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A Social-Belonging Intervention Benefits Higher Weight Students' Weight Stability and Academic Achievement

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Abstract

Psychological interventions can narrow college achievement gaps between students from nonstigmatized and stigmatized groups. However, no intervention we know of has investigated effects for one highly stigmatized group: people of higher bodyweights. We analyzed data from a prematriculation social-belonging intervention trial at 22 colleges, which conveyed that adversity in the college transition is normative, temporary, and nondiagnostic of lack of belonging. Nine months postintervention, higher weight participants in a standard belonging treatment had higher first-year grade point averages (GPAs) than controls and maintained more stable weights, an indicator of physical well-being. Effects of a belonging treatment customized to specific colleges were directionally similar but nonsignificant. Exploratory analyses revealed that effects did not differ by race and that weight effects were driven by women. Together, results show that higher weight students contend with belonging concerns that contribute to a weight gap in GPA, but belonging interventions can raise GPA and promote healthy weight stability.

Keywords

belonging, weight stigma, psychological interventions, weight stability, academic achievement

Students from stigmatized groups face a challenge in the transition to college that their nonstigmatized peers do not. Aware of prejudice toward their groups and conscious of their underrepresentation, they have reason to be uncertain of the degree to which they, or members of their group, are seen to belong (Walton & Cohen, 2007). When they encounter adversity, such as a poor grade or difficulty finding a lab partner, it can be reasonable to interpret that adversity as a signal that they do not belong. These feelings of nonbelonging can be part of a negative recursive process that leads to poor academic and nonacademic outcomes (see Walton & Brady, 2017).

Social-belonging interventions change the meaning students make of these adversities. Such interventions, usually implemented as brief (30–45 min) online reading-and-writing tasks, convey the message that adversity in the transition to college and uncertainty about belonging are normal and pass with time or can be reduced by taking agentic steps. This message was designed to reflect common concerns among many students and has been effective at reducing group-based disparities for underrepresented racial minority students (e.g., Walton & Cohen, 2007, 2011), women in science, technology, engineering, and math programs (Walton et al., 2015), and first-generation college students (Murphy et al., 2020; Yeager et al., 2016). Still unknown, however, are the effects of a social-belonging intervention for one of the most highly stigmatized groups in Western culture—people with higher bodyweights.

Prejudice targeting higher weight people has increased over time (Puhl et al., 2008), even as many other forms of prejudice have decreased (Charlesworth & Banaji, 2019). Higher weight people face stigma in domains including education, employment, health care, and interpersonal relationships (Crandall, 1995; Incollingo Rodriguez et al., 2018; Puhl & Brownell, 2001; Puhl & Heuer, 2009).

The stigma in education may be especially pernicious. Stereotypes allege that higher weight people are lazy and slow (e.g., Brochu & Esses, 2011), traits incompatible with academic success. College students are thinner than the general population (Crandall, 1995; Incollingo Rodriguez et al.,

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2018), meaning higher weight students are underrepresented on campuses relative to other settings. Aware of prejudice, stereotypes, and underrepresentation, higher weight students may experience belonging concerns in the transition to college. Therefore, knowing that belonging concerns are common, experienced by stigmatized and nonstigmatized students alike, and improve with time may improve the college experience for these students.

If such a message, delivered by a social-belonging intervention, does alleviate belonging concerns for higher weight students, on what outcomes might we observe effects? As with other stigmatized groups, we propose that it could increase academic achievement. Although no study we know of has investigated whether there is a "weight gap" in college academic achievement, given the known effects of stigma, identity threat, and belonging concerns on academic achievement for other groups, there is reason to expect that there might be (Major & O'Brien, 2005; Steele et al., 2002; Walton & Brady, 2020). Belonging concerns become barriers to academic achievement in part because they forestall social and academic integration (see Walton & Brady, 2017). But students exposed to social-belonging treatments report more interactions with professors and mentors, participation in extracurricular or study groups, close friendships, friendships with majority group members, and use of academic supports (Walton & Cohen, 2007; Walton et al., 2015; Yeager et al., 2016), suggesting that if a weight gap in academic achievement exists, it could be mitigated by this treatment.

