Group Comparisons of Sociocultural Variables and Work Outcomes among Early Career Latine Engineers

Dr. Lisa Y Flores, University of Missouri - Columbia

Lisa Y. Flores, Ph.D. is a Professor of Psychology and Associate Chair for Diversity and Inclusion in the Department of Psychological Sciences at the University of Missouri. She has expertise in the career development of Latinx and Latinx immigrant issues and has over 100 peer reviewed journal publications.

Dr. Rachel L Navarro, University of North Dakota

Rachel L. Navarro, Ph.D. is Professor of Counseling Psychology and Associate Dean for Research and Faculty Development for the College of Education and Human Development at the University of North Dakota (UND). She is the former department chair for UNDâ€

Dr. Pat Garriott

Dr. Garriott received his PhD from the University of Missouri. He is a member of the American Psychological Association (APA), Division 17 (Counseling Psychology) of the APA, and the Society for Vocational Psychology. His work has been recognized by Divi

Dr. Sarah Lynn Orton P.E., University of Missouri - Columbia

Dr. Orton is an associate professor in Civil Engineering and is an active member of the American Concrete Institute and the American Society of Civil Engineers. Dr. Orton also serves as the Director of Undergraduate Studies for the Civil and Environmental

Jinkoo Lee, University of Missouri - Columbia
Chia-Lin Tsai, University of Northern Colorado

Chia-Lin Tsai is an associate professor in the Department of Applied Statistics and Research Methods at the University of Northern Colorado. Her research interests include psychometrics studies, online learning and teaching, and first-generation college students' academic experience.

Han Na Suh, Georgia State University - Perimeter College
Bo Hyun Lee, The Ohio State University

©American Society for Engineering Education, 2024

Group Comparisons of Sociocultural Variables and Work Outcomes among Early Career Latine Engineers

Lisa Y. Flores[1], Rachel L. Navarro[2], Jinkoo Lee[1], Patton O. Garriott[3], Sarah L. Orton[1], Chia-Lin Tsai[4], Han Na Suh[5], Bo Hyun Lee[6], Anna Nguyen[2], Andrew Lenway[2], & Diana Mathis[7]

[1]University of Missouri, Columbia; [2]University of North Dakota; [3]University of Denver; [4]University of Northern Colorado; [5]Georgia State University; [6]Ohio State University; [7]Purdue University

Engineering is critical to our nation's global competitiveness, and the demand to fill engineering jobs is projected to grow over the next decade (U.S. Bureau of Labor Statistics, 2018). To meet this demand, efforts are needed to broaden the involvement of underrepresented racial minorities (URM) in engineering. Latine are one of the largest racial/ethnic group in the U.S. today, estimated to comprise 19.1% of the U.S. population (U.S. Census Bureau, 2023). Latino and Latinas currently have one of the highest labor force participation rates (75.2%, and 57.3%, respectively; U.S. Bureau of Labor Statistics, 2023), but represented 7.4%, and 1.7%, respectively, of the engineering workforce (NCSES, 2022).

For many years, NSF has aimed to broaden the participation of underrepresented groups in STEM fields (NSF, 2022). Broadening the participation of Latine in engineering fields is especially important given their projected growth in the general U.S. population and labor force in conjunction with their underrepresentation in the field, as noted above. Focusing on the transition from college-to-work is also important, as this is a high-risk period for losing employees. Indeed, a national survey of women engineers found that women reported working conditions, work climate, and lack of family balance as important factors for leaving the field (Fouad & Singh, 2011). Further, a recent national survey of college graduates assessed employees' job satisfaction across specific occupational fields. Data from this survey indicated that among engineers, those with less than 5 years since receiving their degree reported higher levels of being "somewhat dissatisfied" and "very dissatisfied" with their jobs relative to their counterparts with more years since receiving an engineering degree (NCSES, 2021). Finally, among 2010-2013 engineering graduates, more URM were employed in non-science or engineering jobs (33.7%) in 2015, in contrast to Whites (14.1%; NCSES, 2017). More research is needed to understand the factors that influence persistence decisions during the college-to-work transition and early career stages among URM in engineering.

