasize the different experiences of stigmatized and non-stigmatized doctoral students. However, the current data offer little to explain these differences. No significant difference emerged between stigmatized and non-stigmatized participants for either perceptions of mentoring support or perceptions of overall peer support. Investigating the role of race of peers could be critical to explaining

these findings. For example, it is possible that for stigmatized participants mentoring support only trumps peer support when mentoring support comes from a mentor of color, but one's peer support comes from White peers. Future studies should consider examining the interaction between mentoring support and peer support by both race of peers and race of mentor. Further considerations for future studies are discussed below.

Limitation and Considerations for Future Studies

The data did not address all the aspects of the relationships among perceptions of stigma, mentoring support, peer support and achievement potential. As a result, they point to several considerations for future study, particularly with regard to assessing stigmatized doctoral students.

Attention to social-ecological variables. Social-ecological variables such as size of department, minority representation in department, and perceptions of overall racial climate in department were not examined in the current study. Instead, participants were asked to report only their general perceptions of race-related discrimination. Knowing the number and/or percentage of students and faculty of color in participants' given department of study would lead to a deeper interpretation of the study's findings. For instance, because there are no data on the number of faculty of color in participants' department of study, the present data cannot address to what extent participants had a choice in matching with an underrepresented mentor versus an Asian or White mentor. The data also cannot address objective benchmarks of achievement such as the enrollment and completion numbers for different racial/ethnic groups. Nor can it address aspects of the racial climate such as whether students had access to groups devoted to the concerns of racial minority groups.

Gathering reliable data on such social-ecological factors from a student survey is challenging for a number of reasons. First, students can report only their perceptions of these factors which may be biased or incorrect. Information on department statistics and climate could be gathered directly from institutions and/or specific departments. However, this too is problematic. In order for the information to be most useful, students and institutions should be matched. Matching would be simple enough but could compromise participants' anonymity. It further runs the risk of placing all the students of color in a given department or institution under scrutiny. Many doctoral students of color study in programs in which they are only one of a few students of color, and may even be the only member of their group. Asking a department or institution with only a handful of minority students to report on its racial climate could easily reveal the identity of potential survey respondents. Future studies should consider how to better address this issue so that student's experiences can be examined in the context of the climate and ecology of their doctoral programs and institutions without compromising their privacy.

Capturing the mentoring dynamic. Results suggest that there is some relationship between perceptions of stigma and race of mentor. However, it is not possible to explore this relationship fully because the survey revealed little about how mentoring relationships were established. Although participants were asked to report how they came to work with their mentor (e.g. decided mutually to work together), it is not clear how the decision to work with their mentor came about. The data do not indicate whether those participants who were matched with mentors of color sought them out because they hoped for some type of mentoring support specifically related to concerns about stigma and race or if they had more objective reasons for working with their

mentors such as a shared research interest. Likewise, the data do not indicate whether those participants who were matched with White mentors explicitly chose to do so or if they "settled" on a White mentor because no mentor of color was available.

It would also be useful to know how students and their mentors dealt with issues of race and perceived stigma, particularly for stigmatized students working with White mentors. Such issues likely impact mentoring relationships in ways that were not captured by the survey. Past studies by Thomas suggest that how supportive and beneficial cross-race mentoring relationships are to protégés of color depends heavily on how mentors and protégés deal with issues of race (Thomas, 1990; 1993). This work has shown that protégés of color are most likely to perceive their mentor as supportive when they are able to discuss concerns related to race and marginalization openly (Thomas, 1993). Doctoral students belonging to racial minority groups may perceive their mentors as most supportive when their mentors are able to engage with their concerns around race in a way that is reassuring and supportive. Steele refers to such race-conscious mentoring as "wise" and suggests that it is an optimal way to engage students of color in mentoring relationships regardless of mentor race (Cohen & Steele, 2002; Steele, 1997).

It is unlikely that such a 'wise" mentoring dynamic could be captured by a student survey alone. Future research should also consider assessing mentors' experiences with their protégés and stigma attitudes. In addition, future research may wish to assess both parties of the mentoring dynamic, perhaps through interviews, focus groups, or another qualitative method. Ideally, such qualitative data would provide a better understanding of the more subjective aspects of mentoring relationships than a number of interrelated survey measures. Recall that high correlations among the variables of interest made it

difficult to assess the more subtle aspects of mentoring support, such as perceived similarity to mentor, in the current study. Furthermore, results from qualitative data could be used to develop a survey measure that would be more effective at assessing the mentoring relationships of DSOC. This use of multiple methods would provide a more detailed and informative picture of the mentoring dynamic in general, as well as lead to a better understanding of cross-race mentoring relationships.