We further suggest that, for higher weight students, a social-belonging intervention could have effects on an outcome as-yet unexamined in social-belonging research: bodyweight. Students tend to gain weight in their first year of college, on average 3.86 lbs (1.75 kg) according to a meta-analysis (Vella-Zarb & Elgar, 2009). Weight gain, loss, and stability are determined by factors including genetics, physiology, and behavior, but a growing literature suggests that weight stigma plays a role in promoting weight gain and hampering weight loss (Tomiyama, 2014). Studies that manipulate exposure to weight stigma find effects consistent with longer term weight gain. Higher weight women exposed to in-lab weight stigma consume more calories, feel less capable of controlling their eating than controls (Major et al., 2014), and report more stress-related emotions (Major et al., 2012). Stress plays a role in weight gain via physiological and behavioral processes (see Tomiyama, 2019). In contrast, social support, measured subjectively or objectively, has wide-ranging health benefits (see Uchino et al., 1996). Feelings of belonging are conceptually similar to subjective social support, and increased social integration would increase objective social support. Indeed, college women who feel that their close others accept their weight show more stable weights over time relative to those who do not perceive acceptance (Logel et al., 2014).

Two studies find that interventions that bolster participants against psychological threat can promote weight stability. Weight-dissatisfied college women who were asked to write about identify-relevant core values lost 3.41 lbs (1.55 kg) approximately 2 months later, whereas controls had gained 2.76 lbs (1.25 kg; Logel & Cohen, 2012). Effects were subsequently replicated, primarily among higher weight women (Logel et al., 2018). More than 2 years later, affirmed higher weight women from the two studies maintained weight stability, whereas controls gained some weight (Logel et al., 2019). One study investigated the effects of a belonging intervention on health outcomes, showing benefits on self-reported doctor visits and self-reported health (Walton & Cohen, 2011), suggesting such interventions can benefit (self-reported) physical outcomes.

The present research analyzed data from the College Transition Collaborative's (CTC's) social-belonging intervention, with over 46,000 students from 22 U.S. colleges. The social-belonging intervention, delivered online and usually prematriculation, includes nine first-person stories, each describing a common transition challenge (e.g., unexpected low grades), how the student initially questioned their belonging, and how concerns passed in their own time or were alleviated via agentic steps (e.g., attending professors' office hours). Stories are attributed to students from diverse gender and racial groups, implying that challenges and worries are not a function of stigmatized social identities. A subsequent "saying is believing" writing task (Wilson & Linville, 1985) supports mindset change by prompting participants to integrate the message with their own experiences.

CTC's *standard social-belonging treatment*, based on Yeager et al. (2016), describes challenges and solutions that are broadly relevant to shared experiences across schools, such as worries about making friends, getting low grades, and being intimidated by professors. Students read stories that conveyed that these concerns were common, not indicative of nonbelonging, and likely to dissipate with time or with taking agentic steps. We expected this broad focus to ring true for higher weight students' psychological concerns about belonging in college, even though stories did not reference students' body size per se.

The intervention also included a *customized social-belonging* condition to specifically investigate whether materials must be tailored to school-specific belonging concerns. CTC researchers visited campuses to run two focus groups and a survey identifying unique belonging concerns in those contexts. Several standard stories were rewritten at each school to speak more specifically to belonging concerns at individual institutions. For example, one new story described the process of learning that financial difficulties, although challenging given the affluence of peers, were not indicative of nonbelonging. Another new story described belonging uncertainty from guilt about leaving family behind, but reconciling those feelings by staying connected to family while also making connections on campus.

We had no hypothesis about whether this exploratory customized treatment would be more or less effective than the standard treatment for higher weight students. The effortful process of customizing the social-belonging treatment at each partner school was undertaken because it seemed possible that belonging concerns are best addressed by speaking to context-specific experiences. However, because customized stories did not mention weight concern, the greater specificity of customized stories lose the generality that resonates with broader belonging concerns. Indeed, most customized themes reflected concerns of family demands, socioeconomic status (SES), geographical background (e.g., rural cities or other countries), race, and gender.

In this study, we hypothesized that a belonging intervention delivered prematriculation could benefit higher weight students' end-of-year grade point averages (GPAs) and weight stability approximately 9 months posttreatment. We did not expect effects for lower weight or mid-weight students because they experience substantially less weight stigma than higher weight students (e.g., Hunger & Major, 2015). If these hypotheses are supported, this would be the first study we know of to examine and show effects for higher weight students and the first to examine bodyweight as an outcome.

