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In this study of 2- and 4-year colleges, the extent to which women students' perceptions of a "chilly campus climate" were related to first-year cognitive outcomes was investigated at 23 institutions. After a variety of potentially confounding influences were controlled for, several negative relationships were found between perceived chilly climates and women's cognitive growth. The negative relationships were more pronounced for women attending 2-year colleges than for their counterparts at 4-year institutions.

For nearly a decade, women have constituted over half of the undergraduate student population in institutions of higher education in the United States (Shavlik, Touchton, & Pearson, 1989). Higher education researchers have responded to the presence of increasing numbers of women students by investigating the extent to which women's experiences in college support and/or inhibit their personal and intellectual development.

RESEARCH ON COLLEGE OUTCOMES FOR WOMEN

Research has been conducted on gender differences and gender-related effects of such varied aspects of college as development of self-esteem and educational and vocational aspirations (Arnold, 1996; Arnold & Denny, 1985; Holland & Eisenhart, 1990), development of identity (Josselson, 1987; Kaschak, 1992), development of intellectual reasoning (Baxter Magolda, 1988, 1992; Belenky, Clinchy, Goldberger, & Tarule, 1986), course- and major-related learning and participation (Ethington & Wolfle, 1988; Maher & Tetreault, 1994), leadership development (Astin & Leland, 1991; Whitt, 1994), and general effects of college (Astin, 1977, 1993). Results of these studies suggest that certain experiences of women in college can negatively affect their personal and intellectual development. For example, a number of longitudinal studies of girls from childhood through adolescence show "significant declines in [individuals'] self-esteem and self-confidence". (American Association of University Women, 1992, p. 12; see also Mann, 1994; Pipher, 1994). Moreover, some evidence indicates that female self-esteem and self-confidence do not improve once women enter college. Although women are likely to come to college with higher grades than men, they have lower expectations for their own performance in college (Hafner, 1989). And women's self-esteem apparently continues to decline during their time in college. For example, in a longitudinal study of high school valedictorians and salutatorians, researchers found that women experienced an acute decline in their estimates of their own intelligence in comparison with that of their peers, despite continued high levels of academic performance (Arnold, 1996; Arnold & Denny, 1985). Astin (1993) echoed this finding in his most recent book, based on his national studies of college students:

> Women enter college already differing considerably from men in self-rated

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> emotional and psychological health, standardized test scores, GPAs, political attitudes, personality characteristics, and career plans, and most of these differences widen during the undergraduate years. . . . A similar conclusion was reached nearly twenty years ago in *Four Critical Years*. (pp. 405-406)

"CHILLY" CAMPUS CLIMATES FOR WOMEN

The results of these and other studies on college environments for women (Boyer, 1987; Holland & Eisenhart, 1990; Smith, 1990; Smith, Wolf, & Morrison, 1995; Whitt, 1992; Yeager, 1995; Yeager, Terenzini, Pascarella, & Nora, 1995) suggest that the climates of a large number of coeducational postsecondary institutions may not be conducive to, or supportive of, women students' learning.

In 1982, the Association of American Colleges (AAC) Project on the Status and Education of Women published a report entitled *The Campus Climate: A Chilly One for Women?* (Hall & Sandler, 1982). In this report, the authors suggested that the climate in coeducational college classrooms was inhospitable for women students as a result of a variety of overt and covert behaviors of faculty and students, including faculty calling on men more than women, faculty and students making stereotypical comments about women's intellectual abilities, and faculty taking men's contributions more seriously than women's.

Boyer (1987) described this chilly classroom climate in his massive survey of American undergraduates:

> We were especially struck by the subtle, yet significant, differences in the way men and women participated in class. . . . In many classrooms, women are overshadowed. Even the brightest women often remain silent. . . . Not only do men talk more, but what they say often carries more weight. (p. 150)

Hall and Sandler (1984) also identified chilly out-of-class climates for women. These climates are characterized by "micro-inequities" (Hall & Sandler, 1984, p. 4), everyday behaviors that discount or ignore someone on the basis of sex (e.g., sexist humor), as well as institutional policies and practices that discriminate against women, such as inequity in hiring, promotion, and salary decisions (Hensel, 1991), male-dominated academic cultures and traditions (Moore, 1987), and male-dominated student cultures that value men for academic and athletic achievements and women for their attractiveness to men (Holland & Eisenhart, 1990).

To the extent that chilly in- and out-of-class climates exist and are encountered by college women gender stereotypes are reinforced (Moore, 1987). Astin (1993) summarized the effects of this situation on women students:

> Even though men and women are presumably exposed to a common . . . curriculum and to other common environmental experiences during the undergraduate years, it would seem that their educational programs preserve and strengthen, rather than reduce or weaken, stereotypical differences between men and women in behavior, personality, aspirations, and achievement. (p. 406)

RESEARCH LINKING THE CHILLY CLIMATE TO COLLEGE OUTCOMES

Although the work of Astin (1993), Boyer (1987), and other researchers cited here suggests that elements of a chilly campus climate exist, it is not clear exactly what implications such a climate may have for the personal and intellectual development of women. Hall and Sandler (1982, 1984) hypothesized that the chilly climate reduces the self-confidence of women and, as a consequence, diminishes their academic and professional aspirations during and after college. Others have posited that elements of the chilly climate affect more than women's aspirations, and, in fact, inhibit intellectual and personal development during college (e.g., Holland & Eisenhart, 1990; Kuh et al., 1991; Whitt, 1992).