Greater attention to doctoral students without mentors. Overall, less than 13% of participants reported that they did not have a mentor. This group may generally be small. Both Smith and Davidson (1992) and Kelley and Schweitzer (1999) found that only about one-third of graduate students (both MA and Ph.D.) students report having a mentor. Nevertheless, future research may wish to give special attention to those doctoral students who report that they have no mentor. All participants without a mentor reported higher perceptions of stigma and lower scholarly productivity than did their counterparts with mentors, and little in the current data helps to explain these findings. Given the importance of mentoring to degree completion, it is important to understand the experiences of doctoral students without mentors and explore the possible negative impact on their achievement potential. Further study of students without mentors could reveal what factors doctoral students consider when seeking a mentor, whether stigmatized and non-stigmatized doctoral students consider the same factors when seeking a mentor, and if they go without a mentor for similar reasons.

Small sample size for stigmatized participants. Because it has the potential to limit the power of the mediation analyses, the small sample size for the stigmatized group is of particular concern. However, despite the small sample size for this group, the effect sizes for the mediation analyses conducted with the stigmatized participants were not uniformly small. In addition, the analyses conducted with the non-stigmatized group, which was substantially larger, showed a similar range of effect sizes, suggesting that small sample size alone did not depress the power for the stigmatized group.

Although only 58 of the 293 doctoral students who responded to the survey self-identified as members of an underrepresented minority group, this number is consistent with a national sample of doctoral students. Moreover, Black, Latino, and Native American students were all represented in numbers higher than their national enrollment (see Table 1). It is important to remain cognizant of how small the *population* of doctoral students of color is and of the challenges this presents to recruiting from this group in large numbers. Future studies may wish to consider using a more targeted recruitment effort. Although recruiting from a specific institution, discipline, or organization might result in a sample that is less broad, targeting recruitment in this way focuses resources on the desired population and makes techniques like "snowball" recruitment possible.

Grouping of students. Future studies may wish to carefully consider whether doctoral students are examined by their stigma status or whether they are studied by racial/ethnic group. Each approach has its benefits and shortcomings. Examining doctoral students by stigma status can be useful given the small number of stigmatized doctoral students. As shown by the data for Asian American and Latino American students, however, it can also obscure important racial/ethnic differences within these

groups. Examining doctoral students by race/ethnicity attends to such possible differences, but can lead to negative comparisons across groups, particularly when the groups in question are Black, Latino, and Asian American students.

The fact that Asian American students are not underrepresented at either the graduate or undergraduate level often leads to comparisons between them and Black and Latino American students that are at best problematic and often invidious. For example, the model minority stereotype imposes an image of Asian American students as overachievers immune to the negative effects of racial discrimination. Coupled with their tendency to show lower perceptions of stigma than their Black and Latino American peers (see table 8) such stereotypes not only obscure the impact of stereotypes, prejudice, and discrimination on the academic experiences of Asian American students, but also further marginalize Black and Latino American students (Kawai, 2005; Martinez 2007; Wu 2005). It is therefore important for future studies to weigh how best to evaluate the experiences of these groups without comparing them in ways that reinforce negative stereotypes.

Need for longitudinal study. Future research should also consider a longitudinal approach to the study of the relationship between perceptions of stigma, mentoring support, peer support, and achievement potential. Doctoral study extends over several years and mentoring relationships are likely to change over time. Participants' levels of perceived mentoring support were compared across their level of study but no substantial differences emerged. However, other changes in mentoring relationships might be observed if the relationship was examined more broadly with time as a factor. In addition, following doctoral students over the course of their graduate study might

provide a better picture of how intention to complete and scholarly productivity change over time, as well as what other factors may predict actual degree completion.

Longitudinal study may also lead to a better understanding of the potential effects of perceptions of stigma on the experiences of stigmatized doctoral students. For example, longitudinal data could determine whether the perceptions of stigma reported by stigmatized participants working with mentors of color increased as result of their mentor's race. In addition, because reactions to perceived stigma, and by extension the negative consequences of those reactions, can intensify with time (Blascovich et al., 2000; Crocker, Major, & Steele, 1998), longitudinal data could be important to illuminating why Ph.D. completion among Americans of color has not increased along with their increased enrollment in doctoral programs.