Given the paucity of studies examining psychological interventions for higher weight students, our investigations of treatment differences by gender and race were exploratory. One of the few studies examining weight stigma intersectionally found no gender or race differences in weight stigmatizing experiences (e.g., teasing, discrimination) but did find more internalized stigma among women than men and among White participants than minorities (Himmelstein et al., 2017), providing little clarity for a priori predictions.

Method

Participants

The social-belonging intervention was embedded in prematriculation materials at 22 U.S. colleges, diverse in selectivity, size, and geographic distribution (see Supplement CONSORT diagram). Nineteen schools included self-reported height and weight in a postintervention survey, with 31,232 participants responding to those questions. A subsample of participants were recruited for a follow-up survey in their spring semester, and exactly 7,000 participants at 19 schools completed those same height and weight measures. Participants from an all-male school (likely to differ from the rest of the sample in terms of bodyweight and associated stigma; see Azarbad & Gonder-Frederick, 2010) were excluded a priori ($n = 177$), leaving 6,823 participants, approximately 68.75% female, 25.81% underrepresented minority (Black, Hispanic, Native American), 13.60% Asian, 51.31% White, and 9.01% other racial categories. This sample allows detection of an effect size of approximately 0.09 points difference in body mass index (BMI) or 0.04 points change in GPA with 80% power at $p < .05$.

Procedure

See Supplement for complete materials.

Recruitment. In orientation communications, schools gave incoming students a link to an activity called, "What is it like to come to (school name)?" described as learning about "students' experiences coming to (school name)."

Intervention. After clicking the link, participants were randomized within race, gender, and generational status within each school into one of two intervention conditions or a control, taking approximately 30 min. Following the consent page, participants in the standard and customized belonging conditions saw a page summarizing survey results showing that students from different backgrounds (e.g., gender, year in school, race, social class) reported diverse challenges to belonging in the transition to college and, in time, came to feel that they belonged on campus.

Participants then read nine stories attributed to upper year students representing different gender, racial, and generational groups. Each story described facing a challenge in their first year, initially questioning their belonging and then the problem-resolving over time. Control stories described noticing the geographical setting at college, but no longer noticing it over time. For example, one story read:

> As excited as I was to come to college, I must admit that part of me thought that I might not measure up to the other students. Early on, I bombed a test. It was the worst grade I'd ever received, and I felt terrible and isolated.... But then, I found out I wasn't the only one.... Though I still have doubts about myself sometimes, I know they're the kinds of things everybody feels on occasion.

Participants then completed a "saying is believing" exercise (Wilson & Linville, 1985), writing about how their experiences had been, or would be, consistent with that message.

Postintervention survey. After the reading-and-writing exercise, participants completed a survey with demographic and psychological measures (CTC, 2018).

Follow-up survey. On average, 9 months later, a stratified random subsample of those who completed the intervention (oversampling racial minority students) were invited for a follow-up survey. The time between the intervention and the follow-up varied between schools based on intervention timing, academic year length, and timing of the follow-up. The shortest time between the two surveys at any school was 152 days (approximately 5 months); the longest was 395 days (approximately 13 months).

Measures

Demographics. Demographics were measured in the postintervention survey. Gender was measured as, "With which gender do you identify?" with responses choices "male," "female," "transgender," and "I prefer another term." Participants who selected male or female ($0 = male$, $1 = female$) were included in analyses moderated by gender ($N = 6{,}655$, 97.54% of the full sample). The other 2.46% of cases were excluded; there was no significant difference in distribution by condition.

Race was measured as, "With which racial/ethnic group(s) do you identify?" The 19 response choices were recoded into two categories, underrepresented in college (1 = *Black, Hispanic, or Native American*) and nonunderrepresented in college (0 = *White, Asian, South Asian/SE Asian*); participants whose response fell into one of these categories were included in the analysis moderated by race ($N = 6{,}171$, 90.44% of the full sample). The other 9.56% of cases were excluded; there was no significant difference in distribution by condition.

Bodyweight. Although lab-based physical measurements would be ideal, evidence suggests that self-reported weight can be a good approximation of measured weight. Meta-analyses report correlations between self-reports and measured weight and height from $r = .84$ to $r = .98$ (Sherry et al., 2007) and even $r = .99$ in some studies (Jeffery, 1996). The postintervention survey and 9-month follow-up included the item, "What is your height in feet and inches? Round to the nearest half of an inch." A drop-down box ranged from "4 ft. 10 in. or below" to "7 ft. or above." They also included, "What is your current weight in pounds?" in 1 lb increments, with the range capped at "90 lbs or below" and "500 lbs or above." These items were used to calculate BMI, using the standard formula (weight in pounds/height in in.^{2} × 703). BMI is superior to weight for capturing body size because it takes height into account (Mei et al., 2002).

