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Costs on the Mind: The Influence of the Financial Burden of College on Academic Performance and Cognitive Functioning

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Abstract The current studies test the hypothesis that the financial burden of college can initiate a psychological process that has a negative influence on academic performance for students at selective colleges and universities. Prior studies linking high college costs and student loans to academic outcomes have not been grounded within relevant social psychological theory regarding how and when the financial burden of college can influence students' psychological and cognitive processes. We test the hypothesis that the salient financial burden of college impairs students' cognitive functioning, especially when it creates an identity conflict or perceived barrier to reaching a student's desired financially successful future. First, we use longitudinal data from 28 selective colleges and universities to establish that students who accumulate student loan debt within these contexts are less likely to graduate from college because student loan debt predicts a decline in grades over time, even when controlling for factors related to socioeconomic status and prior achievement. Then, in an experiment, we advance research in this area with a direct, causal test of the proposed psychological process. An experimental manipulation that brings high college costs to mind impairs students' cognitive functioning, but only when those thoughts create an identity conflict or a perceived barrier to reaching a student's desired financially successful future.

Keywords Higher education · Debt · Identity · Cognition · Academic achievement

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Introduction

The financial costs of attending college in the United States have seen consistent and often dramatic annual increases over the past 25 years (College Board 2015). Not surprisingly, college student loan debt is on the rise in parallel (FRBNY 2012). The financial burden that many students adopt in order to attend college can have a significant and lasting negative effect on the economic stability of college graduates and their ability to build wealth and assets (Elliott and Lewis 2014). Furthermore, while the availability of loans helps to make college financially accessible to some students, fear of loans and the financial burden of college drive other students away from some colleges and universities altogether (Elliot and Lewis 2013). Despite a burgeoning amount of research on how student loan debt influences students before and after college, little research has focused on how high financial costs affect the college experience itself and students' abilities to succeed in their studies.

Existing evidence of the overall relationship between the financial burden of college and academic outcomes remains mixed. Most existing studies only provide descriptive accounts of the educational outcomes that are associated with different levels of student loan debt for different groups of students, without attention to relevant theory suggestive of potentially important social psychological processes. As a result, descriptive studies with various samples of students sometimes find student loan debt to be associated with worse academic outcomes (e.g., Dowd and Coury 2003; Kim 2007; Robb et al. 2012; John et al. 1992), better academic outcomes (e.g., Chen and DesJardins 2008; Jackson and Reynolds 2013), a non-linear pattern (e.g., Dwyer et al. 2012, 2013; McKinney and Burridge 2015), or no clear association at all (e.g., Rothstein and Rouse 2011; Zhang and Kemp 2009). The current studies aim to add clarity to the understanding of how the financial burden of college can influence academic outcomes by building upon social psychological theory that highlights the potential roles of cognition and identity.

The Roles of Cognition and Identity Conflict

In general, when people are burdened with thoughts about undesirable financial circumstances, such as high costs and debt, they tend to suffer poorer basic attention and cognition (Mani et al. 2013; Shah et al. 2012; Sussman and Shafir 2012). We investigate how this phenomenon may relate to college costs and academic performance by building upon identity-based motivation theory, which draws a connection between identity and cognitive functioning. The theory outlines how students' thoughts about themselves and their social context interact to influence cognitive functioning (Oyserman and Destin 2010). For instance, when college or an educational context feels as though it is a pathway to the life that a student wants for their future, then education and their *future identity* feel connected (Destin and Oyserman 2010). This sense of connection between education and future identity facilitates an experience of cognitive fluency that allows students to reach their highest levels of cognitive functioning. On the other hand, education can sometimes feel as though it is not the path to the future that a student imagines for themselves, leading to a sense of conflict between education and future identity. Identity conflict of this type drains cognitive resources (see Benet-Martinez and Haritatos 2005; Settles 2004) and impairs cognitive functioning.

Many college students imagine a future identity characterized by financial security and stability (e.g., Oyserman et al. 2015), which we call a *desired successful future identity*. However, we suggest that the financial burden of college can conflict with a student's

desired successful future identity, as they begin to imagine young adulthood characterized by the aftermath of high college costs and perhaps debt. Therefore, when thoughts about high college costs and debt are salient and conflict with students' desired successful future identities, they are likely to impair students' cognitive functioning.

Illustrations of students experiencing this type of identity conflict can be found in "Class Confessions", a series of blogs where students at selective universities anonymously post their thoughts related to finances and college. Students regularly end their descriptions of frustration with the financial burden of college with statements that illustrate how current college costs and debt conflict with their desire for future financial success (e.g., "how will I ever hope to send my kids to college in another 30 years?", Confession #405 2014; "I've accepted that I'll be in debt for the rest of my life.", Confession #598 2015).

We predict that, over time, this type of ongoing conflict between the current financial burden of college and a desired successful future identity that impairs cognition leads to a decrease in academic performance, which may in turn lead to a failure to complete college. As a student proceeds through college, they may accumulate more student loan debt and feel that they are closer to the time of repayment, inherently increasing the salience of the financial burden of college. Further, a model that predicts a decrease in students' grades over time allows us to include earlier achievement as a predictor variable, helping to statistically control for any pre-existing differences in student achievement before acquiring loans or early in college. This provides a more precise measurement of the relationship between the financial burden of college and students' subsequent grades and outcomes in college.

Therefore as shown on the top path of Fig. 1, in the current research we first use data from a large, longitudinal sample of students at selective colleges and universities to interrogate the validity of our premise that accumulating student loan debt should predict a decrease in grades and subsequently a decreased likelihood of graduating from college. Next, as shown on the bottom path of Fig. 1, we advance this area of research by introducing a laboratory experiment that provides a direct, causal test of the proposed process to determine whether bringing to mind the financial burden of college impairs cognitive functioning, but only when it conflicts with a desired successful future identity.

