The Role of Altruistic Values in Motivating Underrepresented Minority Students for Biomedicine

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Thoman, D.B., Brown, E.R., Mason, A.Z., Harmsen, A.G., & Smith, J.L. (in press). The role of altruistic values in motivating underrepresented minority students for biomedicine. *BioScience*. doi: 10.1093/biosci/biu199

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Keywords: science education; research motivation; broadening participation; underrepresented minority students; science interest

Abstract

Understanding how cultural values influence undergraduate students' science research experiences and career interest is important for efforts to broaden participation and diversify the biomedical research workforce. Results from our prospective longitudinal study demonstrated that underrepresented minority student (URM) research assistants who see the altruistic value of conducting biomedical research feel more psychologically involved with their research over time which, in turn, enhances their interest in pursuing a scientific research career. These altruistic motives are uniquely influential to URM students and appear to play an important role in influencing URM students' interest in scientific research careers. Further, seeing how research can potentially impact society and help one's community does not replace typical motives for scientific discovery (e.g., passion, curiosity, achievement), which are important for all students. These findings point to simple strategies for educators, training directors, and faculty mentors to improve retention among undergraduate URM students in the biomedically related sciences.

The role of altruistic values in motivating Underrepresented Minority Students for Biomedicine

Significant disparities exist in employment within scientific fields by race and ethnicity. For example, Hispanics, African Americans, and American Indians collectively represent 26% of the U.S. population, but only represent 10% of the science and engineering workforce (NSF 2014). College students from these ethnic backgrounds that are traditionally underrepresented in science (or underrepresented minority (URM) students, as defined by NSF) are initially choosing to pursue undergraduate science majors at higher rates than in the past (from 2002 to 2012 Hispanics increased from 36.4% to 41.6%, African Americans from 35.5% to 36.4%, and Native Americans from 30.6% to 33%; NSF 2014). However, this initial interest has not translated into matriculation at the undergraduate or graduate level (Ginther et al. 2009) and is certainly not poised to meet national scientific workforce diversity goals (NSF 2008).

Because of high attrition rates in undergraduate science majors, recent national reports recommend focusing on retention efforts as the most effective strategy to build and diversify the scientific workforce (PCAST 2012). Although national data suggest that lower pre-college math and science preparation may account for much of the increased attrition between URM and White students during their first years of college (NCES 2013), there is also evidence for a disproportional URM dropout rate at the later stages of education (Garrison 2013). This is especially troubling, as these students have successfully completed the foundational math science coursework. Our study focuses on this later stage of undergraduate education, examining the role of a biomedical research experience in promoting motivation for and ultimately persistence within the discipline (McGee et al. 2012, Graham et al. 2013). Specifically, we study research and research career motivation among students who have already demonstrated skills and a level of achievement and scientific sophistication to be accepted by a faculty member as student researchers in biomedical faculty laboratories. The research experience is a critical juncture in undergraduate student decision-making processes on whether or not to pursue graduate-level

research and research careers (Graham et al. 2013).

How do we increase retention among URMs pursuing biomedical research-related training and careers? There have been various approaches proposed to this question. Traditional approaches have attempted to identify predictors of achievement that were "missing" in URMs. National funding for training programs was, in turn, directed to supplement these assumed missing attributes (e.g., resources, mentorship, rewards, or skill and confidence training), without specific attention to the cultural context in which these students live and learn. In contrast, newer approaches emphasize the importance of cultural influences that shape many URM student experiences and seek to understand what aspects of science education and science research training facilitate, or hinder, career interests of students from groups who have not traditionally been part of mainstream science (Harper 2010). This new approach subtly shifts attention away from changing URM students to be more like majority White students towards ideas of how to change science education and research training. It is supported by the leadership of the NIH Training, Workforce Development, and Diversity Division (NIGMS TWD 2013), and derives from the growing recognition that science and science education are not value- or culture-free, but instead may inadvertently perpetuate the status quo (Lee and Luykx 2007, Boutte et al. 2010). In this paper, we focus on one possible cultural influence that may affect some URM students' motivation for biomedicine; namely the cultural importance of undertaking research that involves "giving back" and "helping others" (called altruistic goals, which we consider more closely below).