Conclusion

The results revealed some interesting relationships and provided important data on the research questions posed. Data on research questions 1 and 2 showed that stigmatized and non-stigmatized participants do not show any significant differences in perceptions of mentoring support, regardless of race of mentor. However, stigmatized students working with mentors of color showed significantly higher perceptions of stigma than did stigmatized students working with White mentors.

Data on research questions 3, 4, and 5 showed that for stigmatized participants, perceptions of stigma and mentoring support do not interact in their effects on intention to complete. In contrast, perceptions of mentoring support fully mediated the relationship between perceptions of stigma and intention to complete for non-stigmatized students.

Results relevant to research question 6 showed that stigmatized and non-stigmatized doctoral students do show significant differences in their perceptions of stigma when examined by stigma status as well as by race/ethnicity. Data on research question 7 show that, regardless of race, doctoral students with no mentor show higher perceptions of stigma and lower achievement potential than do their counterparts with mentors.

Results relevant to research question 8 showed that all doctoral students perceive the greatest support from their same race peers, and that DSOC report greater support from peers of color than they do from White peers. Data on research questions 9 and 10 showed that the relationship between perceptions of stigma and intention to complete is partially mediated by peer support for stigmatized students but, for non-stigmatized students, the relationship between peer support and intention to complete is fully mediated by perceptions of stigma.

Although no research question was posed as to the effects of the interaction between mentoring support and peer support on achievement potential, examining this relationship also revealed interesting differences between stigmatized and non-stigmatized participants. For stigmatized participants, perceptions of mentoring support and perceptions of peer support did not interact in their effects on intention to complete. In contrast, for non-stigmatized students a significant interaction did emerge, and results suggested that for those with low perceptions of mentoring support peer support has a significant positive effect on intention to complete.

Overall these data show that the experiences of stigmatized and non-stigmatized doctoral students are in fact different. Thus, different models may need to be employed

when designing programs or interventions to provide support to the two groups. Moreover, the data suggest that for stigmatized students neither perceptions of mentoring support nor perceptions of peer support fully explain the negative relationship between perceptions of stigma and achievement potential. The models presented here may therefore be insufficient to explain why Ph.D. attainment of stigmatized students continues to lag behind that of their non-stigmatized peers.

By the time they reach the doctoral level, most stigmatized students have had years of formal education in which to develop adequate coping techniques that should prevent stigma attitudes *alone* from seriously impeding their academic success or interpersonal relationships. Perhaps some combination of perceptions of stigma and additional factors is depressing Ph.D. attainment among underrepresented minorities. Future studies should take perceptions of stigma, mentoring support, and peer support as pieces of a larger puzzle, and try to discern how their effects interact with other factors that may affect doctoral achievement. The full depth of the mentoring dynamic, changes over time, and socio-ecological factors, as well as the experiences of students who do not have mentors should all be considered as pieces of this puzzle. The future of our nation's intellectual diversity may depend on our ability to determine how these factors fit together and what can be done to increase the number of underrepresented minorities who attain the Ph.D.

Appendix A: Full list of original study hypotheses

Hypothesis 1a:	DSOC working with a mentor of color will report greater instrumental support from mentor than will those working with a White mentor.
Hypothesis 1b:	DSOC working with a mentor of color will report greater social support from mentor than will those working with a White mentor.
Hypothesis 2:	DSOC working with a mentor of color will report greater perceived similarity to their mentors than will those working with a White mentor.
Hypothesis 3:	DSOC working with a mentor of color will report greater compatibility with their mentors than will those working with a White mentor.
Hypothesis 4:	DSOC working with a mentor of color will report greater interpersonal comfort with their mentor than will those working with a White mentor
Hypothesis 5:	DSOC working with a mentor of color will report lower intergroup anxiety than will those working with a White mentor.
Hypothesis 6:	DSOC working with a mentor of color will report less discounting than will those working with a White mentor.
Hypothesis 7a:	RS-race will be negatively related to perceptions of instrumental support from mentor.
Hypothesis 7b:	RS-race will be negatively related to perceptions of social support from mentor.
Hypothesis 7c:	SC will be negatively related to instrumental support from mentor.
Hypothesis 7d:	SC will be negatively related to social support from mentor.
Hypothesis 8a:	Perceived similarity to mentor will mediate the relationship between RS-race and instrumental support.
Hypothesis 8b:	Perceived similarity to mentor will mediate the relationship between RS-race and social support.
Hypothesis 8c:	Perceived similarity to mentor will mediate the relationship between SC and instrumental support.
Hypothesis 8d:	Perceived similarity to mentor will mediate the relationship between SC and social support.