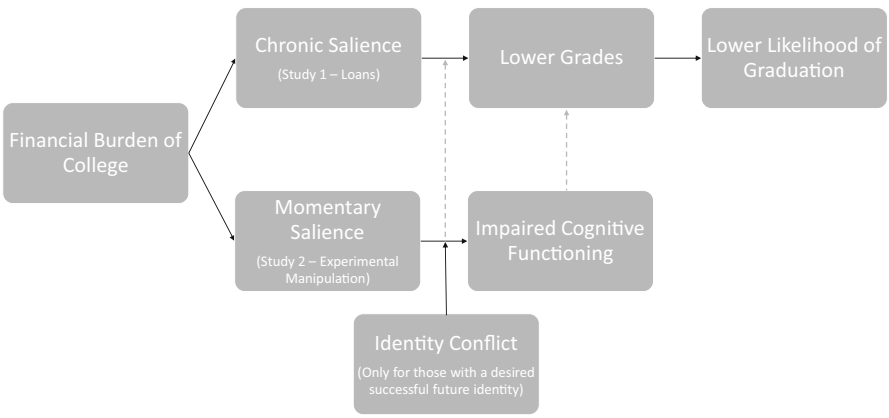

Fig. 1 Hypothesized psychological processes and effects of the financial burden of college on academic performance and cognitive functioning. *Solid lines* are tested in the current studies

Hypotheses

(1) Before directly testing the proposed process, we first utilized data from a 4 year longitudinal study to attempt to replicate findings that the financial burden of college tends to have a negative relationship with academic outcomes for students at selective colleges and universities. We took advantage of student loan debt as a naturally occurring circumstance that makes the financial burden of college feel more chronically salient for those with debt than for those without debt. Therefore, if the salient financial burden of college impairs cognitive functioning as described above, then the acquisition of student loan debt should predict a decrease in grades over time, which in turn predicts a decrease in the likelihood that students graduate from college. To provide initial evidence that the salient financial burden of college impairs cognitive functioning, we expect that students who acquire loan debt will experience a decrease in grades over time, which is in turn associated with lower rates of graduation, even when statistically accounting for the influence of other socioeconomic characteristics or prior academic achievement level before college. As described above, existing evidence regarding the general relationship between the financial burden of college and academic outcomes is mixed. Therefore, in Study 1 we first sought to replicate and bolster findings suggesting that loan debt can be associated with worse academic outcomes. Then, we conducted our experiment (Study 2) in order to delve further into a proposed process that helps to explain *why* the expected relationship exists.

(2) After testing whether a general pattern in support of the proposed process exists in a large longitudinal sample, a laboratory experiment is necessary for a direct, causal test of the proposed psychological process linking the salient financial burden of college to cognitive functioning. We expect that students who are randomly assigned to think about the financial burden of college should show impaired performance on a subsequent cognitive task. A laboratory experiment also allows us to test the proposed role of identity conflict with a desired successful future identity. We predict an interaction effect, such that the negative effect of thinking about the financial burden of college should only occur for those students who experience the identity conflict (i.e., they have a "desired successful future identity"). In other words, for those students who already do not expect or value a traditional sense of future financial security (i.e., they do not have a "desired successful future identity"), salient college costs do not conflict with identity and therefore should not impair cognition.

(3) The laboratory experiment will also provide the opportunity to test whether cognitive impairment can be reversed for those students who do experience an identity conflict between the salient financial burden of college and a desired successful future identity. High college costs can be thought of as an *investment* that helps to lead to future financial success rather than a barrier to financial success. When students are randomly assigned to think about the financial burden of college in a way that feels connected to also reaching a desired successful future identity, those students should experience a rebound in cognitive functioning. We discuss hypotheses 2 and 3 further in Study 2, but first we seek evidence in order to evaluate the top portion of our model.

Study 1

In order to first replicate prior research and provide additional evidence that a chronic reminder of the financial burden of college (i.e., accumulating student loan debt) predicts worse academic performance among a large sample of college students at selective institutions, we used the National Longitudinal Survey of Freshmen (Massey et al. 2011). Specifically, we hypothesized that simply accumulating any amount of student loan debt toward the beginning of college would longitudinally predict a decrease in grades over time which, in turn, would be associated with a lower chance of reaching graduation, even when statistically accounting for variables related to family socioeconomic background and previous academic achievement. In additional analyses we also tested whether having a larger amount of student loan debt, as opposed to simply possessing or not possessing any student loans, predicts a decrease in grades and subsequent decreased likelihood of graduation. Finally, we predicted that the relationship between simply possessing loans (or amount of loans) and graduation would be mediated by a decrease in grades during college.

Materials and Methods

Data

The NLSF, which was facilitated through the Office of Population Research at Princeton University, provided survey data of college students from 28 selective post-secondary institutions (see Appendix Table 5) and included a baseline survey (Fall 1999), four annual follow-up surveys (Spring 2000–2003), and post-graduation data provided by offices of the registrar. The dataset provided responses that assessed neighborhood, family, and educational contexts as well as financial, psychological, and achievement measures.

Our sample included 3924 student respondents (42% male; 24% Asian, 25% White, 23% Hispanic, and 27% Black) who provided data at 5 time points: fall 1999 (Time 1, beginning of first year of college), spring 2000 (Time 2, end of first year of college), spring 2002 (Time 3, end of third year of college), spring 2003 (Time 4, end of the fourth year of college) and post-graduation data (Time 5). No participants were excluded from our analysis, and we used full information maximum likelihood (FIML) to account for missing data on individual measures. Response rates are provided below.

After completing high school, students participated in an initial interview at home and over the phone at each subsequent time point on key constructs, including socio-demographic measures, student loan debt, and grades.

Demographics

Household income was assessed at baseline by asking students at Time 1 to select one of 14 household income ranges from "under $3000" to "$75,000 or more" (96% response rate). Students' also reported their race/ethnicity by responding to one of four categories (black/African American, Caucasian/white, Asian, and Hispanic/Latino). We created a variable indicating whether their group was underrepresented in higher education (50%; black/African American and Hispanic/Latino) or not (50%; Caucasian/white and Asian), as conducted in prior research (e.g., Stephens et al. 2014). Participants also indicated their gender by responding to one of two categories (male or female; 100% response rates).

Standardized Test Scores

Students were also asked to report either their SAT or ACT composite scores. Each participant only provided results of one test or the other, so scores were combined into one test score variable and then standardized into a z-score to be included as a covariate (80% response rate).

Student Loans and College Tuition

At Time 2, toward the end of their first year of college, students were asked if they had borrowed any student loans and could respond either yes or no, which was the primary independent variable in our analyses (55% no loans, 45% loans; 95% response rate). For additional analyses, the amount of student loans was assessed by asking students an open-ended prompt about their college expenses, "What is your best estimate of the total amount of money you needed to attend school this current academic year? Please include tuition, academic fees, room, board, and your daily expenses for living and entertainment". Immediately after this, they were asked how much of the total amount would be funded by several sources, including grants, work, and student loans (e.g., "How much will be funded from each of the following sources: a student loan?; 92% response rate).