To identify whether and how some cultural influences might increase or decrease scientific research interest among URM students, and why these same factors may differ from those that predict research interest among majority White students, we derive study predictions from Goal Congruity Theory (Diekman et al. 2010). This theory suggests that career motivation derives, in part, from the perceived congruity between individuals' most highly valued career goals and the degree to which a given career is perceived to afford (or fulfill) these goals. This

theory can not only be used to predict career interest of specific individuals by examining their individual-level profiles of goals and perceived goal affordances, but it can also be used to predict group-level differences in career interest in cases where groups differ in mean values of goal importance or in perceptions of whether a career is more or less likely to afford those goals. For example, research shows that women, who tend to more highly value the goals of working with and helping others (social and altruistic goals) than men, report greater interest in science careers when they perceive greater social and altruistic goal affordance in science and that gender differences in science career interest can be partially accounted for by differences in goal congruity (Morgan et al. 2001, Weisgram and Bigler 2006, Diekman et al. 2010).

Accordingly, cultural differences in career values between students from URM backgrounds and majority White backgrounds may lead to lower perceived congruity for URMs than Whites in science research careers. Empirical data suggest that although students from URM backgrounds value intrinsic motives (e.g., curiosity, enjoyment of problem solving, passion for discovery) for pursuing careers as much as White students, their career interests are also more likely to be influenced by highly altruistic cultural values (Johnson 2002; Smith et al., forthcoming). This is concordant with Latino, Native American, and African American cultures placing greater significance on the altruistic value of helping others through one's work, particularly contributing to one's community (Martin and Martin 1985, Harper 2005, Fryberg and Markus 2007, Torres 2009, Villaruel et al. 2009, Mohatt et al. 2011).

This cultural orientation toward valuing altruistic career goals may be problematic for URM students in science because scientific research careers are generally perceived as focused on the individual scientist and on individual achievement, not on altruistic goals (Morgan et al. 2001; McGee and Keller 2007; Weisgram et al. 2010; Diekman et al., 2010; Diekman et al., 2011; Gibbs and Griffin 2013). Most science educators and education materials give little attention to developing altruistic connections for students (Harding 2006). Further, successful assimilation into scientific culture typically requires focus on the narrow, exclusive, and

objective disciplinary culture (Carlone 2003). Influenced by social stereotypes (imparted by historical media portrayals) about scientists as older White males working in isolation on theoretical laboratory research, detached from any community outside of science (Barman 1997; Rahm & Charbonneau 1997), undergraduate students' views of science careers are likely to be incongruent with altruistic career goals. This broad perception of science research careers is incongruent with URM students' cultural value toward careers that afford altruistic opportunities.

Support for the importance of altruistic goals in science career interest is highlighted in a survey of 201 high-achieving alumni of an undergraduate biology enrichment program for URMs (Villarejo et al. 2008). Among a much broader range of questions about undergraduate research experience, advising, career paths, and career goals, these alumni were asked to select, from a series of hypothetical statements, what attributes would make a career as a Ph.D. scientific researcher appealing for them. The two most highly selected attributes for these URM alumni were satisfaction and interest in doing science (selected by 63% of alumni) and knowing that scientific knowledge they created would help members of their community (selected by 66% of alumni). The authors further report that in follow-up interviews with approximately half of the alumni who left the scientific research career path, several cited "a desire to help others in a more direct manner" as a reason why they chose an alternative career path (Villarejo et al. 2008). Although the primary focus of this study with URM program alumni was not the role of altruistic goals or affordance perceptions, this exploratory analysis of appealing attributes and reasons for leaving the scientific research path provides initial support for the importance of altruistic goals in science research interest.

Though important, the conclusions that can be drawn from this study are limited and further studies are necessary that incorporate two key design elements. First, a prospective study design is needed to counterbalance the limitations of retrospective self-reports and interview data. Second, multivariate quantitative analysis is needed to distinguish between effects of altruistic goal affordance perceptions from other goals on career interests. Scientific research and

research careers are motivated by multiple goals, including passion or curiosity (intrinsic) and money and prestige (extrinsic) goals, and multivariate statistical analyses are required to explicate potentially over-determined effects of multiple goals on career interests that emerge in interviews or correlational analyses from data collected at a single point in time. A multivariate approach permits the unique effects of altruistic affordances to be isolated, while controlling for perceptions of whether research affords these intrinsic and extrinsic values.