Using data from a 5-year ongoing study of early career Latine engineers, we report scores on sociocultural variables (i.e., acculturation; enculturation) and work outcomes (i.e., goal progress; work satisfaction; turnover intentions, work satisfaction, and life satisfaction). We examine differences in scores across Latine engineers based on gender, parental status, and characteristics of workers in the employer's organization. The findings may point to workplace factors that can impact the retention of Latine engineers.

Method

Participants. A total of 471 self-identified Latine adults who received an engineering degree between 2015 and 2019 participated in the study. All were employed as engineers. There were 313 (66.5%) Latino men and 158 (33.5%) Latina women. Nineteen percent of participants (19.1%) reported that they had children.

Measures. We included established measures that have performed well with Latine adults in prior research and demonstrated strong reliability and validity estimates. Specifically, participants completed (1) a 42-item acculturation measure (Zea et al., 2003) that includes two subscales that assess orientation to U.S. mainstream culture (acculturation) and orientation to Latine culture (enculturation); (2) a 5-item scale by Lent and colleagues (2005) that assessed participants progress at goal-directed activities at work; (3) a 4-item measure of turnover intentions (Hom et al., 1984) that assessed plans for leaving current job; (4) a 3-item work satisfaction measure (Hackman & Oldham, 1975) that assessed satisfaction with their current job; and (5) a 5-item life satisfaction (Diemer et al., 1985) measure of one's global judgments of their life.

Procedures. In Spring 2021, we recruited adults who received a degree in engineering from 2015 and 2019, were employed as an engineer, and who identified as Hispanic, Latina, Latino, Latinx, or Latine or whose origins are from Spanish speaking countries to participate in an online survey. We sent emails to participants from a prior project that we conducted on Latine engineering college students to invite them to participate in this study. We also sought the help of colleges/universities who sent announcements about the study to engineer alumni from their institution who met the eligibility criteria. Participants received a $50 Amazon e-gift card for completing the online survey.

Results

The data collected through the survey in this study were analyzed using MANOVA (Multivariate Analysis of Variance) using SPSS 25.0 to simultaneously examine group differences across multiple dependent variables. This method allows for considering interactions among various dependent variables to assess group mean differences. After confirming the normality and Homogeneity of Covariance of each dependent variable, we conducted a series of MANOVAs to determine whether there were statistically significant differences among groups across the study's variables (acculturation, enculturation, turnover intentions, work satisfaction, and life satisfaction). In the following, we report the group comparisons on the measured variables. The number of participants in each group and the mean scores are reported in the Tables for each of the group comparisons.

Gender comparisons. The results indicated no significant differences between Latino men and Latina women in Acculturation ($F = 1.494$; $p = .22$), Enculturation ($F = .156$; $p = .69$), Turnover Intentions ($F = .695$; $p = .41$), Work Satisfaction ($F = .010$; $p = .92$), and Life Satisfaction ($F = 2.102$; $p = .15$). However, there was a significant gender difference in Goal Progress ($F = 22.542$; $p < .001$). Specifically, Latino men reported higher levels of progress toward their occupational goals than Latina women. See Table 1.

Parental status comparisons. There were no significant differences between early career Latine engineers with children and those without children in Acculturation (F = .64; *p* = .42), Enculturation (F = 1.809; *p* = .18), Goal Progress (F = .011; *p* = .92), Turnover Intentions (F = .469; *p* = .49), and Work Satisfaction (F = .747; *p* = .39). However, there was a significant difference in Life Satisfaction (F = 5.706; *p* = .017), with those who had children reporting higher levels of life satisfaction than their counterparts without children. See Table 2.

Comparisons based on percentage of Latine employees in organization. There were no significant differences between early career Latine engineers based on the percentage of Latine employed within company in Acculturation (F = .028; *p* = .87), Enculturation (F = 3.784; *p* = .05), Turnover Intentions (F = .729; *p* = .39), Work Satisfaction (F = 1.922; *p* = .12), and Life Satisfaction (F = 1.6; *p* = .21). However, there was a significant difference in Goal Progress (F = 5.137; *p* = .02), with Latine engineers employed in a company with over 30% Latine employees reporting higher levels of goal progress than their counterparts employed in a company with less than 30% Latine employees. See Table 3.