Annual college tuition costs included in the NLSF data were collected from US News and World Report and used as a covariate in our models (100% response rate). Tuition costs were z-score transformed prior to analysis.

Work for Pay

Also, at Time 2, students reported if they had worked for pay during their freshman year (95% response rate). 46% reported they had worked during their freshman year while 54% said they had not. Work for pay was included as a covariate to account for the possibility that student loans led to worse academic outcomes only because students with loans spent more of their time working for pay.

Grades

Student grades were collected at Time 2 and Time 4 by asking students what grades they received or expected to receive for each of their classes in the fall, winter, and spring from A+ to F. Students on a quarter system completed all three terms while students on a semester system completed only the fall and spring semesters, listing up to 10 classes per term at Time 2 and six classes per term at Time 4. Grades at Time 2 were initially reported on a 13 point scale but recoded to match the 12 point scale ($12 = A+$, $1 = F$) of grades at Time 4. A composite measure of each of the terms (fall, winter, and spring) was then created for each school year by averaging the grades reported across all classes. From this, a total composite grade point average was created for each time point by averaging the means from fall, winter, and spring, and these two composites were z-score transformed prior to analysis. All analyses covary for grades at Time 2 (94% response rate), so Time 4 (75% response rate) represents a student's change in grades from the end of their first year of college to the end of their fourth year.

STEM Major

At Time 3 students reported their major. These responses were then coded into 68 major codes that incorporated all the major types at the participating universities. For these analyses, we then coded these 68 majors into two categories: science, technology, engineering, and mathematics (STEM) major (28%) or non-STEM major (71; 80% response rate).

Graduation Records

The graduation measure indicated whether or not students graduated from a post-secondary institution within six years of starting college, according to information from offices of the registrar at the participating colleges and universities and the National Student Clearinghouse (99% response rate).

Data Analysis

Analysis Plan

As depicted in Fig. 2, we estimated a structural equation model in Stata 13 to investigate whether accumulating any student loan debt during the first year of college predicted a decline in academic performance over time, which in turn predicted a reduced likelihood of graduating from college. We evaluated a primary model, which included simply accumulating any amount of student loan debt (0 = no loans; 1 = loans), a measure of grades at Time 4 (z-score transformed; senior year), and a measure of graduation within six years as the outcome variable (1 = graduated within 6 years; 0 = did not graduate within 6 years). In the model, we included pathways where loans predicted grades at Time 4 and graduation, while grades at Time 4 predicted graduation. We also evaluated secondary model, which was identical to our primary model except that we replaced the dichotomous measure of accumulating any student loan debt with the linear measure of amount of student loan debt at Time 2 (log transformed) to examine if accumulating more student loan debt predicted a larger decrease in grades.

In addition, both our primary and secondary models included seven covariates. Six covariates were measured at Time 2: college tuition (z-score transformed), household income, gender (0 = male; 1 = female), race (0 = not underrepresented;

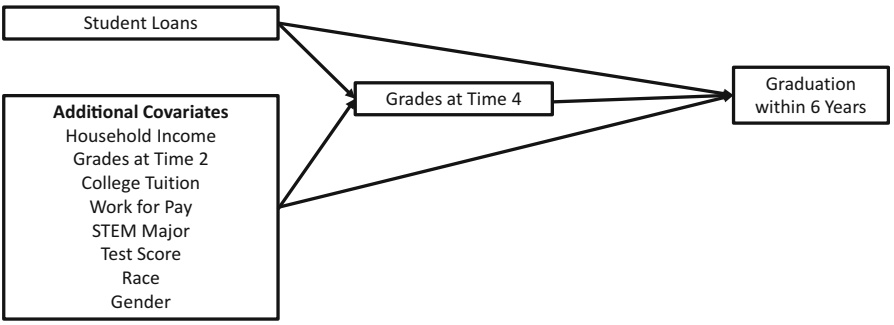

Fig. 2 Hypothesized structural equation model for Study 1

1 = underrepresented), test score (z-score transformed), and work for pay (0 = did not work for pay; 1 = worked for pay). The last covariate, STEM major (0 = non-STEM; 1 = STEM), was measured at Time 3 because many students reported no major during their first and second years of college. In the original models, covariates were correlated with one another and allowed to predict both grades at Time 4 and graduation. However, to improve the parsimonious nature of our models, paths between the covariates and grades at Time 4 and graduation were only retained in our final models if the paths were significant. Also, it is important to note that our models included grades at Time 2 as a covariate, so grades at Time 4 represents the change in grade from freshman to senior year. Finally, because we were interested in the indirect effect of loans on graduation, we estimated if the total indirect effect of student loans on graduation was mediated through the changes in grades.

For our final models, model fit was assessed using the comparative fit index (CFI) and the root mean squared error of approximation (RMSEA) such that a CFI value greater than 0.95 and RMSEA value less than 0.06 indicates good model fit (Hu and Bentler 1999). Full information maximum likelihood was used to account for missing data (Arbuckle 1996).

Results

Preliminary Results

Descriptive statistics and zero-order correlations are reported in Tables 1 and 2. There was a significant correlation between accumulating any student loan debt and graduation ($r = -0.05, p = 0.004$) as well as between the amount of student loan debt and graduation ($r = -0.05$, $p = 0.003$). For comparison, the relationships between loan debt and graduation were comparable in size to the well-established relationships in our model between family income ($r = 0.08$, $p < 0.001$), race ($r = -0.12$, $p < 0.001$), standardized test scores ($r = 0.06$, $p = 0.001$) and graduation.