In addition to building upon prior work with these critical methodological features, we also examine a new theoretical link to explain why making altruistic connections to one's research may predict greater science career interest. Greater perceived congruity between one's valued goals and what the situation (or career) affords is posited to create a deeper psychological experience of involvement in one's research work. At an extreme, psychological involvement may be experienced as "flow" (Csikszentimhalyi 1990), such that the student feels completely immersed in her or his research. On a continuum, students may feel more or less psychologically involved in their research, and variability across students in psychological involvement reliability predicts subsequent science interest (Smith et al. 2007). Thus, if a student highly values altruistic goals and perceives her research work as more likely to afford those goals, the resulting congruity should lead to greater feelings of psychologically involvement in her research, which should in turn predict greater science research career interest.

The present study is designed to address the research question: does variability across students' perceptions of altruistic affordances for their research predict greater psychological involvement in their research laboratory and scientific career interest, even when accounting for multivariate effects of intrinsic and extrinsic affordance perceptions? By longitudinally evaluating the perceptions of a diverse sample of undergraduate students working in faculty biomedical research laboratories, this study prospectively tests whether perceptions of undertaking research that affords altruistic goals (at Time 1) leads to greater psychological involvement in that research and career interest later (at Time 2, 10-12 weeks after the initial

survey). We predict that URMs will feel less psychologically involved in their research and lose interest in continuing a science research career if they fail to see the benefits of their research activities to others and in particular to their community. Alternatively, when URM students do make these altruistic connections, we predict that they will be more likely to maintain high psychological involvement with their research over time, which enhances their interest in research careers.

Study Participants and Procedures

Participants were 337 undergraduate students (46% female; median age = 22) working in 44 different faculty biomedical research laboratories at two universities and 7 tribal colleges. Of these research assistants (RAs), 100 were classified as being from an URM group (38 Latinos, 31 American Indian or Alaska Natives, 9 African American, 6 Pacific Islanders, and 16 were of mixed ethnicity including at least one of the URM groups), and 165 were classified as being White. With Institutional Review Board approval for human subjects research at all data collection sites, all student RAs were recruited via their faculty research mentors for a survey study of undergraduate research experiences. Participants were told that the purpose of the study was to "examine the relationship among students Research Assistants' everyday experiences, perceptions of research, and future career motivations." The analysis covered one academic semester. At Time 1 (5-6 weeks into the semester) all students completed an initial online survey, that probed measures of beliefs about whether or not the research they were conducting in the laboratory afforded (or fulfilled) three types of goals: altruistic, intrinsic, and extrinsic. Simple demographic information, including gender, ethnicity, and year in school was also collected. The Time 2 survey, containing measures of psychological involvement in their research laboratory and science research career interest, was administered approximately 10 weeks later, at the end of the semester. One hundred seventy five (64 URM; 111 White) of the initially recruited students participated in the Time 2 survey. Missing data analysis confirmed that those who completed the Time 2 survey did not differ from those who did not complete the second survey on any of the

study variables collected at Time 1, including perceptions of altruistic affordances, psychological involvement in the research laboratory, or career interest. Additional details on materials, methods, and analysis are available in the supplemental information appendix.

Analyses and Results

The data were analyzed in SPSS, using multiple regression analyses with dummy codes representing participant ethnicity (0 = White, 1 = URM), a continuous variable representing the altruistic affordance measure, and the multiplicative interaction term created from participant ethnicity and altruistic affordance. The focal predictor was the interaction between participant ethnicity and altruistic affordance. We predicted that this interaction term would be significant and positive, such that greater perceived altruistic affordances in one's research would predict greater research laboratory psychological involvement and science career interest for URMs. For majority White RAs this pattern was not expected to be significant. We report standardized regression estimates (β), which allow for comparisons of predictor strength on a standardized metric, for the key study variables in the main text below. More detailed results appearing in the supplemental information appendix also include unstandardized regression estimates (*b*) and their standard errors for all terms in the regression models.

As predicted, a significant positive interaction emerged between participant ethnicity and altruistic affordance at Time 1 for research laboratory psychological involvement (β = .20, p = .04) and research career interest (β = .24, p = .01) 10 weeks later, such that for URMs, greater altruistic affordance predicts greater psychological involvement (β = .37, p = .02) and greater career interest (β = .39, p = .006). For White students, altruistic affordance is unrelated to psychological involvement (β = .003, p = .97) and career interest (β = -.03, p = .73). To illustrate this pattern, we computed predicted values (Ŷs) for URM and White students at representative high and low values (one standard deviation above and below the mean) from the regression equations using the unstandardized coefficients (see Figure 1). Further, to demonstrate the scope of this effect for URM students, we computed odds ratios by dichotomizing both dependent

variables (laboratory psychological involvement and career interest) as well as the altruistic affordance predictor variable into high/low categories with a mean split, and repeating the multiple regression analyses as a logistic regressions. These results show that URM students are 3.32 times more likely to have high (v. low) laboratory psychological involvement and 2.55 times more likely to have high (v. low) career interest if they perceived high (v. low) altruistic affordance in research.