We decided a priori to treat BMI as categorical. While mid-weight students, who are not weight-stigmatized, are likely to experience more belonging concerns than higher weight students, it is unclear whether the lowest weight students could experience fewer belonging concerns than mid-weight students. Our primary hypothesis therefore concerns a difference in outcomes between one specific group of students (i.e., higher weight students) and others. Analyzing BMI categorically allowed us to test that hypothesis directly. Experiences of lower weight students are beyond this study's scope (see Supplement). Additionally, categorical BMI is consistent with many previous studies investigating it as a predictor or moderator of educational and psychological outcomes (e.g., Falkner et al., 2001; Himmelstein et al., 2015; O'Brien et al., 2016; Schvey et al., 2012; Vartanian & Shaprow, 2008).

Because our goal was to segment our sample such that participants in the higher BMI group would be those likely to experience high levels of weight stigma, we used population 10th and 90th percentiles as our cutoff points for our lower BMI and higher BMI categories. The 90th percentile for BMI among 18-year-olds in the general population is 27, which falls in the middle of the "overweight" category. The 10th percentile for BMI among 18-year-olds in the general population is 18.50, which is the upper cutoff for the "underweight" category (CDC, 2001). As such, after removing outliers as described below, we created three BMI categories: Participants with BMIs $\leq$ 18.50 were categorized as "lower weight" ($n = 459$, $M = 17.72$, $SD = 0.62$), participants with BMIs > 18.50 or <27 were categorized as "mid-weight" ($n = 4{,}941$, $M = 22.22$, $SD = 2.18$), and participants with BMIs $\geq$ 27 were categorized as "higher weight" ($n = 1{,}172$, $M = 31.55$, $SD = 4.17$).

Table 1. Means and *SD* of Variables of Interest.

Variable Name	*N*	Mean	*SD*	Min	Max
T1 height	6,572	66.41	3.93	58	84
T1 weight	6,572	148.34	34.41	90	325
T2 weight	6,572	152.02	35.24	90	350
T1 BMI	6,572	23.57	4.67	15.45	49.12
T2 BMI	6,572	24.16	4.82	15.08	49.92
BMI change	6,572	0.59	1.43	−5.55	6.66
First-year GPA	6,121	3.23	0.60	0	4.24
ACT/SAT test	5,215	25.45	5.22	11	36
Gender	6,413	0.69		0	1
Race	5,949	0.28		0	1

Note. Descriptive statistics shown are for the sample after outliers were removed. Demographics were coded as follows: Gender: 0 = *male*, 1 = *female*; race: 0 = *White/Asian*, 1 = *underrepresented minority*. BMI change is a difference score such that higher scores indicate relative weight gain. BMI = body mass index; GPA = grade point average.

First-year GPA. Schools supplied participants' transcripts to CTC. GPA was measured on a 4-point scale ($F = 0.00$, $A = 4.00$ or higher), calculated as total grade points earned divided by the number of credits attempted.

ACT/SAT scores. Schools supplied participants' ACT/SAT scores if available. Analyses used ACT scores, or, where unavailable, SAT scores converted to the 10–36-point ACT Scale using a concordance table (College Board, 2018). Where both were available, an average of ACT scores and converted SAT score was used. The Supplement reports one additional dependent variable. No other dependent variables were examined.

Results

Data Cleaning

Descriptive statistics for height, weight, BMI, and BMI change identified clusters of extreme responses, likely resulting from measurement error (e.g., participants selecting an inaccurate response on the drop-down box), unusual situations (e.g., serious health problems), or extreme weight change nonrepresentative of typical college experiences. A total of 137 BMI values were excluded (2.01% of the full sample), and 114 BMI change values (1.67% of the full sample) resulting in a final analytic sample of 6,572 participants. The distribution of excluded outliers did not vary by condition. See Supplement for details of how outliers were identified and removed. Table 1 displays descriptive statistics after outliers were removed.