Table 1 Descriptive statistics for Study 1

	Male M (SD)	Female M (SD)	Total M (SD)
Student loans—Time 2	2235.61 (5899.52)	2468.63 (5899.52)	2371.53 (6444.83)
Grades—Time 2	9.77; B+ (1.39)	9.85; B+ (1.21)	9.82; B+ (1.19)
Grades—Time 4	10.33; A− (1.28)	10.55; A− (1.09)	10.46; A− (1.18)
College tuition	22,050.42 (5414.08)	21,726.58 (5606.39)	21,862.25 (5528.25)
Household income	35,000–49,999 (1.93)	35,000–49,999 (2.02)	35,000-49,999 (1.99)
SAT score	675.48 (82.67)	648.17 (78.81)	660.16 (81.64)
ACT score	27.07 (4.08)	26.81 (3.79)	26.90 (3.90)
	N	N	N
Work for pay	763	945	1708
Graduated in 6 years	1388	1999	3387
STEM major	436	463	899

N = 3924. M = mean. SD = standard deviation. Work for pay, student loans, graduation, and STEM major in four years are binary variables, so no mean or standard deviation is reported

Table 2 Zero-order correlations among variables in Study 1

	1	2	3	4	5	6	7	8	9	10	11	12
Student loans	–											
Amount of loans	0.99***	–										
Grades at Time 2	−0.12***	−0.12***	–									
Graduation	−0.05*	−0.05*	0.23***	–								
Grades at Time 4	−0.12***	−0.12***	0.45***	0.17***	–							
Household income	−0.22***	−0.23***	0.12***	0.08***	0.14***	–						
College tuition	0.06***	0.07***	0.14***	0.11***	0.12***	0.04**	–					
STEM major	−0.06**	−0.05**	0.05**	−0.01	−0.05*	0.03	−0.01	–				
Test score	−0.04*	−0.04*	0.18***	0.06***	0.16***	0.09**	0.12***	0.05*	–			
Work for pay	0.29***	−0.30***	0.07***	0.01	0.03	0.21***	−.18***	0.08***	0.00	–		
Race	0.20***	0.21***	−0.27***	−0.12**	−0.23***	−0.20***	−0.03	−0.12***	−0.20***	−0.16***	–	
Gender	0.05***	0.04	0.03	0.05**	0.09***	−0.05**	−0.03	−0.10***	−0.09***	−0.06***	0.07***	–

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Students loans (1 = loans), gender (1 = female), race (1 = underrepresented), work for pay (1 = yes), and STEM major (1 = STEM major) were dichotomous variables

Primary Structural Equation Model

We investigated the relationship between accumulating any student loan debt, grades, and graduation. In our original model, paths between all the additional covariates and grades at Time 4 and graduation were estimated. However, paths that were non-significant were removed from our final model. Paths that were non-significant in our original model included the path between work for pay and grades at Time 4 as well as the paths between work for pay, test score, and STEM major with graduation. The marginal path between gender and graduation was retained in the final model ($p = 0.051$). All direct effects estimated in our final model are reported in Table 3. The model fit the data very well ($\chi^2(2) = 0.26$, $p = 0.880$; RMSEA = 0.000; CFI = 1.000) and accounted for 28% of the variation in grades at Time 4 and 8.50% of the variation in graduation.

The standardized and non-standardized direct effects from the theoretical model are reported along with the indirect effect in Table 3. Almost half of the students in our sample reported borrowing loans (45%), and the predicted pathways were significant. As shown in Table 3, simply accumulating any amount of student loan debt at Time 2 significantly predicted lower grades for students at Time 4, which represented a real change in grades because all analyses controlled for Time 2 grades measured at the end of the first year of

Table 3 Summary of parameter estimates and significance levels for direct and indirect effects for the primary model

	Effects		
	b	z	β
Direct effects			
Grades at Time 4			
Student loans	−0.09*	−2.54	−0.04
Grades at Time 2	0.42***	23.10	0.41
College tuition	0.07***	4.04	0.07
Household income	0.03***	3.91	0.07
Test score	0.07***	3.90	0.07
STEM major	−0.17***	−4.50	−0.08
Race	0.23***	−6.45	−0.11
Gender	0.24***	7.30	−0.12
Graduation			
Student loans	−0.003	−0.24	0.004
Grades at Time 4	0.05***	5.86	0.15
Grades at Time 2	0.05***	6.86	0.14
College tuition	0.02***	4.46	0.07
Household income	0.01*	2.10	0.04
Race	−0.03*	−2.36	−0.04
Gender	0.02*	2.04	0.03
Indirect effect			
Student loans → Grades at Time 4 → Graduation	−0.004*	−2.36	−0.006

N = 3924 college students. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$. Test score, tuition, and grades were z-score transformed

college. Further, better grades significantly predicted an increased likelihood of graduation. For comparison in Table 3, the strength of the standardized relationship between loans and grades was comparable in size to the relationships between family income, race, standardized test scores and grades.

Further, a test of the hypothesized indirect pathway from student loan debt to graduation through change in grades was significant ($b = -0.004$, $\beta = -0.006$, $p = 0.020$), and the unstandardized 95% confidence interval did not include zero, (-0.008, -0.001), suggesting that the relationship between accumulating any amount of student loan debt and graduation was mediated by the change in grades over time during college (Selig and Preacher 2009).[1]

Secondary Structural Equation Model

For our additional model, we replaced the measure of simply accumulating any student loan debt with the measure of the amount of student loan debt that students reported at Time 2. Similar to our original primary model, our original secondary model included paths between all additional covariates and grades at Time 4 and graduation. However, for our final secondary model, we removed any non-significant paths between these additional covariates. The paths we removed were the same as those we removed in our primary model: path between work for pay and grades at Time 4 as well as the paths between work for pay, test score, race, and STEM major with graduation. The model fit the data very well ($\chi^2(2) = 0.25$, $p = 0.880$; RMSEA = 0.000; CFI = 1.000) and accounted for 28% of the variation in grades at Time 4 and 8.50% of the variation in graduation.

The standardized and non-standardized direct effects from the theoretical model are reported along with the indirect effect in Table 4. A greater amount of student loan debt at Time 2 did significantly predict a decrease in grades at Time 4, matching the pattern described above. Again, mirroring results above, an increase in grades significantly predicted an increased likelihood of graduating.

A test of the hypothesized indirect pathway of student loans on graduation through change in grades was significant ($b = -0.001$, $\beta = -0.009$, $p = 0.020$). However, the unstandardized 95% confidence interval did include zero, [-0.001, 0.000], suggesting that the relationship between possessing a greater amount of student loan debt and graduation was not fully mediated by the change in grades over time in college (Selig and Preacher 2009).