To determine whether perceived altruistic affordance uniquely contributes to research laboratory psychological involvement and science research career interest above and beyond other important goals, we added to the regression model both intrinsic and extrinsic affordances. As seen in Tables S4 and S5, even when controlling for effects of intrinsic and extrinsic affordances, the results supported the analyses reported above, demonstrating that altruistic affordance perceptions positively predict research psychological involvement and research career interest for URM, but not majority White students. Additionally, although intrinsic and extrinsic affordances were included in the analysis primarily as control variables to test the research question about the unique effects of altruistic goals, it is worthwhile to note that greater intrinsic affordance perceptions predicted greater research laboratory psychological involvement (see Table S4) and greater extrinsic affordances uniquely predicted greater research career interest (see Table S5). Additional detail on this analysis is provided in the supplemental information appendix.

Next, to examine the influential process predicting effects on science research career interest, we tested a mediated moderation model, whereby laboratory psychological involvement (at Time 2) was predicted to mediate the effect of altruistic affordance (at Time 1) on science career interest (at Time 2) for URM, but not White students. We utilized the computational tool PROCESS (Hayes 2013) as a SPSS macro utility to estimate the indirect effects of altruistic affordances on career interest via psychological involvement for URM and White students, respectively. Results support the complete mediated moderation hypothesis. A significant positive

indirect effect of altruistic affordance on science career interest through laboratory psychological involvement was found for URMs, as the 95% bias corrected bootstrap confidence interval (.02 to .42) was above zero. For White students, however, this indirect effect was not significant, as the 95% bootstrap confidence interval (-.10 to .09) contained zero.

Discussion

Our results demonstrate that URM students who recognize that their research fulfills altruistic goals of helping others and giving back to the community are more psychologically involved in their research which, in turn, leads to greater interest in pursuing science research careers. Thus, students from cultural backgrounds that traditionally place high value on helping others through work can be retained in science when their research experience embraces this cultural strength. These altruistic motives appear to be important to these students in addition to, not instead of, the intrinsic and extrinsic drivers that are critical for all emerging scientists (McGee and Keller 2007).

Previous science education intervention research suggests that all students benefit from activities that increase the relevance (or utility value) of science to their everyday lives (Hulleman et al. 2009, Hulleman et al. 2010), and such interventions targeted at parents of high school students also increase their children's participation in math and science (Harackiewicz et al. 2012). Our findings suggest that that this influence is not equal across ethnic groups and that establishing this particular aspect of utility value, altruistic societal relevance of research, is particularly beneficial in promoting persistence in science for URM students. Inversely, consideration must be given to the potential negative influence of stereotypical images of disconnected scientists on the recruitment and retention of URM students. For example, even well- intentioned mentors who advocate that the main purpose for science research is pure intellectual curiosity may inadvertently hinder the scientific interest of a URM student by failing to capitalize on an important motivational factor for retaining URM students. By recognizing the importance of this motivational factor, mentors may help in promoting retention of URM students

in the sciences without changing the nature of the scientific endeavor or the content of the research experience. Such altruistic connections could be made by science educators or research training programs/mentors assigning students individual or group projects that require them to identify the societal or communal benefits of their laboratory experiences in a personal and culturally meaningful way.

National agencies, such as NSF and NIH, already place high importance on their funded projects translating specific research objectives to broader impacts. However, during the formative stages of their research experience, students are unlikely to fully understand the broader implications and significance of their research duties. A simple approach would be for educators and mentors to share the translational impact statements with students to help them understand the possible long-range significance and benefits of the research. Such efforts require no additional money, just recognition that a personal investment in a student and support for her/his culturally-connected values can make a meaningful impact in diversifying the biomedical workforce.

Acknowledgements

Data collected for this study and preparation of this manuscript was supported in part by grant 1R01GM098462-01 from the National Institute of General Medical Science. Any opinions, findings, and conclusions or recommendations expressed in this material are our own and do not necessarily reflect the views of the National Institutes of Health. We also thank Justin Chase, Katherine Lee, Gregg Muragishi, and Lisa Zazworsky for their invaluable contributions to this project. Portions of these data were also presented at the Understanding Interventions to Broaden Participation in Research Careers conference in May 2014, Baltimore, MD.