At present, however, little or no evidence exists to support either of these hypotheses. In a multi-institution study of changes in educational

aspirations during the first 2 years of college, Yeager et al. (1995) found that a measure of the perceived chilly campus climate for women had a positive net association with increases in educational aspirations—that is, women students who perceived a chilly campus climate had significantly *higher* educational aspirations than their counterparts who did not perceive a chilly climate. The researchers did find, however, that women who perceived a chilly climate were more likely to have higher scores on academic and social integration measures than their peers who did not, and that African American women were more likely to perceive a chilly climate than Caucasian women. Differences between students who perceived a chilly climate and those who did not might account for the counterintuitive findings of this study.

A review of existing literature, however, revealed no empirical evidence pertaining to the impact of a chilly climate on women's intellectual development. The purpose of this study, therefore, was to test the hypothesis that women's perceptions of the presence of a chilly climate is significantly linked to their cognitive development.

RESEARCH METHODS

Institutional Sample

The sample was selected from incoming first-year students at 18 four-year and 5 two-year colleges and universities located in 16 different states. These 23 institutions participated in the National Study of Student Learning (NSSL), a longitudinal investigation of the factors that influence learning and cognitive development in college, sponsored by the federally funded National Center on Postsecondary Teaching, Learning, and Assessment (NCTLA).

Institutions were selected from the National Center on Education Statistics Integrated Postsecondary Education Data System (IPEDS) database to represent differences in colleges and universities nationwide on a variety of characteristics, including institutional type and form of control (e.g., private and public research universities, private liberal arts colleges, public and private comprehensive universities, 2-year colleges, historically black colleges), size, location, proportions of commuter and residential students, and the racial/ethnic distribution of the undergraduate student body. The aggregate student population of the 23 schools approximated the race/ethnicity and sex (male-female) balance of the national population of undergraduates.

Student Sample

Each of the 23 institutions was given a target student sample size relative to the size of the first-year class at that institution. The overall target sample was 5,000 first-year students; the actual sample for the initial data collection in Fall 1992 was 3,840, a participation rate of 76.8%.

The sample was, to the extent possible, selected at random from among the new students at each of the 23 participating institutions. The students in the sample were informed that they were part of a longitudinal national study of student learning and that they would be paid a stipend for their involvement. They also were told that the information they provided in the study would be anonymous and would never be part of their institutional records.

Follow-up testing of the sample took place in Spring 1993. Of the original sample of 3,840 students involved in the Fall 1992 data collection, 2,685 participated in the follow up, a follow-up participation rate of 69.92%. Given the high participation rates at both testing times, it is not particularly surprising that the sample was reasonably representative of the population from which it was drawn. To adjust for potential response bias by sex, race/ethnicity, and institution, however, a sample weighting algorithm was developed. Follow-up participants in each institution were weighted up to the institution's first-year population by sex (male or female) and race/ethnicity (White, Black, Hispanic, other). Thus, for example, if institution A had 100 Black women in its first-year class, and 25 Black women in the sample, each Black woman in the sample was given a sample weight of 4.00. An analogous weight was computed for participants in each Sex x Race/Ethnicity cell in each institution. Applying sample weights in this manner allowed us to adjust not only for response

bias by sex and race/ethnicity, but also for response bias (i.e., differential response rates) by institution.

DATA COLLECTION

Initial Data Collection

The initial data collection was conducted in Fall 1992 and lasted approximately 3 hours. Data collected included a precollege survey of student demographic characteristics and background, students' aspirations and expectations of college, and students' orientation toward learning. Participants also completed Form 88A of the Collegiate Assessment of Academic Proficiency (CAAP). The CAAP was developed by the American College Testing Program (ACT) to assess general intellectual skills typically acquired by students during the first 2 years of college. The CAAP consists of five 40-minute, multiple-choice test modules, three of which—reading comprehension, mathematics, and critical thinking—were administered in the initial data collection. A brief description of each test follows.

The CAAP reading comprehension test is composed of 36 items that assess reading comprehension as a product of skill in inferring, reasoning, and generalizing. The test consists of four 900-word prose passages designed to represent the level and kinds of reading students commonly encounter in college curricula, including topics in fiction, humanities, social sciences, and natural sciences. The KR-20 internal consistency reliability for the reading comprehension test ranges between .84 and .86 (American College Testing Program, 1989).

The mathematics test consists of 35 items designed to measure a student's ability to solve mathematical problems. The test emphasizes quantitative reasoning, rather than formula memorization, and includes algebra (four levels), coordinate geometry, trigonometry, and introductory calculus. The KR-20 reliability coefficients for the mathematics test range between .79 and .81 (American College Testing Program, 1989).

The critical thinking test is a 32-item instrument designed to measure a student's ability to clarify, analyze, evaluate, and extend arguments. The test consists of four passages in a variety of formats (e.g., case studies, debates, dialogues, experimental results, statistical arguments, editorials). Each passage contains a series of arguments that support a general conclusion and a set of multiple-choice test items. The KR-20 reliability coefficients for the critical thinking test range between .81 and .82 (American College Testing Program, 1989). In a pilot test of instruments for use in the NSSL, the critical thinking test of the CAAP correlated .75 with the total score on the Watson-Glaser Critical Thinking Appraisal (Pascarella, Bohr, Nora, & Terenzini, 1995).