[1] We also estimated a structural equation model that takes into account the categorical nature of graduation and the clustering of data at 28 schools by using full information maximum likelihood (FIML) estimation method with robust standard errors which handles non-normality and non-independence of observations (in Mplus, ESTIMATOR = MLR; (Muthén and Muthén 1998). The standard errors were clustered at the school level and computed using a sandwich estimator (Asparouhov and Muthén 2006). Finally, a Monte Carlo method was used for assessing mediation between a binary dependent variable and a continuous mediating variable with missing data (in Mplus, INTEGRATION = MONTECARLO; MacKinnon et al. 2004). Our final model excluded paths between work for pay and grades at Time 4 as well as paths for work for pay, test score, and STEM major with graduation because they were non-significant. The model explained 8.50% of the variance in graduation and 28% of the variance in grades at Time 4. The direct effects of student loans to grades at Time 4 ($b = -0.09$, $\beta = -0.04$, $p = 0.020$) and grades at Time 4 to graduation ($b = 0.50$, $\beta = 0.15$, $p < 0.001$) were still significant. The indirect effect of loans at Time 2 to graduation through grades at Time 4 was also still significant ($b = -0.004$, $\beta = -0.006$, $p = 0.048$). However, the 95% confidence interval included zero, [-0.009, 0.000], suggesting that the relationship between any amount of student loan debt and graduation was not fully mediated by the change in grades over time in college. Because the results were similar, we report the basic structural equation model in the text.

Table 4 Summary of parameter estimates and significance levels for direct and indirect effects for the secondary model

	Effects		
	b	z	β
Direct effects			
Grades at Time 4			
Student loans	−0.01*	−2.51	−0.04
Grades at Time 2	0.42***	23.09	0.41
College tuition	0.07***	4.08	0.07
Household income	0.03***	3.91	0.07
Test score	0.07***	3.90	0.07
STEM major	−0.17***	−4.48	−0.08
Race	−0.23***	−6.44	−0.11
Gender	0.07***	7.28	0.12
Graduation			
Student loans	−0.001	−0.41	−0.01
Grades at Time 4	0.05***	5.87	0.15
Grades at Time 2	0.05***	6.85	0.14
College tuition	0.02***	4.47	0.07
Household income	0.01*	2.04	0.03
Race	−0.03*	−2.33	−0.04
Gender	0.02*	2.04	0.03
Indirect effect			
Students loans →Grades at Time 4 → Graduation	−0.001***	−2.33	−0.009

N = 3924 college students. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$. Test score, tuition, and grades were z-score transformed

Discussion

In a large sample of college students at selective institutions, accumulating any amount of student loan debt during the first year of college predicted a significant decline in students' grades during college, which predicted a decreased likelihood of graduation. Even when accounting for family background and prior academic achievement, which had similarly sized effects as loans, the experience of accumulating student loans uniquely predicted a decrease in student performance. In addition to taking on any student loan debt, taking on a greater amount of student loan debt was associated with a greater decrease in grades and a reduced likelihood of graduation. Models also statistically accounted for the potential influence of college tuition rates and whether students worked for pay, so the illustrated associations between loan debt and student performance were above and beyond these other potentially explanatory factors.

Despite the importance of the findings from Study 1, it only established the existence of a general pattern in support of the idea that the salient financial burden of college impairs cognitive functioning. Study 1 replicated and bolstered prior evidence, but it did not, however, directly evaluate the proposed process involving identity and cognition. It is possible that the negative relationship between loans and student outcomes observed in

Study 1 is a result of other unmeasured processes not directly related to identity or cognition. Loans were operationalized as a proxy assuming that the financial burden of college was more salient for students with loans, which may not be the case for all students. Similarly, lower grades and graduation rates were presumed consequences of continuous impairment to cognitive functioning. Last, the causal role of the salient financial burden of college and the moderating role of conflict with a student's desired successful future identity could not be tested directly with large, longitudinal data.

Study 1 could not randomly assign students to experience a more salient financial burden of college and it did not measure whether or not students had a desired successful future identity to conflict with this financial burden. Therefore, it remains possible, yet unexamined, that the relationship between debt and academic outcomes observed in Study 1 was driven by those students who hoped and expected to reach financial success after college. Those students with a desired successful future identity are expected to experience identity conflict with the chronic salience of their growing college debt, which impairs academic outcomes.

In Study 2, we complement the more externally valid and generalizable patterns in Study 1 with a more controlled laboratory experiment to directly assess causation and the proposed psychological process involving identity and cognition. Specifically, we randomly assign students to an experimental condition that directly manipulates the salience of the financial burden of college and assess the causal effects on a basic measure of cognitive functioning. We also directly evaluate the moderating role of identity conflict. The negative effects on cognition should only emerge for students who actually have a desired successful future identity to conflict with the salient financial burden of college. Further, we should be able to reverse the negative effect on cognition by giving students the opportunity to resolve the identity conflict (i.e., thinking about the financial burden of college as an investment that is connected to reaching their desired successful future identity rather than as a barrier).

Study 2

In a controlled laboratory experiment, Study 2 directly assesses the effects of the salient financial burden of college on cognitive functioning. We suggest that everyday thoughts about the financial burden of college have measurable negative effects on cognitive functioning, especially when those thoughts conflict with a student's desire for future financial security. Salient thoughts about the financial burden of college should disrupt students' basic cognitive functioning because these thoughts cue an automatic and momentary conflict between students' current circumstances and their underlying desired future identities as financially stable adults. However, if identity conflict is central to the process, the financial burden of college should only affect cognition for those who indeed value and aspire to reach traditional financial success, meaning that they have a desired successful future identity.

Also, college costs can be thought of as an *investment* in reaching the future. Therefore, it should be possible to bring the financial burden of college to mind in a way that is connected, rather than conflicting, with a desired successful future identity and therefore does not impair cognitive functioning for those students who do value traditional financial success. We predict that when cued alone in a way that conflicts with a student's underlying expectations for future success, thoughts about the financial burden of college will

have negative implications for cognitive functioning for these students. We also predict, however, that the financial burden can be cued in a way that does not create an identity conflict and rather is connected to an image of future success, which should not disrupt cognitive functioning for these students. The high costs of college can be connected with a successful future identity for some students when college costs are brought to mind along with a moment to also think about reaching future career goals. The opportunity to explicitly think about costs and one's desired successful future identity together allows students to reconcile the costs of college as an investment that leads to their desired future success. When these students consider college costs but are also given the opportunity to contextualize those costs as an investment that can help lead to reaching a desired successful future identity after college, rather than creating an identity conflict, cognitive ability should flourish without disruption.