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Figure 1

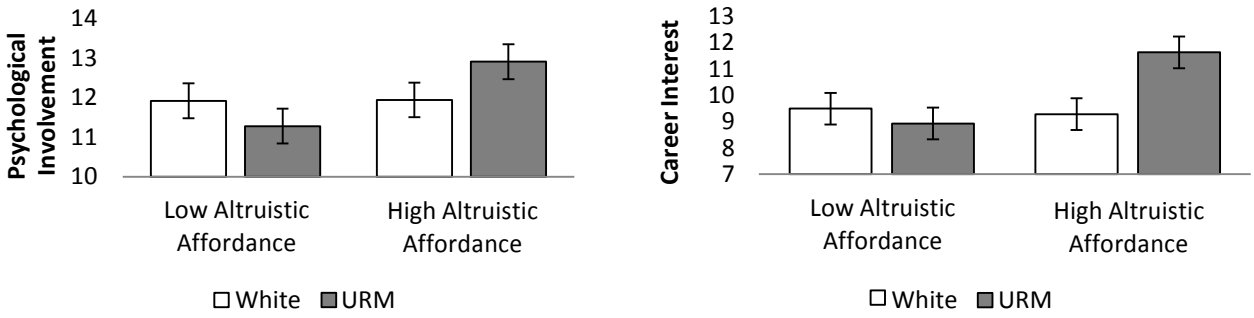
Psychological Involvement
14
13
12
11
10
Low Altruistic Affordance
High Altruistic Affordance
White
URM
Career Interest
13
12
11
10
9
8
7
Low Altruistic Affordance
High Altruistic Affordance
White
URM

Figure 1. Psychological involvement in the research laboratory (left) and research career interest (right) as predicted by student ethnicity and perceived altruistic affordance. Predicted values are computed from the multiple regression equation for the interaction between student ethnicity (URM v. White) and altruistic affordance (low = -1 SD, high = +1 SD) on psychological involvement and career interest. Error bars represent ± 2 SEM (0.22 for psychological involvement and 0.30 for career interest).

Supplementary Information Appendix

Measures

Predictor variables: Time 1. Participants responded to statements (modified from Johnson 2002) about how much they valued altruistic, intrinsic, and extrinsic goals in their career. To measure perceptions of research laboratory affordances, these statements were then repeated, this time framed as the extent to which participants perceived the research they were doing in their faculty's laboratory as fulfilling altruistic, intrinsic, and extrinsic goals. Statements were rated on scales ranging from 1(*not at all*) to 5(*very much*). Table S1 presents the items and reliabilities for each scale. Because different numbers of items comprise each of the work goals and affordance variables, means for these variables are presented as averages rather than sum scores, in order to make these means comparable on the same 1-5 scale rating metric.

Dependent variables: Time 2. At Time 2 participants responded to statements about their psychological involvement in a research laboratory (Smith et al. 2007) on scales ranging from 1(*strongly agree*) to 4(*neither agree nor disagree*) to 7(*strongly agree*). Participants also responded to statements about their science career interest (Carroll et al. 2009) on scales ranging from 1(*never*) to 3(*sometimes*) to 5(*always*). Table S2 presents the items and reliabilities for each scale.

Results

Testing the values assumption. Our cultural model assumes that URM students report greater valuing of altruistic science work goals than White students, but that all students highly value intrinsic science work goals. Thus, to test this assumption we compared mean ratings between URM and White students on the three work values: altruistic, intrinsic, and extrinsic. As predicted, altruistic goals were more highly valued by URMs (M = 4.41, SD = .86) than Whites (M =4.19, SD = .70, p = .03, d = .27) and intrinsic science work goals were valued similarly (not statistically different) among URMs (M =

4.47, SD = .51) and Whites (M = 4.35, SD =.48). Extrinsic science work goals were also more highly valued by URMs (M = 3.84 SD = .81) than Whites (M = 3.42, SD = .87, p = .001, d = .48). Notably, for both URM and White students, intrinsic science values were rated as most important. For White students, intrinsic goals were rated considerably more important than altruistic or extrinsic goals. However, for URMs, altruistic goals were rated as highly as intrinsic science work goals.