Comparisons based on percentage of BIPOC employees in organization. There were no significant differences between early career Latine engineers based on the percentage of BIPOC employees within the company in Acculturation (F = .002; *p* = .96), Enculturation (F = .670; *p* = .41), Turnover Intentions (F = .008; *p* = .93), Work Satisfaction (F = .36; *p* = .55), and Life Satisfaction (F = .365; *p* = .55). However, there was a significant difference in Goal Progress (F=3.889; *p* = .05), with Latine engineers employed in a company with over 30% BIPOC employees reporting higher levels of goal progress than their counterparts employed in a company with less than 30% BIPOC employees. See Table 4.

Comparisons based on percentage of women employees in organization. There were no significant differences between Latine early career engineers based on the percentage of women employed at their company in Acculturation (F = 3.501; *p* = .06), Enculturation (F = .001; *p* = .98), Goal Progress (F = .023; *p* = .88), Work Satisfaction (F = .114; *p* = .74), and Life Satisfaction (F = .061; *p* = .81). However, there was a significant difference in Turnover Intentions (F = 4.501; *p* = .03). Latine employed in organizations with more than 30% women employees reported less likelihood to leave their organization than their counterparts employed in organizations with less than 30% women employees. See Table 5.

Comparisons based on percentage of BIPOC women employees in organization There were no significant differences between Latine early career engineers based on the percentage of BIPOC women employed at their company in Acculturation (F = .010; *p* = .92), Enculturation (F = .591; *p* = 44), Turnover Intentions (F = .072; *p* = .79), and Work Satisfaction (F = .001; *p* = .97). However, there was a significant difference in Goal Progress (F = 4.443; *p* = .04) and Life Satisfaction (F = 7.617; *p* = .006). Specifically, Latine engineers employed in organizations with more than 30% BIPOC women employees reported higher levels of goal progress but lower life satisfaction than their counterparts employed in organizations with less than 30% BIPOC women employees. See Table 6.

Discussion

We found differences in goal progress across gender groups and diversity represented among employees at their current work organization. Specifically, Latino men reported more progress toward work goals than Latina women, and Latine engineers employed in organizations with 30% or more Latine workers, BIPOC workers, and BIPOC women workers reported more progress toward goals at work than their counterparts in organizations with fewer than 30% Latine, BIPOC, and BIPOC women employees, respectively. These findings may be explained by the presence of male-dominated workplaces which may contribute to a chilly workplace climate for Latina women, BIPOC workers, and BIPOC women workers. A prior study found that junior women faculty in STEM reported increased levels of ostracism and incivility in the workplace than their male colleagues. (Miner et al., 2019). These levels of ostracism and incivility were also associated with negative job-related and wellbeing outcomes. The presence of a chillier workplace climate for Latina and BIPOC women workers may explain similar workplace outcomes such as the lower levels of goal progress that we found in the present study.

Two groups of Latine engineers reported higher levels of life satisfaction: those with children and those employed at organizations with less than 30% BIPOC women. Latine engineers with children reported higher satisfaction with life relative to their peers with no children. This finding would align with previous research around the value of familísmo, or familism, in which individuals prioritize family closeness and interdependence (Buriel, 1993). Unexpectedly, Latine engineers employed in organizations with 30% or more BIPOC women reported lower life satisfaction than their counterparts who worked in companies with 30% or less BIPOC Women. Although there is a significant difference in these two groups, it is important to note the skewness of the sample sizes which may explain some of the results, wherein most (83.95%) of the Latine engineers studied are employed at companies with less than 30% BIPOC women. Notably, despite the significant difference in reported life satisfaction between these two groups, the level of life satisfaction was high for both groups.

Early career Latine engineers who were employed in organizations with fewer than 30% women reported higher intentions to leave their current job/employer than those working in an organization with 30% or more women employees. This finding may be explained by the presence of an exclusionary workplace climate, especially towards women workers and BIPOC women workers, which has been observed in STEM fields. A prior study of turnover intentions and exclusion among women faculty and faculty of color at a predominantly white institution found that turnover intentions were associated with lower positive work climate perception and decreased job satisfaction (Settles et al., 2022). The participants in our study may have experienced similar exclusionary workplace environments lacking in both race and gender representation which could explain their greater turnover intentions.