Again, the processes described above should only occur for students who expect financial success after college. For those students who do not actually value or expect relative financial success after college (those without a desired successful future identity), thoughts about the financial burden of college do not conflict with their underlying future identity in the same way so they should not affect cognitive functioning. In Study 2, we randomly assigned students to experimental conditions that varied in whether and how they brought to mind the financial burden of college. When the financial burden of college was cued in a way that conflicted with a student's desired successful future identity, they should experience a cognitive load, which impairs executive functioning (see Engle 2002; Paas et al. 2003). So, participants completed a task that required executive functioning after the experimental manipulation. We selected the Stroop (1935) color-naming task as a suitable outcome measure because it captures momentary impairments to executive functioning, like that which is expected to result from thoughts about the financial burden of college (e.g., Chan et al. 2008) when they conflict with a desired successful future identity.

Materials and Methods

Undergraduate students from an Introduction to Psychology participant pool at a private, R1 doctorate-granting university were assigned to come into the laboratory to participate in a computer-facilitated study on student life in partial fulfillment of a course requirement ($N = 221$; 43.9% male; 58.4% White, 5.9% Black, 5.9% Latino/a, 22.6 % Asian/Asian American, 7.2% other).

Experimental Conditions

As the study began, participants were randomly assigned, between-subjects, to one of three conditions. In the *college costs only* condition, participants read a prompt that was designed to cue the financial burden of college. This condition was designed to allow for the most unresolved conflict for students with an underlying desired successful future identity and we expected it to lead to the worst cognitive functioning for them. Participants were only asked to calculate their total tuition costs and indicate how they will pay those costs:

> "University tuition costs total approximately $13,280 per quarter. Based on this information, please calculate an estimation of your total tuition costs for your time at University. Please indicate, in detail, how you will pay these tuition costs (i.e., $XX in grants, $XX in loans, $XX family contribution)."

A second group of participants were randomly assigned to the *costs + identity* condition, and they completed the same tuition prompt as participants in the *college costs only* condition. However, immediately afterwards, they also completed a future identity prompt intended to subtly lead them to think about how the financial burden of college was connected to an image of themselves (i.e., their future identity) after graduation. This was designed to alleviate the identity conflict between costs and financial success for students with a desired successful future identity, and we expected it to improve cognitive functioning for them. The prompt told students that the average income in the United States was about $50,000, then asked them to:

> "…Please indicate your likely occupation following graduation and your estimated annual income."

Because we only expected experimental condition to have an effect for students who brought to mind a *successful* future identity after college, all future identity responses were coded for whether they were indicative of a successful future identity or not, relative to the $50,000 anchor that was provided in the prompt. 40.7% of participants provided responses that were coded as indicative of a desired successful future identity because they reported an expectation of earning an annual salary at or above the reported national average of $50,000 (e.g., "consultant, $60,000"). 59.3% of participants provided responses that were coded as not indicative of a desired successful future identity because they reported an expectation of earning an annual salary below the reported national average of $50,000 (e.g., "film editor, $36,000").[2] Students who were not assigned to the *costs + identity* condition completed the future identity prompt at the end of the study after completing the cognitive task, in order to code their future identities as well.

A final group of participants were randomly assigned to a *comparison* condition, where they were induced into a negative mood state, with a type of mood state induction that leads to cognitive distraction (Schwarz and Clore 1983, 2003). This condition provided the ability to test whether the predicted effect of thinking about college costs on cognition was comparable to the established negative effect of a general negative mood on cognitive functioning. Participants read:

> "Please take a moment to think about a recent time when you were in a negative mood. Describe that time below in a short paragraph."

Stroop Task

Following the experimental manipulation, participants completed a Stroop color-naming words task to assess the effects of experimental condition on cognitive functioning. The task required participants to use four color-coded keys to indicate the font color of words that appeared on the screen. In control trials, participants viewed "XXXXX" in red, yellow, blue, or green font. In matched trials, they viewed the words "red", "yellow", "blue", or "green", in matching color font. In mismatched trials, the words were displayed in mismatching fonts (e.g., "red" printed in blue font), requiring cognitive control to inhibit the word text and identify the font color. After a short practice block, each participant completed three blocks consisting of 12 trials each, completing 36 total trials. Each

[2] If participants planned to attend graduate or professional school, they were coded based upon whatever expected income they provided (either as a graduate/professional student or as they began their career), which reflected the nature of the identity that came to mind as a result of the prompt (desired successful future identity or not).

stimulus remained on the screen for a maximum of 2000 ms and there was a 1500 ms interval between trials.

All Stroop trial reaction times were recoded in accordance with the treatment described by Richeson and Trawalter (2005). There were no reaction times less than 200 ms to recode, but all reaction times greater than 2.5 standard deviations above the mean per type of trial (i.e., control, matched, mismatched) were recoded at the appropriate value, 2.5 standard deviations above the mean. Stroop interference scores were computed by subtracting an individual's mean reaction time on control trials from their mean reaction time on mismatched trials, which required cognitive control ($M = 482.77$, $SD = 1000.46$). Higher Stroop interference scores indicated poorer performance.

In a previously administered survey, a reduced sample (79% of participants) completed a battery of preliminary surveys, including a measure of their family's household income on a range from 1 ($25,000 or less) to 9 ($300,001 or more, $M = 5.96$, $120,001–$150,000, $SD = 2.45$) to include as a control variable in secondary analyses.

Analysis Plan

We hypothesized that among students with a desired future identity that was coded as successful, those who were randomly assigned to the *college costs only* condition where they experience an unresolved identity conflict would perform worse on the cognitive task than those who were randomly assigned to the *costs + identity* condition where they were given the opportunity to think about college costs as a gateway to their desired future success. In other words, we predicted a significant interaction between experimental condition and whether a student's future identity was coded as successful or not. We expected the negative effect on cognition for those students in the *college costs only* condition, where they would experience an identity conflict between costs and their successful future identity, to be similar to that experienced by those who were randomly assigned to the comparison condition where students brought to mind and wrote about a negative experience. However, those students without a desired successful future identity (future identity not coded as successful) do not expect or strive towards financial success and the financial burden of college does not conflict with any expectations for their future, so we did not expect them to experience cognitive impairment from thinking about college costs. Thus, we conducted an Analysis of Variance (ANOVA) with SPSS version 22 to test for a predicted interaction effect between experimental condition and future identity.

We also conducted an additional analysis with a reduced sample which further accounted for the extent to which the college costs prompt cued a sense of a financial burden to pay for college by examining the amount of loans that participants reported and their family household income. An Analysis of Covariance (ANCOVA) was performed including loan debt and family household income as covariates in order to determine whether observed patterns were consistent controlling for these pre-existing characteristics. Furthermore, any remaining concerns about the influence of these and other potential demographic characteristics were minimal because participants were randomly assigned to experimental condition.