Examining effects of altruistic affordances on research laboratory psychological involvement and scientific career interest. To test whether greater perceived altruistic affordances in the laboratory predicts research laboratory psychological involvement and career interest, we utilized multiple regression. Each outcome measure (psychological involvement and research career interest) was separately regressed onto a model that included altruistic affordance and a dummy code variable that indicated participant ethnicity (URM = 1; White = 0). A multiplicative interaction term was also created with these two variables, after the continuous altruistic affordance measure was centered (Cohen et al. 2003). To interpret significant interaction effects from these analyses, we computed simple regression slopes for URM and White students. We also computed predicted values (Ŷs) for URM and White students at representative high and low values (one standard deviation above and below the mean) from the regression equations using the unstandardized coefficients (see Figure 1).

As predicted, a significant positive interaction emerged between student ethnicity and perceiving that research fulfills altruistic goals for research laboratory psychological involvement ($\beta = .20$, $p = .04$) and career interest ($\beta = .24$, $p = .01$). To interpret this interaction, simple slope analyses reveal that for URMs, greater altruistic affordance predicts greater laboratory psychological involvement ($\beta = .37$, $p = .02$) and greater career interest ($\beta = .39$, $p = .006$). For White students, altruistic affordance is unrelated to laboratory psychological involvement ($\beta = .003$, $p = .97$) and career interest ($\beta = -.03$, $p = .73$). The predicted values from the regression equation indicate that URM students who perceived high levels (one standard deviation above the mean) of altruistic affordances in their research reporter greater psychological involvement in their research laboratory and greater career interest ($\hat{Y}_{Involvement} = 12.91$; $\hat{Y}_{Interest} = 11.62$) than URM students who reported low (one standard deviation below the mean) perceived altruistic affordances ($\hat{Y}_{Involvement} = 11.28$; $\hat{Y}_{Interest} = 8.92$), whereas White students reported similar levels of laboratory psychological involvement and career interest no matter whether they had high altruistic affordances ($\hat{Y}_{Involvement} = 11.94$; $\hat{Y}_{Interest} = 9.27$) or low altruistic affordances ($\hat{Y}_{Involvement} = 11.94$; $\hat{Y}_{Interest} = 9.27$). Complete results from these regression models are presented as Step 1 in Table S4 (research laboratory psychological involvement) and Table S5 (research career interest).

To further demonstrate the extent of this effect for URM students, we computed odds ratios by dichotomizing both dependent variables (laboratory psychological involvement and career interest) as well as the altruistic affordance predictor variable into high/low categories with a mean split, and repeating the multiple regression analyses as a logistic regressions. Compared to the multiple regression analyses, no new statistical information regarding hypothesis testing is obtained from this analysis, but coefficients in the logistic model can be more meaningfully interpreted as odds ratios. Results suggest that URM students were 3.32 times more likely to have high (v. low) psychological

involvement in their research laboratory and 2.55 times more likely to have high (v. low) career interest if they perceived high (v. low) altruistic affordance. For majority White students, consistent with the non-significant results from the multiple regression models, their odds ratios were close to 1: majority White students were 1.11 times more likely to have high (v. low) laboratory psychological involvement and 1.29 times less likely to have high (v. low) career interest if they perceived high (v. low) altruistic affordance.

Examining the relative contribution of altruistic goal affordance. Regression results presented above demonstrate that seeing their research as fulfilling altruistic goals benefits URM students by enhancing their psychological involvement in their laboratory and science research career interest, and that seeing these connections has no effects on White students. However, all students highly value intrinsic (e.g., passion and curiosity), and to a lesser extent extrinsic (e.g., money and prestige), work goals so the question remains: does greater perceived altruistic affordance contribute to URM student motivation above and beyond effects of intrinsic and extrinsic affordances?

As seen in Table S3, the pattern of correlations among study variables for URM and White students suggest that both perceived intrinsic and extrinsic laboratory affordances were positively correlated (though not always significantly) with students' research laboratory psychological involvement and career interest. Further, unlike the pattern for altruistic affordance, these correlations with intrinsic and extrinsic affordances are similar for URM and White students. Thus, given that all three goal affordances were generally related to greater subsequent science motivation, and to each other, correlations cannot address whether there is a unique contribution of altruistic affordances for URMs, in particular.