Follow-up Data Collection

Follow-up data collection, conducted in Spring 1993, took about 3.5 hours and included Form 88B of the CAAP reading comprehension, mathematics, and critical thinking modules; the College Student Experiences Questionnaire (CSEQ) (Pace, 1984); and a follow-up instrument developed for the NSSL. The CSEQ and the NSSL follow-up instrument were used to measure a wide range of students' curricular and out-of-class experiences in the first year of college.

One part of the CSEQ asked students to indicate how much they felt they had gained or made progress in a variety of aspects of college learning, including science; academic preparation for a career; writing and thinking skills; and understanding the arts and humanities. These self-reported gains, as well as a composite score of the CAAP modules, were the dependent variables in this study.

Embedded in the NSSL follow-up instrument was a set of eight Likert-type items—from 1 (*strongly agree*) to 5 (*strongly disagree*)—that asked students to indicate the extent to which they had observed or experienced gender discrimination in classroom and nonclassroom settings during the first year of college. The items were developed specifically to reflect perceptions of the dimensions of the chilly campus climate for women outlined by Hall and Sandler (1982, 1984); thus, they reflected women's experiences both in the classroom and outside the classroom. An introduction to the items stated:

> Students have different views about their college experiences. On the next seven pages are groups of statements describing those views. Please circle the number on the scale below which indicates your level of agreement or disagreement with each statement. There are no "right" answers here, so please be honest.

The scale formed a priori from the eight items about perceived gender discrimination, named the Perceived Chilly Climate for Women Scale, had a mean of 26.98, a standard deviation of 5.48, and an internal consistency reliability of .81. Yeager et al. (1995) found that by the end of the second year of college women rated the climate of their institution significantly ($p < .001$) higher (i.e., more chilly) on the items of the scale than did men. As a prelude to the current study it was also found that by the end of the first year of college the women in the NSSL sample rated the climate of their institution as significantly ($p < .001$) more chilly on the scale than did their male counterparts. The wording of the items of the scale, the correlation of each item with the total scale, and the percentage of women disagreeing or strongly disagreeing with each item are shown in Table 1. (It is worth noting from Table 1 that a substantial percentage of the women in the sample responded in the direction of a chilly climate [i.e. *disagree* or *strongly disagree*] on many of the items constitutiing the Perceived Chilly Climate for Women Scale.) This scale constituted the independent variable of primary interest for the study.

TABLE 1.

Alpha Reliabilities, Item-total Score Correlations, and Percent Disagreeing for the "Perceived Chilly Climate for Women" Scale

Scale/Item	Item-Total Score Correlation	Percentage of Women Responding *disagree* or *strongly disagree*
Perceived Chilly Climate for Women (alpha reliability = .81)		
I have never been singled out in class or treated differently than other students because of my gender.	.48	23.0
Few if any of the students in this college are prejudiced against women.	.54	31.7
Instructors treat all students the same whether the student is male or female.	.69	30.2
I have never observed discriminatory words, behaviors, or gestures directed toward female students.	.65	43.3
One seldom hears negative words about women while attending classes.	.63	32.9
This college promotes respect for differences (e.g., racial/ethnic, gender).	.44	7.4
I am treated with respect by faculty at this institution.	.36	9.3
Overall, course content at this institution reflects the experiences of women.	.30	15.2

Note. All items coded in reverse: 1 = *strongly agree* to 5 = *strongly disagree.*

TABLE 2.
Variable Definitions

Category/Variable
INDEPENDENT VARIABLES
Precollege (Fall 1992) Cognitive Development: A composite of the reading comprehension, mathematics, and critical thinking modules of Form 88A of the Collegiate Assessment of Academic Proficiency (CAAP), developed by the American College Testing Program; alpha reliability = .83
Average Student Precollege Cognitive Development at the Institution Attended: Estimated by the average level of precollege cognitive development in the male and female sample of each of the 23 institutions in the study. Each female student was given the mean score of the sample at her institution.
Person of Color: 1 = *Person of Color*, 0 = *White*.
Age: A continuous variable calculated by subtracting year of birth from 1992.
Precollege Academic Motivation: An eight-item, Likert-type scale (5 = *strongly agree* to 1 = *strongly disagree*) with an internal consistency reliability of .65. The scale items were based on existing research on academic motivation (e.g., Ball, 1977). Examples of constituent items are: "I am willing to work hard in a course to learn the material even if it won't lead to a higher grade," "When I do well on a test, it is usually because I was well-prepared not because the test was easy," "In high school I frequently did more reading in a class than was required simply because it interested me," and "In high school I frequently talked to my teachers outside of class about ideas presented during class."
Socioeconomic Status: Average of parental education and income.
Total Credit Hours Completed: Number of hours completed during the first year in college.
Average Hours Per Week Spent Studying: Single-item, 6-point self-report of average number of hours spent studying per week, where 1 = *none* and 9 = *more than 20 hours*.
On-Campus Residence: 1 = *lived on campus*, 0 = *lived off campus*.
Hours Worked Per Week: Combination of average number of hours of on- and off-campus work per week during the school year, coded 1 = *none* , 9 = *more than 35*.
Social Sciences Courses Taken: Number of college courses taken in the first year in anthropology, ideology/speech pathology, child and family studies, communications, economics, geography, history, political science, psychology, sociology, or social work.
Mathematics Courses Taken: Number of college courses taken in the first year in pre-algebra, algebra, calculus, statistics, computer science, geometry, matrix algebra, accounting, or business math.
Technical/Professional Courses Taken: Number of college courses taken in the first year in drawing, drafting, architectural design, criminology, education, agriculture, business, physical therapy, pharmacy, physical education, nursing, or computer programming.
Arts and Humanities Courses Taken: Number of college courses taken in the first year in art history, art appreciation, studio art, dance, theater, music appreciation, music performance, composition or writing, English literature, foreign language, humanities, philosophy, linguistics, classics, or religious studies.