Hypothesis 9a: Compatibility with mentor will mediate the relationship between RS-race and instrumental support.

Hypothesis 9b: Compatibility with mentor will mediate the relationship between RS-race and social support.

Hypothesis 9c: Compatibility with mentor will mediate the relationship between SC and instrumental support.

Hypothesis 9d: Compatibility with mentor will mediate the relationship between SC and social support.

Hypothesis 10a: Interpersonal comfort with mentor will mediate the relationship between RS-race and instrumental support.

Hypothesis 10b: Interpersonal comfort with mentor will mediate the relationship between RS-race and social support.

Hypothesis 10c: Interpersonal comfort with mentor will mediate the relationship between SC and instrumental support.

Hypothesis 10d: Interpersonal comfort with mentor will mediate the relationship between SC and social support.

Hypothesis 11a: Intergroup anxiety will mediate the relationship between RS-race and instrumental support.

Hypothesis 11b: Intergroup anxiety will mediate the relationship between RS-race and social support.

Hypothesis 11c: Intergroup anxiety will mediate the relationship between SC and instrumental support.

Hypothesis 11d: Intergroup anxiety will mediate the relationship between SC and social support.

Hypothesis 12a: Discounting will mediate the relationship between RS-race and instrumental support.

Hypothesis 12b: Discounting will mediate the relationship between RS-race and social support.

Hypothesis 12c: Discounting will mediate the relationship between SC and instrumental support.

Hypothesis 12d: Discounting will mediate the relationship between SC and social support.

Hypothesis 13a: The negative effect of RS-race on scholarly productivity will be mediated by instrumental support.

Hypothesis 13b: The negative effect of SC on scholarly productivity will be mediated by instrumental support.

Hypothesis 14a: The negative effect of RS-race on intention to complete will be mediated by instrumental support

Hypothesis 14b: The negative effect of SC on intention to complete will be mediated by instrumental support

Hypothesis 15a: The negative effect of RS-race on scholarly productivity will be mediated by social support.

Hypothesis 15b: The negative effect of SC on scholarly productivity will be mediated by social support.

Hypothesis 16a: The negative effect of RS-race on intention to complete will be mediated by social support

Hypothesis 16b: The negative effects of SC on intention to complete will be mediated by social support.

Hypothesis 17: Peer support will be positively related to scholarly productivity.

Hypothesis 18: DSOC will report greater support from peers of color than from White peers.

Hypothesis 19: The proposed negative relationship between perceptions of stigma and scholarly productivity will be mediated by peer support.

Appendix B: Survey Measures

Mentoring functions scale (1 = not at all, 5 = to a very large extent)

Social support

1. To what extent has your mentor gone out of his/her way to promote your academic interests?
2. To extent has your mentor conveyed feelings of respect for you as an individual?
3. To what extent has your mentor conveyed empathy for the concerns and feelings you have discussed with him/her?
4. To what extent has your mentor encouraged you to talk openly about anxiety and fears that detract from your work?
5. To what extent has your mentor shared personal experiences as an alternative perspective to your problems?
6. To what extent has your mentor discussed your questions or concerns regarding feelings of competence, commitment to advancement, relationships with peers and supervisors or work/family conflicts?
7. To what extent has your mentor shared history of his/her career with you?
8. To what extent has your mentor encouraged you to prepare for the next steps?
9. To what extent has your mentor served as a role model?
10. To what extent has your mentor displayed attitudes and values similar to your own?

Instrumental support

11. To what extent has your mentor helped you finish assignments/tasks or meet deadlines that otherwise would have been difficult to complete?
12. To what extent has your mentor protected you from working with other faculty, lecturers, or staff before you knew about their likes/dislikes, opinions on controversial topics, and the nature of the political environment?
13. To what extent has your mentor given you authorship on publications?
14. To what extent has your mentor helped you improve your writing skills?
15. To what extent has your mentor helped you with a presentation (either within your department, or at a conference)?
16. To what extent has your mentor explored career options with you?