We found that there were no differences across groups of early career Latine engineers on measures of acculturation to U.S. culture, enculturation to Latine culture, or work satisfaction. This absence of significant relationships could be due to the moderate to high levels of acculturation and enculturation reported by the participants. Acculturation has been found to be an environmental resource, with a bicultural continuum (Ojeda et al., 2011). Thus, it may be important for Latine engineers to be able to adapt to and understand the White-male culture that they work in.

There are several practical implications for the enhancement of work experiences of early career Latine engineers. As we have seen, a racially diverse and intersecting work environment has positive outcomes on Latine engineers' goal progress. Thus, it would be beneficial for companies employing engineers to promote tangible Diversity, Equity, and Inclusion (DEI) efforts in their hiring, promoting, and supporting efforts within their companies. These efforts towards DEI could include hiring and promoting more diverse individuals (e.g. people of color, queer folx, women, individuals with disabilities), holding affinity/support groups for diverse groups within the company, and fostering a non-competitive work environment.

References

Buriel, R. (1993). Childrearing orientations in Mexican American families: The influence of generation and sociocultural factors. *Journal of Marriage and the Family, 55*(4), 987–1000. https://doi-org.ezproxy.library.und.edu/10.2307/352778

Diener, E., Emmons, R. A., Larsen, R. J., & Grifin, S. (1985). The Satisfaction with Life Scale. Journal of Personality Assessment, 49, 71-75.

Fouad, N. A., & Singh, R. (2011). Stemming the tide: Why women leave in engineering: University of Wisconsin-Milwaukee. *Final rep., NSF Award*, *827553*.

Hackman, J. & Oldham, G. (1975). Development of the Job Diagnostic Survey. *Journal of Applied Psychology, 60*, 159-170. doi: 10.1037/h0076546

Hom, P.W., Griffeth, R.W., & Sellaro, C.L. (1984). The validity of Mobley's 1977 model of employee turnover. *Organizational Behavior and Human Performance, 34*, 141–174. doi: 10.1016/0030-5073(84)90001-1

Lent, R. W., Singley, D., Sheu, H.-B., Gainor, K. A., Brenner, B. R., Treistman, D., & Ades, L. (2005). Social Cognitive Predictors of Domain and Life Satisfaction: Exploring the Theoretical Precursors of Subjective Well-Being. *Journal of Counseling Psychology, 52*(3), 429-442. doi: 10.1037/0022-0167.52.3.429

Miner, K. N., January, S. C., Dray, K. K., & Carter-Sowell, A. R. (2019). Is it always this cold? Chilly interpersonal climates as a barrier to the well-being of early-career women faculty in STEM. Equality, Diversity and Inclusion: An International Journal, 38(2), 226-245.

National Center for Science and Engineering Statistics (2017). *Women, Minorities, and Persons with Disabilities in Science and Engineering*. Arlington, VA: National Science Foundation.

National Center for Science and Engineering Statistics (2021). *National Survey of College Graduates, Employed college graduates, by sex, major occupation, job satisfaction, and years since highest degree*. Retrieved from https://www.bls.gov/opub/reports/race-and-ethnicity/2022/home.htm

National Science Foundation (2022). *2022-2026 Strategic Plan*, nsf22068. Retrieved from https://www.nsf.gov/pubs/2022/nsf22068/nsf22068.pdf

Ojeda, L., Flores, L. Y., & Navarro, R. L. (2011). Social cognitive predictors of Mexican American college students' academic and life satisfaction. Journal of Counseling Psychology, 58(1), 61–71. https://doi-org.ezproxy.library.und.edu/10.1037/a0021687

Settles, I. H., Jones, M. K., Buchanan, N. T., & Brassel, S. T. (2022). Epistemic exclusion of women faculty and faculty of color: Understanding scholar (ly) devaluation as a predictor of turnover intentions. The Journal of Higher Education, 93(1), 31-55.

U.S. Bureau of Labor Statistics (2023). *Labor force participation rates by se, race, and Hispanic or Latino ethnicity, 1972-2022 averages*. Report 1105. Retrieved from https://www.bls.gov/opub/reports/race-and-ethnicity/2022/home.htm

U.S. Census Bureau (2023). QuickFacts. Retrieved from https://www.census.gov/quickfacts/fact/table/US/PST045223

Zea, M. C., Asner-Self, K. K., Birman, D., & Buki, L. P. (2003). The abbreviated Multidimensional Acculturation Scale: Empirical validation with two Latino/Latina samples. Cultural Diversity and Ethnic Minority Psychology, 9, 107-126.