Analytic Strategy

A preliminary descriptive analysis of variance showed that schools differed in initial BMI, suggesting a hierarchical structure in which participants within schools had more similar BMIs than participants between schools. Subsequent analyses

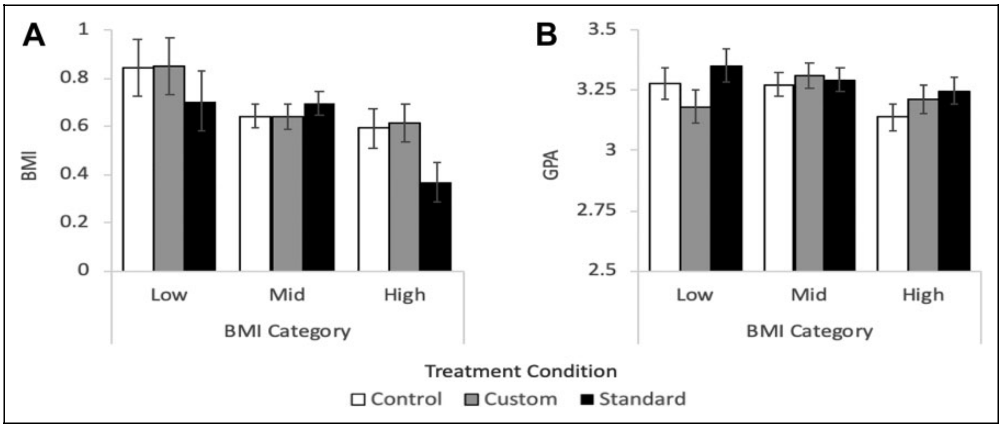

Figure 1. Estimated marginal means of Body Mass Index (BMI) Category × Treatment Group on (Panel A) change in BMI and (Panel B) first-year grade point average (controlling for incoming SAT/ACT scores).

Table 2. BMI Change × Weight Category and Condition.

Step	Level	Variable	*b*	*SE*	*p* Value	95% CI		β
Step 1	Fixed	Intercept	0.66	.05	.00	0.57	0.76	.05
		Low BMI	**0.14**	**.07**	**.04**	**0.01**	**0.28**	**.10**
		High BMI	**−0.14**	**.05**	**.00**	**−0.23**	**−0.05**	**−.10**
		Standard	−0.01	.04	.81	−0.09	0.07	−.01
		Custom	0.00	.04	.94	−0.08	0.09	.00
	Random	Residual	2.00	.03		1.93	2.07	.98
		Intercept	0.02	.01		0.01	0.05	.01
Step 2	Fixed	Intercept	0.64	.05	.00	0.54	0.74	.04
		Low BMI	0.20	.12	.09	−0.03	0.43	.14
		High BMI	−0.05	.08	.53	−0.21	0.11	−.04
		Standard	0.05	.05	.28	−0.04	0.15	.04
		Custom	−0.00	.05	.97	−0.10	0.09	−.00
		Low BMI × Standard	−0.19	.17	.27	−0.52	0.15	−.13
		Low BMI × Custom	0.01	.17	.94	−0.31	0.34	.01
		Hi BMI × Standard	**−0.28**	**.11**	**.01**	**−0.50**	**−0.06**	**−.20**
		Hi BMI × Custom	0.02	.11	.84	−0.20	0.25	.02
			ΔBMI	*SE*	*p* Value	95% CI		*d*
Contrasts		High BMI, control versus standard	**−0.22**	**.10**	**.03**	**−0.42**	**−0.03**	**−.14**
		Mid-BMI, control versus Standard	0.05	.05	.28	−0.04	0.15	.03
		Control, mid versus Hi BMI	−0.05	.08	.53	−0.21	0.11	−.03
		Standard, mid versus Hi BMI	**−0.33**	**.08**	**.00**	**−0.48**	**−0.17**	**−.18**

Note. Contrasts are provided for statistically significant interactions only. Positive scores indicate weight gain relative to the reference group, and negative scores indicate weight loss relative to the reference group. Reference groups are mid-BMI for weight category and control condition for treatment. BMI = body mass index. Bold indicates a significant *p* Value.

used multilevel modeling with participants at Level 1, nested within schools at Level 2. Intraclass correlations for BMI change and GPA nested within colleges were both approximately 4%, a meaningful proportion of the variance with an $n > 300$ average college cluster size (Muthen, & Satorra, 1995).