Results

Primary Analyses

A 3 × 2 ANOVA found significant main effects of experimental condition, $F(2, 213) = 5.95$, $p = 0.003$, and future identity, $F(1, 213) = 31.18$, $p < 0.001$, on Stroop task performance, which were qualified by a significant interaction effect, $F(2, 213) = 14.67$, $p < 0.001$, $\eta_p^2 = 0.12$. As predicted, pairwise comparisons showed that among participants with a desired successful future identity, those in the *college costs only* condition performed significantly worse on the cognitive task than those in the *costs + identity* condition, where they were assigned to consider the financial burden of college in connection to their successful future. So, participants with a desired successful future identity in the *costs + identity* condition performed significantly better on the Stroop task than participants with a desired successful future identity who were randomly assigned to the *college costs only* condition ($p < 0.001$, $d = 1.16$) or *comparison* condition ($p < 0.001$, $d = 0.99$) where they were assigned to only think about the financial burden of college or a negative experience, respectively (see Fig. 3). Effect sizes suggested large practical significance. In other words, students who expected to have financially successful futures but experienced an identity conflict because they were guided to think only about the financial burden of college (*college costs only* condition) showed levels of cognitive impairment similar to those who were in a negative mood. Conversely, students who expected to have a successful future and did not experience an identity conflict because they were guided to think about how costs of college will help lead to their successful future (*costs + identity* condition) experienced better cognitive functioning.

As expected, pairwise comparisons showed no significant differences between the *college costs only* and *costs + identity* experimental conditions for participants who did not have an underlying desired successful future identity and did not want or expect financial success after college ($p = 0.730$). Surprisingly, these participants also did not show significantly worse cognitive functioning in the comparison condition where they considered a negative experience ($ps > 0.348$). That is, students who did not expect

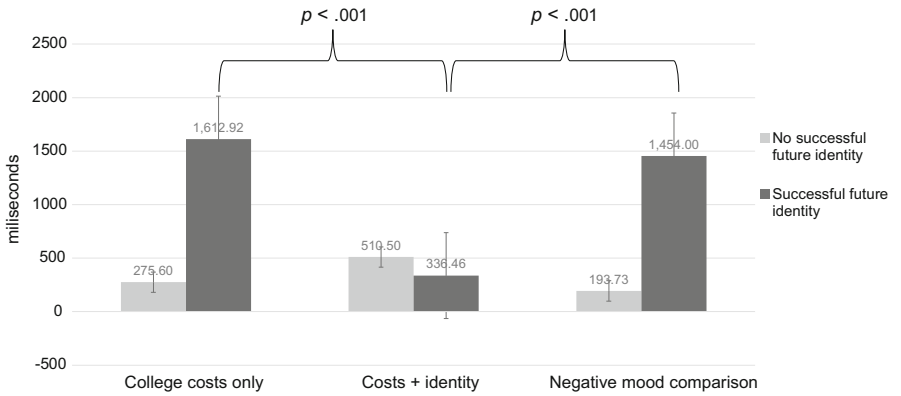

Fig. 3 *Bars* represent Stroop interference reaction times in Study 2 and higher scores indicate poorer performance. For students with an underlying expectation for future financial success (i.e., successful future identity, *dark bars*), the college costs only experimental condition impairs cognitive functioning (to levels similar to a negative mood) and the costs + identity experimental condition improves cognitive functioning. Experimental manipulations do not influence students who do not expect financial success (i.e., no successful future identity, *light bars*)

financial success had generally better cognitive functioning and were generally less reactive to the information provided in the experimental manipulations than those with a desired successful future identity.

Additional Analyses

To further evaluate the finding, we also replicated the primary analysis controlling for family household income[3] and whether or not participants anticipated student loan debt. Because not all participants provided each measure, the following analyses used a reduced sample with less statistical power than the primary analyses (N = 141), which did not differ from the full sample of participants on any major demographic characteristics, such as race or gender. The predicted interaction effect between experimental condition and future identity (successful or not) remained significant when controlling for family household income and student loan debt, $F(2, 133) = 5.25$, $p = 0.006$, $\eta_p^2 = 0.07$. The previously significant pairwise comparisons for participants with successful future identities were weakened to marginal significance with the reduced sample, but effect sizes remained large (*college costs only* vs. *costs + identity*, $p = 0.086$, $d = 0.85$; *costs + identity* vs. *comparison*, $p = 0.082$, $d = 0.95$). All other pairwise comparisons remained non-significant ($ps > 0.26$).

Discussion

Study 2 provided direct experimental evidence that thinking about the financial burden of college reduces students' abilities to perform difficult cognitive tasks. However, bringing to mind high college costs in connection with a desired successful future identity in order to reduce identity conflict restored students' cognitive abilities. As expected, students who did not have a desired successful future identity and did not experience an identity conflict were not affected by these experimental manipulations. In other words, the financial burden of college did not conflict with their imagined futures, so their cognitive abilities did not suffer when they thought about the costs of paying for college and they did not rebound when thinking about how the costs of college will lead them to their future occupations. It also appeared that students who are not focused on financial success were generally more resilient than those with a traditionally successful future identity because they also did not experience a reduction in cognitive ability when thinking about a negative experience in the comparison condition. It is possible that those students were more likely to have desired career paths that include a greater sense of personal meaning and purpose rather than an emphasis on financial security. This greater sense of purpose might serve as a buffer that sustains cognitive functioning in the face of negative thoughts more generally (see Yeager et al. 2015). However, such possible explanations could not be evaluated in the current study, which was focused on students who were most likely to experience an identity conflict from considering the financial burden of college. Future research remains necessary to deeply investigate the facilitators and barriers to motivation and cognitive functioning for students who do not place a strong emphasis on reaching a traditionally successful future.

Overall, the effects illustrated in Study 2 provide experimental evidence for how thoughts about the financial burden of college can influence immediate cognitive functioning, depending on how those thoughts interact with students' stable and salient future identities in predictable ways. These findings complement the pattern of Study 1

[3] Family household income was not significantly correlated with whether or not participants reported a successful future identity, $p = 0.544$.

suggesting that more chronic reminders of the high costs of college, like student loan debt, gradually influence longer-term academic outcomes. Study 2 adds that the financial burden of college directly affects cognition exclusively for those who experience identity conflict because they have a future identity that includes financial success. Furthermore, it is possible to bring costs to mind in a way that does not cause identity conflict and impair cognitive functioning for these students.