To test whether perceiving greater perceived altruistic affordances in the laboratory provide unique prediction to research laboratory psychological involvement and career interest, we again utilized multiple regression. Because we added new terms to the multiple

regression models described above, results are presented as Step 2 in Table S4 (research laboratory psychological involvement) and S5 (research career interest). Laboratory psychological involvement and science research career interest were separately regressed onto a model that included all three goal affordance measures (altruistic, intrinsic, and extrinsic), the same dummy code variable as above indicating participant ethnicity, as well as the multiplicative interaction terms between all variables. For the analyses, all continuous main effect terms were centered, and multiplicative two- three- and four-way interaction terms were created with these variables (Cohen et al. 2003). Because none of the three- or four-way interactions effects were significant they were trimmed from the models.

The key predictor in these analyses is the interaction term between the ethnicity code variable and altruistic affordance. As seen in Tables S4 and S5, even when controlling for effects of intrinsic and extrinsic affordances, the key interaction term between ethnicity and altruism remained a significant predictor of research involvement ($\beta = .26$, $p = .04$) and research career interest ($\beta = .24$, $p = .04$) with altruistic goals positively predicting involvement and interest for URM's and not White undergraduate research assistants. The positive direction of the interaction coefficient in both models indicates that the pattern of this interaction is the same as found when examining effects of perceived altruistic affordance alone.

Additionally, although intrinsic and extrinsic affordances were included in the analysis primarily as control variables to isolate the unique effects of altruistic goals, it is worthwhile to note effects of these variables. Specifically, greater intrinsic affordance perceptions uniquely predicted greater research laboratory psychological involvement ($\beta = .29$, $p = .05$) and greater extrinsic affordances uniquely predicted greater research career interest ($\beta = .29$, $p = .02$). There were not significant interactions between ethnicity and either intrinsic or extrinsic affordances, suggesting that the relationships between these

variables and the study outcomes were similar for all participants.

Examining how perceiving altruistic value in research affects career interest.

Results from the regression analyses support the hypothesis that seeing their work in the research laboratory as fulfilling more altruistic goals benefits the research experience and science career interest of URM students. We next examine whether effects of altruistic affordances on research laboratory psychological involvement mediates the effect on science career interest. We dropped intrinsic and extrinsic affordances as predictors in these process analyses, having already established the unique effects of altruistic affordances on laboratory psychological involvement and career interest for URMs. Thus, we tested a mediated moderation model, whereby psychological involvement in the research laboratory (at Time 2) was predicted to mediate the effect of altruistic affordance (at Time 1) on science career interest (at Time 2) for URM, but not White, students. We utilized the computational tool PROCESS (Hayes 2013) to estimate the indirect effects of altruistic affordances on career interest via laboratory psychological involvement for URM and White students, respectively.

Consistent with the regression analyses reported above, the first step of the mediated moderation model confirmed that greater perceived altruistic affordance predicted greater laboratory psychological involvement for URM, but not White, students. In addition, the second step of the model shows, as predicted, that laboratory psychological involvement significantly predicted science career interest. Finally, the moderated indirect effects support the complete mediated moderation hypothesis. Specifically, a significant positive indirect effect of altruistic affordance on science career interest via laboratory psychological involvement was found for URMs, as the 95% bias corrected bootstrap confidence interval (.02 to .42) was wholly above zero. For White students, however, this indirect effect was not significant, as the 95% bootstrap confidence interval (-.10 to .09) contained zero.

Table S1.

Self-reported survey predictors at Time 1.

Construct	*Reliability (Chronbach's α)*	*Items*
Altruistic Work Goals	.78	A job that gives you an opportunity to be directly helpful to others.
		A job that is worthwhile to society.
Intrinsic Work Goals	.73	A job which is interesting to do.
		A job which uses your skills and abilities—lets you do things you can do best.
		A job where you can see the results of what you do.
		A job where the skills you learn will not go out of date.
		A job where you can learn new things, learn new skills.
		A job where you have the chance to be creative.
Extrinsic Work Goals	.85	A job where the chances for advancement and promotion are good.
		A job which provides you a chance to earn a good deal of money.
		A job that most people look up to and respect.
		A job that has high status and prestige.
Altruistic Goal Affordances	.74	The research work I do in this laboratory is worthwhile to society.
		The research work I do in this laboratory gives me an opportunity to be directly helpful to others.
		The research work I do in this laborartory allows me to give back to my community.
Intrinsic Goal Affordances	.79	The research work I do in this laboratory is interesting to do.
		The research work I do in this laboratory uses my skills

		and abilities—lets me do things I can do best.
		The research work I do in this laboratory where I can see the results of what I do.
		The research work I do in this laboratory where the skills I learn will not go out of date.
		The research work I do in this laboratory where I can learn new things, learn new skills.
		The research work I do in this laboratory where I have the chance to be creative.
Extrinsic Goal Affordances	.67	The research work I do in this laboratory where chances for advancement and promotion are good.
		The research work I do in this laboratory has a chance to earn a good deal of money.
		The research work I do in this laboratory most people look up to and respect.
		The research work I do in this laboratory has high status and prestige.