The first Level 1 predictor was the three-level BMI category, coded as two dummy variables using the mid-weight category as the reference group because we did not expect the treatment to affect these nonstigmatized participants (*lower weight* = 1, *mid-weight and higher weight* = 0, *higher weight* = 1, *mid-weight and lower weight* = 0). The second was treatment, coded as two dummy variables with control as the reference group to enable examination of treatment effects (1 = *standard treatment*, 0 = *control and customized treatment*; 1 = *customized treatment*, 0 = *control and standard treatment*).

Main effects were entered at Step 1, interactions at Step 2. For interaction terms, each BMI dummy variable was multiplied by each treatment dummy variable. We then recoded the dummy variables to test comparisons between other groups (e.g., recoding the two dummy variables representing treatment to compare the standard to the customized treatments). Where significant interactions emerged, we investigated patterns using

Table 3. First-Year GPA × Weight Category and Condition (Controlling for ACT/SAT Score).

Step	Level	Variable	*b*	*SE*	*p* Value	95% CI		β
Step 1	Fixed	Intercept	1.56	.07	.00	1.42	1.70	.07
		Low BMI	−0.02	.03	.40	−0.08	0.03	−.04
		Hi BMI	**−0.09**	**.02**	**.00**	**−0.13**	**−0.06**	**−.16**
		Standard	**0.04**	**.02**	**.03**	**0.00**	**0.07**	**.07**
		Custom	0.03	.02	.05	0.00	0.07	.06
		ACT/SAT score	**0.07**	**.00**	**.00**	**0.06**	**0.07**	**.58**
	Random	Residual	0.28	.01		0.27	0.29	.76
		Intercept	0.03	.01		0.02	0.07	.09
Step 2	Fixed	Intercept	1.57	.07	.00	1.43	1.71	.08
		Low BMI	0.01	.05	.92	−0.09	0.10	.01
		Hi BMI	**−0.14**	**.03**	**.00**	**−0.20**	**−0.07**	**−.22**
		Standard	0.02	.02	.33	−0.02	0.06	.03
		Custom	0.04	.02	.06	0.00	0.08	.06
		ACT/SAT score	**0.07**	**.00**	**.00**	**0.06**	**0.07**	**.58**
		Low BMI × Standard	0.05	.07	.46	−0.09	0.19	.09
		Low BMI × Custom	**−0.14**	**.07**	**.05**	**−0.27**	**0.00**	**−.22**
		Hi BMI × Standard	**0.09**	**.05**	**.06**	**0.00**	**0.18**	**.15**
		Hi BMI × Custom	0.04	.05	.45	−0.06	0.13	.06

Note. BMI = body mass index; GPA = grade point average. Bold indicates a significant *p* Value.

two-sample *z* tests comparing the estimated mean of the outcome for each group. Effect sizes are shown as partially standardized βs (see Lorah, 2018); Cohen's *d* (using the raw pooled *SD*) is included for all contrasts at $p < .10$.

Does a Social-Belonging Intervention Affect Bodyweight for Higher Weight Students?

Figure 1, Panel A, shows higher weight participants gained less weight than mid-weight participants ($\beta = -.10, p = .003$). This main effect was qualified by an interaction with condition (standard vs. control; $\beta = -.20, p = .013$). Higher weight participants in the standard treatment had more stable weights than higher weight controls ($\Delta BMI = -0.22$, $d = -.14$, $p = .025$), gaining 0.59 BMI units (4.00 lbs on an average-heighted 5′6″ participant) in the control compared to 0.37 BMI units (2.50 lbs) in the standard treatment (see Table 2).

There were no main effects or interactions with the customized treatment compared to the control. Lower weight participants gained weight relative to mid-weight participants ($\beta = .10$, $p = .039$), but there were no interactions with condition.

Does a Social-Belonging Intervention Affect Academic Achievement for Higher Weight Students?

Analyses controlled for ACT/SAT scores. Four schools did not report either GPA or ACT/SAT scores ($n = 879$), so observations from these schools were excluded in those analyses. An indicator of additional missingness on GPA and ACT/SAT score variables ($n = 478$, or <10% of remaining data, typical for education datasets; see Peugh & Enders, 2004) was shown to not vary systematically ($r < .05$) with gender, race, condition, or BMI, so listwise deletion with a maximum likelihood estimator was used.