General Discussion

In two studies, we used longitudinal and experimental methods to evaluate predictions of how the financial burden of college and student loan debt can impair cognitive functioning and academic success for students at selective institutions. We first replicated prior studies and demonstrated evidence for the relationship between chronic reminders of the financial burden of college and academic performance. The longitudinal, indirect association of student loan debt with a decreased likelihood of graduating from college was mediated by a decrease in grades throughout college. We also advanced research in this area with a direct causal test of the proposed psychological process in a laboratory setting. Momentary thoughts about the costs of college impaired performance on a cognitive task for students who otherwise aspire toward financial success after graduation. At the same time, a subtle manipulation that made the financial burden of college feel connected to reaching that financially successful future identity (rather than conflicting) restored cognitive functioning. Therefore, although a chronic reminder of the financial burden of college through the acquisition of student loans over time tends to be associated with an academic cost, educational expenses and debt can be brought to mind in ways that either impair or enhance cognition in the moment.

Previous relevant research has illustrated that poverty can impair cognitive functioning (e.g., Mani et al. 2013), and we advance these insights by illustrating how economic hardships specific to college students can influence immediate cognition and academic performance over time. Loans are uniquely situated to remind students of the long-term costs associated with their educational investment and disrupt academic outcomes over time, controlling for any effects of family socioeconomic status (having fewer economic resources), overall tuition costs (attending a more expensive school), or even working for pay during college. We also provide evidence for an effective identity-based tool to redirect the interpretation of students' financial burdens. Research on identity-based motivation provides numerous examples of how current and future identities can be cued to enhance or inhibit motivation towards educational goals (e.g., Destin and Oyserman 2010; Markus and Nurius 1986; Oyserman et al. 2006). The current studies advance theory by showing effects of contextual framing and identities on a basic measure of cognitive functioning. Importantly, creating a sense of connection between current college costs and a successful future identity only mattered for students who articulated, and presumably valued, an expectation of financial success.

Students who did not plan to earn above the annual median income in the United States did not benefit from invoking a future identity. At the same time, those students who did not have a successful future identity, as currently defined, were also less reactive to the experimental manipulations in general. It is possible that the development of future identities that are not focused on future financial success may also serve as a protective factor. Future research may further investigate the contextual and dispositional factors that lead students to develop different types of future identities and how these factors may be associated with basic cognitive functioning and well-being.

Limitations and Future Directions

The current studies focused on the roles of cognition and identity in understanding the effects of the financial burden of college on students. It is quite likely that college costs and loans also affect students' cognition, achievement, and well-being in other ways and through other pathways, such as through increased emotional distress or goal disengagement. Additionally, the current studies focused specifically on how the financial burden of college affects students at selective four-year colleges and universities in the United States. We targeted selective institutions because highly qualified students from low-income backgrounds and first-generation college students who reach selective institutions often encounter adjustment difficulties that impair their ability to perform up to their academic potential in college (e.g., Pascarella et al. 2004). However, processes are likely to differ systematically for students at different types of post-secondary institutions in different social contexts and from varied socioeconomic and academic backgrounds. Future research may address how the financial burden of college is confronted by students at different types of institutions and further how variation in institutional messaging regarding student debt influences students.

Practical Implications

The current studies provide a clearer understanding of the patterns of cognitive and academic performance that occur as a result of college costs and loans, and they indicate the importance of understanding how students regularly conceptualize their educational costs and debt in everyday settings. It is quite possible that significant variation exists by context in the likelihood that students focus on costs alone or draw connections between educational costs and reaching future success. There is also likely to be significant variation in the extent to which students define success for themselves along primarily financial means, which appears to make them more sensitive to the negative effects of high costs. In some university and classroom contexts, students may be more likely to be surrounded by constant reminders of the expense of their investment or they may be less certain that their degree will guide them to a desired future. On the other hand, other educational contexts may provide more consistent cues about the institution as a pathway towards success, whether it be economic success as focused upon in the current studies or the ability to achieve other desired identities and goals, such as a positive social impact.

The current findings also provide added insight into the experience of low-income and first-generation college students. First, the high financial costs are likely to be especially salient for them, and second, these students are especially likely to enroll in college in order to provide financial stability for their families (e.g., Phinney et al. 2006). According to our findings, these types of students may be most vulnerable to the negative effects of bringing college costs to mind without a connection to thoughts about how the costs are instrumental to reaching a successful future identity. As demonstrated, the subsequent cognitive challenges may contribute to gaps in academic achievement between low- and high-income college students. However, a better understanding of how students perceive the financial burden of college may contribute to effective psychological interventions to reduce socioeconomic achievement gaps, particularly at selective institutions (e.g., Stephens et al. 2014).

Conclusions

Even though educational costs and debt can be detrimental for young adults, the long-term returns of a college education remain desirable, especially for those from less affluent households (Baum et al. 2010). However, it may be difficult for students to remember that

everyday educational tasks are connected to their goals for future success, rather than simply contributing to economic hardship. When students are reminded of their own deeply held future identities or focused on broader goals for success and well-being, financial costs become less detrimental and students become more likely to reap the benefits of an investment in education, regardless of their socioeconomic background.

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Appendix

See Table 5.

Table 5 Colleges and universities represented in NLSF

College and Universities
Howard University, Washington, D.C.
University of Michigan, Ann Arbor, MI
University of North Carolina, Chapel Hill, NC
University of California, Berkeley, CA
Columbia University, New York, NY
Emory University, Atlanta, GA
Miami University, Oxford, OH
Northwestern University, Evanston, IL
Penn State University, University Park, PA
Stanford University, Palo Alto, CA
Tulane University, New Orleans, LA
University of Pennsylvania, Philadelphia, PA
Georgetown University, Washington D.C.
Oberlin College, Oberlin, OH
Princeton University, Princeton, NJ
Rice University, Houston, TX
Tufts University, Sommerville, MA
University of Notre Dame, South Bend, IN
Washington University, St. Louis, MO
Wesleyan University, Middletown, CT
Williams College, Williamstown, MA
Yale University, New Haven, CT
Barnard College, New York, NY
Bryn Mawr College, Bryn Mawr, PA
Denison University, Granville, OH
Kenyon College, Gambier, OH
Smith College, Northampton, MA
Swarthmore College, Swarthmore, PA

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