Table 1. Comparisons between early career Latino men and Latina women in engineering on the measured variables.

	Latino men (n = 313)		**Latina women (n = 158)**	
	M	*SD*	*M*	*SD*
Acculturation	3.39	.40	3.35	.36
Enculturation	2.92	.65	2.94	.60
Goal Progress	**3.00**	**.86**	**2.61**	**.83**
Turnover Intentions	1.73	.86	1.80	.92
Work Satisfaction	4.16	.71	4.16	.62
Life Satisfaction	5.26	1.15	5.09	1.28

Note. Bold text indicates significant differences at $p < .05$.

Table 2. Comparisons between early career Latine engineers with children and without children on the measured variables.

	With Children (n = 90)		**No Children (n = 381)**	
	M	*SD*	*M*	*SD*
Acculturation	3.35	.39	3.38	.39
Enculturation	3.01	.64	2.91	.63
Goal Progress	2.87	.86	2.86	.87
Turnover Intentions	1.69	.94	1.77	.87
Work Satisfaction	4.22	.65	4.15	.69
Life Satisfaction	**5.48**	**1.26**	**5.14**	**1.18**

Note. Bold text indicates significant differences at $p < .05$.

Table 3. Comparisons between early career Latine engineers employed at a company with more than 30% Latine employees and Latine engineers employed at a company with less than 30% Latine employees on the measured variables.

	Company < 30% Latine (n = 336)		**Company > 30% Latine (n = 126)**	
	M	*SD*	*M*	*SD*
Acculturation	3.37	.37	3.38	.44
Enculturation	2.90	.63	3.03	.63
Goal Progress	**2.81**	**.86**	**3.02**	**.88**
Turnover Intentions	1.78	.88	1.71	.89
Work Satisfaction	4.13	.69	4.23	.67
Life Satisfaction	5.16	1.18	5.32	1.23

Note. Bold text indicates significant differences at $p < .05$.

Table 4. Comparisons between early career Latine engineers employed at a company with more than 30% BIPOC employees and Latine engineers employed at a company with less than 30% BIPOC employees on the measured variables.

	Company < 30% BIPOC (n = 315)		**Company > 30% BIPOC (n = 142)**	
	M	*SD*	*M*	*SD*
Acculturation	3.38	.38	3.37	.40
Enculturation	2.91	.64	2.97	.60
Goal Progress	**2.81**	**.85**	**2.98**	**.88**
Turnover Intentions	1.76	.90	1.76	.83
Work Satisfaction	4.17	.70	4.13	.66
Life Satisfaction	5.22	1.17	5.15	1.27

Note. Bold text indicates significant differences at $p < .05$.

Table 5. Comparisons between early career Latine engineers employed at a company with more than 30% women employees and Latine engineers employed at a company with less than 30% women employees on the measured variables.

	Company < 30% Women (n = 306)		**Company > 30% Women (n = 157)**	
	M	*SD*	*M*	*SD*
Acculturation	3.40	.36	3.33	.43
Enculturation	2.93	.64	2.93	.63
Goal Progress	2.86	.85	2.88	.90
Turnover Intentions	**1.82**	**.92**	**1.64**	**.79**
Work Satisfaction	4.17	.66	4.14	.73
Life Satisfaction	5.21	1.21	5.18	1.17

Note. Bold text indicates significant differences at $p < .05$.

Table 6. Comparisons between early career Latine engineers employed at a company with more than 30% BIPOC women employees and Latine engineers employed at a company with less than 30% BIPOC women employees on the measured variables.

	Company < 30% BIPOC Women (n = 382)		**Company > 30% BIPOC Women (n = 73)**	
	M	*SD*	*M*	*SD*
Acculturation	3.38	.38	3.37	.41
Enculturation	2.95	.64	2.88	.58
Goal Progress	**2.82**	**.86**	**3.05**	**.86**
Turnover Intentions	1.77	.88	1.74	.88
Work Satisfaction	4.16	.69	4.16	.69
Life Satisfaction	**5.28**	**1.13**	**4.86**	**1.44**

Note. Bold text indicates significant differences at $p < .05$.