Figure 1, Panel B, shows higher weight participants had lower GPAs than mid-weight participants ($\beta = -.16$, $p < .001$). Participants in the standard treatment had higher GPAs than controls ($\beta = .07$, $p = .027$). These main effects were qualified by a marginally significant ($\beta = .15$, $p = .058$) interaction (see Table 3). Controlling for ACT/SAT scores, higher weight participants in the standard treatment had higher GPAs than higher weight controls ($\Delta GPA = 0.11$, $d = .10$, $p = .010$), with an estimated mean GPA of 3.25 in the standard treatment compared to 3.14 in the control.

There was no main effect of the customized treatment, and no interaction for higher weight participants compared to mid-weight participants. For lower weight participants, there was a marginally significant ($\beta = -.22, p = .053$) interaction with the customized condition compared to control. However, contrasts revealed no significant differences between lower weight students in the customized treatment and the control.

Do the Effects of the Belonging Intervention Differ for Men and Women?

To explore the degree to which treatment effects were moderated by gender, we added gender (0 = *male*, 1 = *female*) as an additional Level 1 predictor, along with its interactions with treatment and weight. Here, we report significant and marginally significant effects for higher weight relative to mid-weight participants. See Supplement for full output, including any effects for lower weight participants.

BMI. Women gained more weight than men ($\beta = .10, p = .001$), and higher weight participants gained less than mid-weight participants ($\beta = -.09$, $p = .009$). These main effects were qualified by a marginally significant three-way interaction between gender, condition (standard vs. control), and bodyweight (higher vs. mid-weight; $\beta = -.32$, $p = .062$). Higher weight women in the standard treatment had more stable weights than higher weight women in the control (ΔBMI $= -.44$, $d = -.29$, $p < .001$), gaining 0.26 BMI units (1.60 lbs on a 5′6″ participant) in the standard treatment, compared to 0.70 BMI units (4.40 lbs) in the control. Considered another way, in the control, higher weight women gained more than higher weight men (ΔBMI $= 0.26$, $d = .18$, $p = .085$), whereas in the standard treatment, higher weight women gained less than men (ΔBMI $= -0.37$, $d = -.25$, $p = .016$). There was no effect of the standard treatment compared to the control for higher weight men. However, mid-weight men gained in the standard treatment relative to the control ($\beta = .13$, $p = .041$). There were no main effects or interactions with the customized treatment.

GPA. Women had higher GPAs than men ($\beta = .20$, $p < .001$), and higher weight participants had lower GPAs than mid-weight participants ($\beta = -.15$, $p < .001$). Participants in the standard treatment had higher GPAs than controls ($\beta = .06$, $p = .048$). There was no three-way interaction between gender, higher weight compared to mid-weight participants, and either treatment compared to control.

Do the Effects of the Belonging Intervention Differ by Racial Group Membership?

To explore the degree to which the effect of treatment was moderated by racial identity, we added race (*nonunderrepresented* = 0, *underrepresented* = 1) as a Level 1 predictor. As above, we report significant and marginally significant effects for higher weight relative to mid-weight participants. See Supplement for full output, including for lower weight participants.

BMI change. Participants from underrepresented groups gained weight relative to nonunderrepresented participants ($\beta = .12$, $p < .001$), and higher weight participants gained less weight than mid-weight participants ($\beta = -.10$, $p = .003$). There were no interactions between treatment and race for higher weight compared to mid-weight participants and no effects for the customized treatment.

GPA. Participants from underrepresented groups had lower GPAs than those from nonunderrepresented groups ($\beta = -.24$, $p < .001$), and higher weight participants had lower GPAs than mid-weight participants ($\beta = -.14$, $p < .001$). Participants in the standard treatment had higher GPAs than controls ($\beta = .08$, $p = .011$). These effects were qualified by a two-way interaction between higher weight participants relative to mid-weight and standard treatment compared to the control ($\beta = .29$, $p = .004$) and a three-way interaction between treatment, BMI category, and race ($\beta = -.41$, $p = .016$). Higher weight participants with nonunderrepresented racial identities had higher GPAs (ΔGPA $= 0.19$, $d = .22$, $p = .001$) in the standard treatment ($M_{\text{GPA}} = 3.33$) than the control ($M_{\text{GPA}} = 3.14$). There was no effect for underrepresented higher weight participants. Participants in the customized treatment had higher GPAs than controls ($\beta = .07$, $p = .032$). There were no interactions with the customized condition.

Do Effects Hold Controlling for SES?

We reran analyses predicting GPA and BMI, including SES, which is correlated with BMI, as a covariate. The pattern of results became stronger (see Supplement for methods and detailed results).