Networking support

17. To what extent has your mentor given you challenging assignments that present opportunities to learn new skills?
18. To what extent has your mentor helped you meet other people in your field at the University?
19. To what extent has your mentor helped you meet other people in your field elsewhere?

Perceived similarity to mentor (1 = strongly disagree, 6 = strongly agree)

1. My mentor and I see things in much the same way.
2. My mentor is similar tome in terms of our general outlook and perspective.
3. My mentor and I analyze problems in a similar way.
4. My mentor and I have similar values about work.
5. My mentor and I have similar values about life in general.
6. My mentor and I think alike in terms of coming up with a similar solution for a problem.
7. In important ways, my mentor and I are more similar than dissimilar.

Interpersonal comfort with mentor (1 = strongly disagree, 6 = strongly agree)

1. I feel I can talk openly to my mentor.
2. There is a great deal of open communication between me and my mentor.
3. I feel I can discuss personal issues with my mentor
4. I trust my mentor.
5. I feel I can be myself around my mentor.
6. I feel close to my mentor.
7. I feel comfortable interacting with my mentor outside of school.

Compatibility with mentor (1 = strongly disagree, 6 = strongly agree)

1. I am satisfied with my relationship with my mentor.
2. I effectively utilize my mentor to help me develop.
3. My mentor meets my expectations.
4. I feel satisfied with my mentor.
5. I like my mentor very much as a person.
6. I think my mentor would make a good friend.
7. I enjoy spending time with my mentor.
8. I can get my mentor to meet with me.
9. I can resolve disagreements with my advisor.

Intergroup anxiety (1 = not all, 10 = to a very large extent)

If you were the only member of your racial/ethnic group interacting with people from a different racial/ethnic group (e.g. working on a project with them, talking, having a meeting) how would your feel compared to occasions when you are interacting with people from your own group? For example, how would you feel if you were the only Latino student interacting with a group of non-Latino students?

1. I would feel certain (R)
2. I would feel awkward
3. I would feel self-conscious
4. I would feel happy (R)
5. I would feel accepted (R)
6. I would feel confident (R)
7. I would feel irritated
8. I would feel impatient
9. I would feel defensive
10. I would feel suspicious
11. I would feel careful

Discounting (1 = strongly disagree, 7 = strongly agree)

1. I feel that academic requirements in my department fairly assess my abilities as a doctoral student. (R)
2. In general, I feel that the academic requirements in my department are a good measure of my competence as a graduate student. (R)
3. Most academic requirements in my department have nothing to do with being a good doctoral candidate.
4. I feel that the academic requirements in my department are definitely biased against me.

Sensitivity to race-based rejection

(Concern: 1 = very unconcerned, 6 = very concerned; Likelihood: 1 = very unlikely, 6 = very likely)

Read the following scenarios, and answer the questions after each. As you do this, think about your experiences as a member of your racial/ethnic group. For example if you identify as African American, think about your experiences as an African American.

1. Imagine that you are in class one day, and the professor asks a particularly difficult question. A few people, including yourself, raise their hands to answer the question.
    a. How concerned would you be that the professor would NOT pick you because of your race?
    b. How likely do you think it would be that the professor would NOT pick you because of your race?

2. Imagine that you are in a pharmacy, trying to pick out a few items. While you're looking at the different brands, you notice one of the store clerks glancing your way.
    a. How concerned would you be that the clerk would treat you poorly because of your race?
    b. How likely do you think it would be that the clerk would treat you poorly because of your race?

3. Imagine you have just completed a job interview over the telephone. You are in good spirits because the interviewer seemed enthusiastic about your application. Several days later you complete a second interview in person. Your interviewer informs you that they will let you know about their decision soon.
    a. How concerned would you be that you would NOT get the job because of your race?
    b. How likely do you think it would be that you would NOT get the job because of your race?

4. Imagine that a new assistant dean is selecting graduate students for a scholarship fund that you really want. He has only one scholarship left and you are one of several students that are eligible for this scholarship.
    a. How concerned would you be that the dean would not select you because of your race?
    b. How likely do you think it would be that the dean would not select you because of your race?

5. Imagine you have just finished shopping, and you are leaving the store carrying several bags. Its closing time, and several people are filing out of the store at once. Suddenly, the alarm begins to sound, and a security guard comes over to investigate.
    a. How concerned would you be that the security guard would stop you because of your race?
    b. How likely do you think it would be that the security guard would stop you because of your race?