Table S2.

Self-reported survey dependent variables at Time 2

Construct	*Reliability (Chronbach's α)*	*Items*
Research Laboratory Psychological Involvement	.69	My research laboratory work does not hold my attention at all. (reverse-scored) I think it was a waste of time to do work in my research laboratory. (reverse-scored)
Science Research Career Interest	.82	Could you see yourself building a career as a science researcher? Could you see yourself building a career in biomedical research?

Table S3.

Correlations Among and Descriptive Statistics for URM and White Students.

Variable		1	2	3	4	5
1. Altruistic Research Laboratory Affordance		-	.49***	.33***	.003	-.03
2. Intrinsic Research Laboratory Affordance		.32**	-	.52***	.26*	.18
3. Extrinsic Research Laboratory Affordance		.38**	.28**	-	.16	.27**
4. Research Laboratory Psychological Involvement		.37**	.34**	.24	-	.33**
5. Research Career Interest		.36**	.12	.31*	.24	-
URM	*M*	4.08	4.35	3.48	12.25	10.37
	SD	(.75)	(.57)	(.83)	(1.91)	(3.36)
White	*M*	3.77	4.24	3.26	11.97	9.39
	SD	(.84)	(.66)	(.75)	(2.29)	(3.37)
Scale Range		1-5	1-5	1-5	2 – 14	2 – 14

Note: Correlations on the lower diagonal represent values for URM students. Correlations on the upper diagonal represent values for White students.

* $p < .05$, ** $p < .01$, *** $p < .001$

Table S4.

Multiple regression results for research laboratory psychological involvement

	Step 1				*Step 2*			
	b	SE	*β*	*p*	b	SE	*β*	*p*
Intercept	11.93	0.22		0.00	11.98	0.25		0.00
Ethnicity (URM= 1;White = 0)	0.14	0.38	0.03	0.71	0.14	0.28	0.03	0.71
Altruistic Affordance	0.00	0.09	0.00	0.97	-0.17	0.11	-0.17	0.14
Ethnicity * Altruistic	0.35	0.17	0.20	0.04	0.44	0.21	0.26	0.04
Intrinsic Affordance					0.18	0.09	0.29	0.05
Extrinsic Affordance					0.09	0.10	0.13	0.32
Ethnicity * Intrinsic					-0.02	0.13	-0.02	0.90
Ethnicity *Extrinsic					-0.11	0.15	-0.11	0.45
Altruistic *Intrinsic					-0.02	0.03	-0.07	0.53
Intrinsic * Extrinsic					0.02	0.01	0.11	0.32
Extrinsic * Altruistic					-0.03	0.03	-0.10	0.36
R^2	.04				.15			

Note: b = unstandardized coefficient. SE = standard error. *β* = standardized regression coefficient.

Table S4.

Multiple regression results for research career interest

	Step 1				*Step 2*			
	b	SE	*β*	*p*	b	SE	*β*	*p*
Intercept	9.39	0.30		0.00	4.58	0.17		0.00
Ethnicity (URM= 1;White = 0)	0.86	0.56	0.12	0.13	0.55	0.28	0.15	0.06
Altruistic Affordance	-0.05	0.14	-.03	0.73	-0.13	0.08	-0.17	0.11
Ethnicity * Altruistic	0.63	0.25	0.24	0.01	0.31	0.15	0.24	0.04
Intrinsic Affordance					0.10	0.07	0.21	0.13
Extrinsic Affordance					0.16	0.07	0.29	0.02
Ethnicity * Altruistic					0.31	0.15	0.24	0.04
Ethnicity * Intrinsic					-0.12	0.10	-0.13	0.23
Ethnicity *Extrinsic					-0.05	0.10	-0.06	0.63
Altruistic *Intrinsic					0.04	0.02	0.18	0.07
Intrinsic * Extrinsic					0.01	0.01	0.04	0.65
Extrinsic * Altruistic					-0.03	0.02	-0.14	0.16
R^2	.07				.16			

Note: b = unstandardized coefficient. SE = standard error. β = standardized regression coefficient