table continues

TABLE 2. *continued*

Category/Variable

Natural Sciences and Engineering Courses Taken: Number of college courses taken in the first year in astronomy, botany, biology, chemistry, physics, geology, zoology, microbiology, or engineering.

Perceived Chilly Climate for Women: An eight-item Likert-type scale (1 = *strongly agree* to 5 = *strongly disagree*) assessing students' perceptions of the extent to which the classroom and non-classroom climates of the college discriminate against women; alpha reliability = .81. All items in the scale are shown in Table 1.

DEPENDENT VARIABLES

End-of-First-Year Cognitive Development: A composite of the reading comprehension, mathematics, and critical thinking modules of Form 88B of the Collegiate Assessment of Academic Proficiency (CAAP), developed by the American College Testing Program; alpha reliability = .83.

Self-Reported Gains in Understanding Science: A four-item factorially-derived scale taken from the College Student Experiences Questionnaire (CSEQ) that asks students to indicate how much they have gained or made progress during college in understanding science; alpha reliability = .86. Constituent items were: "understanding the nature of science and experimentation," "understanding new scientific and technical developments," "becoming aware of the consequences (benefits/hazards/dangers/values) of new applications in science and technology," and "quantitative thinking—understanding probabilities, proportions, etc." Coded: 4 = *very much*, 1 = *very little*.

Self-Reported Gains in Academic Preparation for a Career: A four-item factorially-derived scale taken from the College Student Experiences Questionnaire (CSEQ) that asks students to indicate how much they have gained or made progress during college in the academic preparation for a career; alpha reliability = .73. Constituent items were: "vocational training—acquiring knowledge and skills applicable to a specific job or type of work," "acquiring background and specialization for further education in some professional, scientific, or scholarly field," "gaining a broad general education about different fields of knowledge," and "gaining a range of information that may be relevant to a career." Coded: 4 = *very much*, 1 = *very little*.

Self-Reported Gains in Writing and Thinking Skills: A four-item factorially-derived scale taken from the College Student Experiences Questionnaire (CSEQ) that asks students to indicate how much they have gained or made progress during college in writing and thinking skills; alpha reliability = .77. Constituent items were: "writing clearly and effectively," "ability to think analytically and logically," "ability to put ideas together, to see relationships, similarities, and differences between ideas," and "ability to learn on your own, pursue ideas, and find information you need." Coded: 4 = *very much*, 1 = *very little*.

Self-Reported Gains in Understanding the Arts and Humanities: A four-item factorially-derived scale taken from the College Student Experiences Questionnaire (CSEQ) that asks students to indicate how much they have gained or made progress during college in understanding the arts and humanities; alpha reliability = .76. Constituent items were: "developing an understanding and enjoyment of art, music, and drama," "broadening your acquaintance and enjoyment of literature," "becoming aware of different philosophies, cultures, and ways of life," "seeing the importance of history for understanding the present as well as the past," and "gaining knowledge about other parts of the world and other people—Asia, Africa, South America, etc." Coded: 4 = *very much*, 1 = *very little*.

DATA ANALYSIS

Final Sample

Because the purpose of the study was to determine the impact of a perceived chilly climate on women's cognitive growth during the first year of college, analyses were limited to women in the sample: 1,636 women attending the 23 two- and four-year institutions participating in the NSSL. This sample represented a population of 18,129 first-year women at those institutions.

Analytical Model

The independent variable of primary interest in the study was the Perceived Chilly Climate for Women Scale. The first dependent variable—of five—was a composite measure of end-of-first-year cognitive development created by combining the Spring 1993 scores for each student on the CAAP reading comprehension, mathematics, and critical thinking modules. This measure was constructed in two steps. First, each of the three CAAP modules was standardized to put all modules in the same metric. The composite score then was computed by summing across the standardized scores. A composite score provided an objective, standardized estimate of students' intellectual growth during the first year of college. The alpha (internal consistency) reliability for the end-of-first-year composite cognitive development measure was .83.

The second set of dependent variables was four factorially derived scales estimating students' self-reported first-year gains in the following areas: understanding science; academic preparation for a career; writing and thinking skills; and understanding the arts and humanities. Recall that the items constituting each of the four self-reported-gains scales were taken from the College Student Experiences Questionnaire (Pace, 1984). The alpha (internal consistency) reliabilities for the four self-reported-gains scales were as follows: understanding science (alpha reliability = .83); academic preparation for a career (alpha =.73); writing and thinking skills (alpha = .77); understanding the arts and humanities (alpha = .76).