6. Imagine that you are in a restaurant, trying to get the attention of your waitress. A lot of other people are trying to get her attention as well.
    a. How concerned would you be that the waitress would ignore you because of your race
    b. How likely do you think it would be that the waitress would ignore you because of your race?

7. Imagine you're driving down the street, and there is a police barricade just ahead. The police officers are randomly pulling people over to check drivers' licenses and registrations.
    a. How concerned would you be that the officers would stop you because of your race?
    b. How likely do you think it would be that the officers would stop you because of your race?

8. Imagine that you are standing in line for the ATM machine, and you notice the woman at the machine glances back while she's getting her money.
    a. How concerned would you be that the woman is nervous because of your race?
    b. How likely do you think it would be that the woman is nervous because of your race?

Stigma consciousness

For each statement below think about your experiences as a member of your racial/ethnic group. For example if you identify as Asian American, think about your experiences as an Asian American. Then, rate how much you agree or disagree with each statement using the scale below (1 = strongly disagree, 6 = strongly agree)

1. Stereotypes about my group have not affected me personally. (R).
2. I never worry that my behaviors will be viewed as stereotypical of my group. (R).
3. When interacting with people outside my group, I feel like they interpret all my behaviors in terms of the fact that I am a member of my group.
4. Most people outside my group do not judge members of my group on the basis on their race. (R).
5. My being a member of my group does not influence how people outside my group act with me. (R).
6. I almost never think about the fact that I am a member of my group when I interact with people outside my group. (R).
7. My being a member of my group does not influence how people act with me. (R).
8. Most people outside my group have a lot more prejudiced thoughts than they actually express.
9. I often think that people outside my group are unfairly accused of being prejudiced. (R).
10. Most people outside my group have a problem viewing members of my group as equals.

Perceptions of race-related discrimination

Read each statement below, then using the scale provided rate how much you agree or disagree with each statement (1 = strongly disagree, 6 = strongly agree).

1. The racial/ethnic climate in my department is generally tense.
2. My department fosters respect for different racial and ethnic groups. (R)
3. I feel students in my department discriminate against me because of my race.
4. I feel my department values diversity. (R)
5. My department discriminates against students from some racial/ethnic groups.
6. Faculty in my department hold different academic expectations for students of color compared to majority White students.
7. I feel faculty in my department discriminate against me because of my race.
8. Faculty in my department provide different levels of academic assistance to students of color compared to majority White students.
9. In my department, a student's race or ethnicity has no effect on their opportunity to complete their degree. (R)

Intention to complete the degree (1 = strongly disagree, 6 = strongly agree)

1. I feel I am making timely progress toward my degree.
2. I sometimes feel I will never complete my degree (R).
3. I see many obstacles preventing me from completing my degree (R).
4. I am confident in my ability to complete my degree.
5. I often worry that I will not complete my degree. (R)
6. I am determined to complete my degree.

Scholarly productivity

Check any of the following activities in which you have been involved while enrolled as a graduate student in your department of study.

Have you…

1. Been asked by a fellow student to critique his/her work?
2. Held membership in a professional organization?
3. Asked a fellow student to critique your work?
4. Attended convention or conference of a professional organization?
5. Performed research of your own which was not required by your program or studies?
6. Called or written to a scholar at another institution to exchange views on scholarly work?
7. Written, alone or with others, a grant proposal?
8. Authored, alone or with others, an unpublished manuscript (not part of a course)?
9. Authored, alone or with others, a paper or chapter submitted for publication?
10. Presented a paper on a panel or in a symposium at a conference or convention?
11. Authored, alone or with others, a paper or chapter accepted for publication?
12. Participated on a committee in your department or at your institution?
13. Held an office in a professional organization or society?
14. Participated on a discussion panel at a conference or convention?
15. Presented a poster at a conference or convention?
16. Given a talk at your own or another university?
17. Presented at conference at your own or another university?
18. Reviewed alone or with others a manuscript for a peer-reviewed journal?
19. Written a column for a professional newsletter?
20. Been a student editor of a newsletter or journal?

Support for peers in the department

This set of questions asks about relationships with GRADUATE STUDENTS IN YOUR DEPARTMENT OF STUDY. Read the questions then, answer using the scale provided.

Instrumental functions (1 = Not at all, 5 = To a very large extent)

1. To what extent do other students in your department help you to understand department requirements?
2. To what extent do other students in your department provide you with academic help?
3. To what extent has interacting with other students in your department helped your research?
4. To what extent has interacting with other students in your department helped you to be more involved in professional activities?
5. To what extent has interacting with other students in your department enhanced your scholarly productivity?