Discussion

We predicted and found that a standard social-belonging treatment (but not a school-specific customized treatment) promotes weight stability for higher weight students. We also showed that higher weight students in the standard condition had higher first-year GPAs than those in the control condition.

This is the first study we know of in psychological research to show a weight gap in GPA, and the first to examine bodyweight as an outcome of a social belonging intervention. While the interaction by condition and weight predicting GPA did not reach the threshold of statistical significance here, we believe the patterns suggest that the impact of such social-belonging interventions on GPA is worth further study. It is also the first to test a social–psychological field intervention with students outside of those for whom they were originally designed (i.e., underrepresented racial, gender, or socioeconomic identities). Treatment materials did not mention bodyweight or indicate weight status of the students portrayed. This suggests that psychological interventions, when they speak to shared psychological experiences, can have impacts on people from diverse identities. Future research could examine effects for other stigmatized students (e.g., students with disabilities, students who speak English as an additional language).

Exploratory intersectional analyses revealed that effects on higher weight students' bodyweight were driven by women, whereas effects on GPA were driven by participants with nonunderrepresented racial identities (i.e., White, Asian, and Middle Eastern). This divergence suggests differing mechanisms for these effects, and although the dearth of studies precluded us from generating a priori hypotheses, past research could help us identify next steps to understand the results. Although variation in weight change and academic achievement both have behavioral components, weight mechanisms are also physiological (e.g., stress causing fat storage; Björntorp, 2001), whereas academic mechanisms can also be cognitive (e.g., reduced working memory capacity; Hutchison et al., 2013; Logel et al., 2009; Schmader & Johns, 2003). For bodyweight, the treatment may have alleviated a pattern in which higher weight women in the control condition, facing more weight loss pressure than men because of gendered hyper-thin cultural ideals (Vartanian et al., 2001), may have resorted to highly restrictive diets, which slow metabolism and trigger hunger hormones, often leading to weight gain (see Logel et al., 2015). Indeed, higher weight women gained more weight than men in the control condition but less weight than men in the standard treatment condition. For GPA, perhaps academically relevant stigmas from both race and weight faced by Black, Latino, or Native American students (i.e. alleging unintelligence) tax working memory, increasing intractability of identity-related negative effects. Research that measures these pathways could contribute to understanding intersectional processes.

Although the effect sizes corresponding to our main analyses were small according to Cohen's (1969) benchmarks, they represent moderate-to-large effects according to benchmarks for education interventions (Kraft, 2020). Even small effects could have a large impact if delivered to thousands of students, given that this intervention is low cost and has demonstrated scalability.

In this study, we did not find clear beneficial effects on weight stability or GPA for students in the customized condition. It is possible that more tailored stories, customized to the specific concerns identified during the focus groups, restricted the range of experiences represented in the stories. With fewer stories that resonated with their experiences, higher weight students may not have benefited from the customized intervention as much as they might have from the standard intervention—where the more general uncertainties about the transition to college help to normalize students' concerns about belonging. Future research could explore whether including weight-related concerns in the stories helps resonate with higher weight students and, consequently, impacts their weight and performance outcomes.

These results go beyond work showing that values affirmation promotes weight stability (i.e., Logel & Cohen, 2012; Logel et al., 2018, 2019). There, a 15-min writing task bolstered global self-integrity, presumably buffering weight-dissatisfied participants against weight-related self-integrity threats in a lab context including multiple weight-relevant activities. Here, in this multisite field trial, the standard social-belonging treatment changed attributions for future challenges and belonging threats in the college transition, none related to weight. This adds to research on the pernicious effects of weight stigma, showing that it poses a threat to belonging, a fundamental human need (Baumeister & Leary, 1995). However, a belonging intervention can attenuate its effects by illuminating how widely shared adversities are common for diverse students and need not portend a global lack of belonging.

Authors' Note

This article analyzes data from a dataset collected by the College Transition Collaborative (PIs: Christine Logel, Mary Murphy, Greg Walton, and David Yeager).

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Author Contributions

C. L. drafted the manuscript. O. F., J. M. L., and C. L. developed the study concept and contributed to design and collection of the data for which this study conducted secondary analysis. E.B.W. analyzed the data, cowrote the results section, and produced tables and figures. All authors provided critical revisions approved the final version of the manuscript for submission.

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Supplemental Material

The supplemental material is available in the online version of the article.

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