Two sets of potentially confounding variables—individual-level variables and institutional-level variables—also were included in the analytic model. A number of factors extraneous to the study might influence a woman's cognitive growth during the first year of college, as well as the extent to which she perceives her college climate as chilly. As a consequence, simple correlations might yield a misleading estimate of the impact of the perceived chilly climate on first-year cognitive development (Feldman, 1994; Pascarella, 1985; Pascarella & Terenzini, 1991).

In selecting individual-level confounding variables, we were guided by evidence on the factors independently influencing learning and cognitive development in college (e.g., Astin, 1968, 1977, 1993; Astin & Panos, 1969; Kuh, 1993; Pascarella, 1985; Pascarella & Terenzini, 1991). Individual-level variables incorporated in the analytic model were: precollege (Fall 1992) cognitive development; race/ethnicity (White/Person of Color); precollege academic motivation; socioeconomic status; total credit hours completed at the end of the first year; hours per week spent studying; on- or off-campus residence; hours employed per week; and the number of courses taken during the first year in social sciences, mathematics, technical/professional areas, arts and humanities, and natural science and engineering.

Because evidence also suggests that the academic preparation of an institution's student body can influence the climate of an institution (e.g., Pascarella & Terenzini, 1991; Yeager et al. 1995), an estimate of student academic preparation was considered an institutional-level confounding variable. The measure of student academic preparation was estimated with the average precollege (Fall 1992) composite cognitive development score (CAAP reading, math, and critical thinking) for the sample of first-year students (men and women) at each of the 23 institutions. Each woman in the sample was given the mean estimate of academic preparation for her institution, and the institutional mean estimate was used in the analysis of end-of-first-year cognitive development and the four areas of self-reported gains. Operational definitions and, where appropriate, reliabilities

of all variables in the analyses are shown in Table 2.

Analyses

In the first stage of data analysis, we estimated the net impact of the perceived chilly climate for women on the five first-year cognitive outcomes, applying statistical controls for the potentially confounding variables just identified. Using an ordinary least squares approach, each of the five cognitive outcomes (i.e., end-of-first-year composite cognitive development plus the four self-reported gains scales) was regressed on all of the potentially confounding influences plus the Perceived Chilly Climate for Women Scale. Preliminary analyses indicated that the net effects of the perceived chilly climate scale differed in magnitude for women at 2-year and 4-year colleges in the sample; that is, the effects were significantly more negative for women at 2-year colleges than for their counterparts at 4-year institutions.

To determine the precise nature of these differences, separate analyses for 2- and 4-year institutions were conducted. Weighted samples, adjusted to the actual sample sizes to obtain correct standard errors, were used in all analyses. Because of the large (unweighted) sample size for 4-year-college women (n = 1460), the critical alpha level was set at .01. The relatively small sample of 2-year-college women (n = 176) warranted a more liberal alpha level of .05.

RESULTS

2-Year College Results

Table 3 illustrates the results of the regression analyses for women attending 2-year colleges. As the table indicates, when statistical controls were applied for the 15 confounding influences, student perceptions of a chilly climate for women had statistically significant negative associations with two of the five cognitive outcomes: the composite measure of end-of-first-year cognitive development and self-reported gains in academic preparation for a career. Two-year-college women who perceived chilly campus climates performed significantly less well on the composite measure of cognitive development and reported significantly lower gains in academic preparation for a career than their peers who perceived less chilly—or not chilly—campus climates for women.

4-Year-College Results

The results of the analyses for women attending 4-year colleges and universities are displayed in Table 4. For 4-year-college women, a perceived chilly campus climate tended to have negative net relationships with the cognitive outcome measures. With the exception of self-reported gains in academic preparation for a career, however, the negative relationships were small and statistically nonsignificant.

Comparison of 2-Year and 4-Year Results

Tables 3 and 4, taken together, reflect a comparison of the results for 2-year-college and 4-year-college women. Given the corresponding regression weights from each table (Pedhazur, 1982), the net negative relationship between a perceived chilly climate for women and end-of-first-year cognitive development was stronger for women in 2-year colleges than for women in 4-year colleges. Also, the negative associations of a perceived chilly climate with self-reported gains in academic preparation for a career and in writing and thinking skills were stronger, respectively, for women in 2-year institutions. Although small in an absolute sense, the relative differences between the 2- and 4-year college groups in the size of the associations between a perceived chilly climate and each of the three cognitive outcomes were statistically significant at $p < .01$.

Conditional Effects

Additional analyses were conducted to determine if the potential cognitive effects of a perceived chilly climate were general or conditional. That is, were the net associations reported in Tables 3 and 4 similar in magnitude for all women in the sample (general effects), or did they differ for different kinds of students (conditional effects)?

To test for the presence of conditional effects, a set of cross-product terms was formed between the Perceived Chilly Climate for Women

TABLE 3.