Psychosocial functions (1 = strongly disagree, 6 = strongly agree)

6. Other students in my department provide social support that helps me to cope with the challenges of graduate school.
7. Other students in my department provide emotional support that helps me to cope with the challenges of graduate school.
8. Interacting with other students in my department reduces my anxiety about school.
9. Interacting with other students in my department helps me cope with the stress of graduate school.
10. Other students in my department are important to my success in graduate school.

Amount of peer support

Think about all the support you get from your friends and acquaintances in graduate school (either in your department, or in a different department or at a different institution) in terms of percent. Divide 100% of your support among the groups listed below. No matter what percentage of support you attribute to each group, the final number should equal 100%.

1. students from my own race/ethnicity_____
2. students from a different race/ethnicity than me (non-White students/ students of color)_____
3. students from a different race/ethnicity than me (White students) _____

Appendix C: Exploratory Factor Analysis Results for Mentoring Functions Scale

	Factor Structure 1[a]			**Factor Structure 2**[b]	
	Factor 1	Factor 2	Factor 3	Factor 1	Factor 2
Social support items [c]					
1	.72	**.75**	.59	**.77**	.75
2	.52	**.89**	.47	**.83**	.55
3	.44	**.90**	.46	**.83**	.47
4	.42	**.72**	.67	**.78**	.48
5		.70	**.78**	**.81**	.45
6	.44	.67	**.74**	**.77**	.51
7	.45	.67	**.79**	**.79**	.53
8	**.69**	.68	.59	**.72**	.72
9	**.72**	.71	.65	**.76**	.75
10	.57	**.80**	.48	**.77**	.59
Instrumental items					
11	**.74**	.45	.62	.56	**.77**
12	.57		**.71**	.46	**.62**
14	**.83**	.45	.43	.48	**.82**
15	**.71**				**.70**
16	**.79**	.54	.57	.61	**.80**
Networking items					
17	**.72**	.44			**.68**
18	**.81**	.47	.59	.55	**.82**
19	**.81**	.44	.49	.50	**.81**

[a] The three factors shown in Factor Structure 1 explained 66.3% of the variance. The first factor explained 51.88% of this variance and had an eigenvalue of 9.34. The second factor explained 9.53% of this variance and had an eigenvalue of 1.72. The third factor explained 4.92% f the variance and had an eigenvalue of .885.

[b] The three factors shown in Factor Structure 2 explained 61.41% of the variance. The first factor explained 51.88% of this variance and had an eigenvalue of 9.34. The second factor explained 9.53% of this variance and had an eigenvalue of 1.72.

[c] These item numbers correspond to the item numbers used in Appendix A and the full items may be found in that appendix. Boldface indicates the factor on which a given item loaded above .40. Item loadings under .40 are not shown.

Appendix D: Confirmatory Factor Analysis Results for RS-race and SC Scales

Table D1. Factor models for SC and RS-race together.

	Four Factor Model [a]				**Two Factor Model** [b]	
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 1	Factor 2
Stigma consciousness items						
1	.72				.72	
2	.58				.57	
3		.57			.28	
4		.59			.74	
5	.90				.91	
6	.72				.71	
7	.93				.92	
8		.70			.45	
9	.22				.21	
10		.80			.48	
Sensitivity to race-based rejection items						
1			.60			.42
2				.72		.75
3			.88			.72
4			.82			.60
5				.91		.88
6				.78		.81
7				.75		.71
8				.80		.76

[a] $X^2(129) = 256.26$, $p \leq .001$, RMSEA = 0.10.
[b] $X^2(134) = 400.89$, $p \leq .001$, RMSEA = 0.14.

Table D2. Two-factor model for SC.

	Factor 1	Factor 2
Stigma consciousness items		
1		.10
2		.10
3	.16	
4		.18
5		.09
6		.12
7		.05
8	.02	
9		.34
10	.13	

$X^2(19) = 67.37$, $p \leq .001$, RMSEA = 0.10.

Table D3. Two-factor model for RS-race.

	Factor 1	Factor 2
Sensitivity to race-based rejection items		
1	.59	
2		.73
3	.90	
4	.80	
5		.91
6		.79
7		.73
8		.80

$X^2(19) = 64.01$, $p \leq .001$, RMSEA = 0.15.

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