Regression Analysis Summaries for Women at Two-year Colleges[a]

Column 1: End-of-First-Year Cognitive Development
Column 2: Gains in Understanding Science
Column 3: Gains in Academic Preparation for a Career
Column 4: Gains in Writing and Thinking Skills
Column 5: Gains in Understanding the Arts and Humanities

Predictor	1	2	3	4	5
Precollege (Fall 1992) Cognitive Development	.281** (.798)	−.006 (−.017)	−.002 (−.008)	−.024 (−.081)	−.002 (−.008)
Average Student Precollege Cognitive Development at the Institution Attended	.083* (.151)	.012 (.022)	.054 (.112)	.083* (.178)	.154** (.334)
Person of Color	.138 (.090)	.225 (.150)	.148 (.110)	.260* (.199)	.636** (.492)
Age	.001 (.015)	−.006 (−.017)	.016* (.196)	−.006 (−.079)	−.006 (−.070)
Precollege Academic Motivation	−.069 (−.048)	.399** (.285)	.221* (.176)	.352** (.273)	.256* (.213)
Socioeconomic Status	.003 (.009)	−.094** (−.272)	.020 (.066)	−.016 (−.054)	.020 (.066)
Total Credit Hours Completed	−.000 (−.000)	.098* (.221)	.117** (.296)	.118** (.309)	.035 (.092)
Hours Spent Studying	.015 (.027)	−.051 (−.093)	.003 (.006)	−.016 (−.034)	−.038 (−.082)
On-Campus Residence	.064 (.036)	−.011 (−.007)	.066 (.043)	−.045 (−.030)	−.154 (−.103)
Hours Worked per Week	−.001 (−.005)	.010 (.040)	−.003 (−.016)	.001 (.005)	.003 (.013)
Social Science Courses Taken	.006 (.018)	−.016 (−.042)	.017 (.051)	.032 (.099)	.067* (.211)
Mathematics Courses Taken	−.009 (−.014)	.049 (.076)	.058 (.101)	.039 (.069)	−.039 (−.072)
Technical/Preprofessional Courses Taken	.015 (.031)	−.014 (−.030)	.035 (.083)	−.022 (−.054)	.014 (.035)
Arts and Humanities Courses Taken	.019 (.041)	−.039 (−.086)	−.039 (−.098)	−.000 (−.002)	.047* (.124)
Natural Sciences and Engineering Courses Taken	.026 (.025)	.180* (.177)	.052 (.057)	.071 (.080)	−.063 (−.072)
Perceived Chilly Climate for Women	−.018** (−.124)	.016 (.107)	−.025* (−.192)	−.017 (−.137)	−.001 (−.010)
R^2	.752**	.246**	.263**	.183*	.263**

[a] Top numbers are the unstandardized, metric regression coefficients; numbers in parentheses are the standardized (beta) regression coefficients.

*$p < .05$. **$p < .01$.

TABLE 4.

Regression Analysis Summaries for Women at Four-year Colleges[a]

Column 1: End-of-First-Year Cognitive Development
Column 2: Gains in Understanding Science
Column 3: Gains in Academic Preparation for a Career
Column 4: Gains in Writing and Thinking Skills
Column 5: Gains in Understanding the Arts and Humanities

Predictor	1	2	3	4	5
Precollege (Fall 1992) Cognitive Development	.259** (.797)	−.049** (−.153)	−.006 (−.021)	−.010 (−.039)	−.018 (−.063)
Average Student Precollege Cognitive Development at the Institution Attended	.016 (.051)	.020 (.063)	.015 (.059)	−.023 (−.088)	.005 (.018)
Person of Color	−.137** (−.090)	.015 (.010)	−.030 (−.024)	−.082 (−.006)	−.023 (−.017)
Age	−.001 (−.010)	−.013** (−.093)	−.008 (−.072)	−.010** (−.092)	−.005 (−.046)
Precollege Academic Motivation	.014 (.009)	.274** (.187)	.199** (.166)	.270** (.226)	.304** (.239)
Socioeconomic Status	−.004 (−.015)	−.006 (−.019)	−.008 (−.031)	−.006 (−.023)	−.000 (−.000)
Total Credit Hours Completed	.036** (.064)	.021 (.038)	.018 (.038)	.003 (.006)	−.006 (−.012)
Hours Spent Studying	−.016 (−.027)	.027 (.047)	.065** (.138)	.052** (.112)	.033 (.067)
On-Campus Residence	−.051 (−.033)	.049 (.032)	.100 (.081)	.119* (.097)	.082 (.063)
Hours Worked per Week	−.005 (−.019)	.007 (.024)	.000 (.003)	−.016 (−.075)	.000 (.000)
Social Science Courses Taken	.006 (.016)	−.047 (−.123)	.024* (.078)	.031** (.099)	.024* (.073)
Mathematics Courses Taken	.015 (.024)	.010 (.016)	−.043 (−.085)*	−.021 (−.042)	−.067** (−.123)
Technical/Preprofessional Courses Taken	−.029 (−.042)	.009 (.014)	.065** (.115)	.001 (.002)	.016 (.026)
Arts and Humanities Courses Taken	−.004 (−.014)	−.011 (−.035)	.013 (.049)	.019* (.075)	.061** (.221)
Natural Science and Engineering Courses Taken	.011 (.021)	.202** (.386)	.020 (.046)	.005 (.011)	−.012 (−.028)
Perceived Chilly Climate for Women	−.002 (−.018)	−.003 (−.019)	−.011* (−.102)	−.002 (−.022)	.002 (.019)
R^2	.769**	.252**	.115**	.108**	.143**

[a] Top numbers are the unstandardized, metric regression coefficients; numbers in parentheses are the standardized (beta) regression coefficients.

*$p < .01$. **$p < .001$.

Scale and each of the 15 other confounding variables in the regression model. This set of cross-product terms was added to the general effects regression equations (Tables 3 and 4).

For the 4-year-college sample, a significant (at .01) increase in explained variance (R^2) associated with the *set* of cross-product terms would indicate the presence of conditional effects (Pedhazur, 1982). Because of the small size of the 2-year-college sample, a more liberal criterion was used. Rather than requiring the entire set of cross-products to be associated with a significant R^2 increase, we judged individual cross-product terms significant at $p < .01$ to be sufficient evidence of the presence of conditional effects.

These analyses revealed no conditional effects for women attending 4-year colleges and universities. In all five analyses, the set of cross-products terms was associated with small (less than 1%) and nonsignificant increases in explained variance. The associations between a perceived chilly climate for women and the five cognitive outcomes shown in Table 4 appear to be similar in magnitude for students at different levels of the 15 confounding variables in the regression equation. Thus, the findings that a perceived chilly climate had significant negative associations with self-reported gains in academic preparation for a career and small, nonsignificant relationships with the four other cognitive outcomes were the same for women in the 4-year sample, regardless of individual or institutional differences.

The results of the analyses for the 2-year sample yielded generally similar results, with two exceptions. First, in the analysis of end-of-first-year cognitive development and self-reported gains in writing and thinking skills, there were statistically significant ($p < .01$) conditional effects involving the Perceived Chilly Climate for Women Scale and precollege cognitive development. To determine the nature of the conditional effects, the 2-year sample was divided in half, based on mean scores on precollege cognitive development, and the regression analysis for end-of-first-year cognitive development and writing and thinking gains was repeated.

This analysis revealed that a perceived chilly climate had a stronger negative association with end-of-first-year cognitive development for women who entered a 2-year college with lower levels of cognitive development ($b = -.020$, beta = $-.232$) than women who entered with higher levels of cognitive development ($b = -.014$, beta = $-.137$). The opposite, however, was true for self-reported gains in writing and thinking skills: a perceived chilly climate had a stronger negative association with that scale for women who entered a 2-year college with higher levels of cognitive development ($b = -.023$, beta = $-.218$) than for their peers who began with lower levels of cognitive development ($b = -.015$, beta = $-.098$). In other words, a chilly climate had a *more* negative association with end-of-first-year cognitive development and a *less* negative association with self-reported gains in writing and thinking skills for women who entered a 2-year college with lower levels of cognitive development than for women who entered with higher levels of cognitive development.

DISCUSSION

Summary of the Results

The purpose of this study was to test the hypothesis that a perceived chilly campus climate for women would be negatively associated with the cognitive growth of women during the first year of college. Analyses of longitudinal data from 1,636 women attending 23 two- and four-year colleges throughout the country lend only modest support for the hypothesis. Moreover, the findings suggest that if a chilly campus climate for women has negative implications for women's cognitive development, such implications may be of somewhat greater significance at 2- than at 4-year colleges.

In the presence of statistical controls for such factors as precollege cognitive development and academic motivation, race, age, socioeconomic status, courses taken, place of residence, employment status, and the average precollege cognitive development of entering students at the institution attended, a measure of the perceived chilly campus climate for women had small but

significant negative associations with two of five cognitive outcomes for women at 2-year colleges. These cognitive outcomes were a standardized measure of end-of-first-year cognitive development, and a measure of self-reported gains in academic preparation for a career. The corresponding analyses for women at 4-year colleges indicated that a perceived chilly climate had a significant negative association only with self-reported gains in academic preparation for a career.

In the analyses for 2-year college women there was additional evidence to suggest that any potential negative cognitive effects of a perceived chilly climate differed in magnitude for women who entered college with different levels of standardized cognitive development. That is, a chilly campus climate had its strongest negative association with end-of-first-year standardized cognitive development for 2-year college women who began postsecondary education with lower levels of cognitive development.

The reverse was true for the potential impact of a perceived chilly climate on 2-year-college women's self-reported gains in writing and thinking skills. On this outcome, perceptions of a chilly climate had their strongest negative association for women who began college with initially high levels of standardized cognitive development.

The corresponding analyses for 4-year college women indicated no significant conditional effects. That is, the potential negative effects of a perceived chilly climate for 4-year-college women did not differ for women with different precollege characteristics or for those whose institutions differed in the average cognitive development of entering students.

INTERPRETATION OF THE RESULTS

Size of Potential Effects

We have already indicated that the associations with cognitive outcomes and, thus, the potential negative cognitive effects of a perceived chilly climate were small. Examination of the standardized (beta) regression weights in Tables 3 and 4 shows that even for those cognitive outcomes where the Perceived Chilly Climate for Women Scale had significant negative associations with cognitive outcomes, the size of the net association ranged between –.10 and –.19 of a standard deviation. That is, when the influence of confounding variables was controlled, one standard deviation increase in the Perceived Chilly Climate for Women Scale was associated with decreases of between .10 and .19 of a standard deviation in various dimensions of cognitive growth during the first year of college. Such effect sizes are considered modest (Pascarella & Terenzini, 1991).

Another perspective on the magnitude of the potential negative cognitive effects of a perceived chilly climate for women can be gained by considering the unique variance increments explained by the Perceived Chilly Climate for Women Scale when the influence of confounding variables is controlled. Even on those cognitive outcomes where the chilly climate scale had significant negative associations with women's cognitive outcomes, the unique variance in those cognitive outcomes explained by a perceived chilly campus climate ranged only between 0.9% and 2.7%—once again, quite modest.

2-Year and 4-Year Differences

Our data provide little direct explanation for the difference between women at 2- and 4-year colleges in the magnitude of the associations between the chilly climate and cognitive outcomes. One might speculate that the difference can be explained by differences in the extent to which women in 2- and 4-year colleges perceive a chilly climate. Additional analyses of our data, however, showed no significant differences between 2- and 4-year-college women in average scores on the Perceived Chilly Climate for Women Scale, after we controlled for background characteristics such as academic motivation and precollege cognitive development. There also were no significant differences in the variances of the perceptions of the 2-year and 4-year college women on the scale; that is, the range of perceptions of a chilly climate was essentially the same for both groups.

A more plausible explanation for the differences in findings between women attending 2- and 4-year colleges is the nature of the scale

employed to estimate the chilly climate. A review of Table 1 shows that most of the items (five of eight) deal specifically with issues of a chilly academic climate for women; thus, the scale places more emphasis on gender discrimination in classroom settings and academic experiences than in nonclassroom settings. It may be that the 2-year-college women—most of whom lived off campus—viewed the climate for women at their institutions largely in terms of what happened in their classrooms and academic programs, and so the scale described a comparatively large part of their college experience.

On the other hand, about 50% of the 4-year-college sample lived on campus. For this group, in-class and academic experiences probably define a smaller part of the institutional climate than for the 2-year-college students (Kuh, 1993; Kuh et al., 1991; Pascarella & Terenzini, 1991). The cognitive outcomes measured in this study—overall cognitive growth, thinking and writing skills, understanding science, and understanding the arts and humanities—could be achieved in a variety of out-of-class or non-academic settings in 4-year institutions, including student leadership positions, volunteer work, undergraduate research assistantships, cultural and educational programs, and internships. If the chilly climate scale employed in this study had described a wider range of nonclassroom experiences, the negative effects for women attending 4-year colleges might have been larger.

The chilly climate in 4-year colleges had a significant negative relationship only with self-reported gains in academic preparation for a career. This finding might reflect the importance the women in the sample placed on interactions with faculty and male peers in classroom and academic settings for career preparation. First-year women students might rely on their experiences in those settings—such as the extent to which their contributions in class are sought and valued, the extent to which their intellectual and career potential is taken seriously by faculty and male classmates, and the extent to which men are given preferential treatment—to assess the validity of their career goals and their progress toward those.

Conditional Effects of the Chilly Climate for Women

Conditional effects of the chilly climate were found for women in 2-year colleges. The negative association of the chilly climate with end-of-first-year cognitive development was strongest for the women who entered college with relatively low levels of cognitive development. As the level of precollege cognitive development increased, the magnitude of the negative association of a chilly campus climate with end-of-first-year cognitive development decreased. Thus, the 2-year-college women most disadvantaged in terms of precollege cognitive development suffered the most from perceived gender discrimination in their institutions.

With regard to self-reported gains in writing and thinking skills, however, the perceived chilly climate had the strongest potential negative impact on women who began college with high levels of cognitive development. As the level of precollege cognitive development decreased, so, too, did the magnitude of the negative relationship between the perceived chilly climate and gains in writing and thinking skills.

These findings might reflect interaction of differences in the students and in the dependent variables. The measure of end-of-first-year cognitive development is an objective measure, whereas gains in thinking and writing skills were self-reported. Therefore, the 2-year college women with higher levels of precollege cognitive development may have perceived a chillier campus climate than their peers, and their perceptions may have influenced self-reported gains in thinking and writing.

Implications

Given the sensitive sociopolitcal context in which this research may be considered, it is entirely possible that two divergent yet reasonable views may be taken with regard to the policy implications of the findings. One view focuses on the fact that only a few significant negative relationships were found between a perceived chilly climate and women's cognitive development; and the few significant negative relationships that were found were modest in magnitude. Thus,

even if a chilly climate does exist, it may have only a small, trivial impact on women's cognitive development in college. In short, the findings do not provide sufficient enough support for the negative effects of a chilly climate on women's cognitive growth that they warrant changes in, or reformulation of, institutional policy.

A different view interprets the findings as providing at least some support, particularly at 2-year institutions, for the hypothesis that a perceived chilly campus climate for women can, in fact, have negative implications for women's cognitive growth. Particularly important from this perspective is the fact that in the 2-year college sample a perceived chilly climate had a significant negative association with a broadly based, standardized measure of cognitive development that included such dimensions as reading comprehension, mathematics and quantitative reasoning, and critical thinking. Moreover, this negative association remained significant even after controls were made for 15 confounding variables, including women's precollege scores on a parallel form of the same standardized measure. Thus, the findings are also based on a stringent methodological criterion.

From this latter perspective the findings suggest that institutional policy warrants a more activist approach. At the very least there is a need for faculty, administrators, and other policymakers to better understand the climate for women on their own campuses, and to be sensitive to the possibility that issues of gender equity, both in and outside the classroom, may have implications for women's educational growth as early as the first year of college. Of course, any policies and programs aimed at fostering a climate of gender equity are justifiable primarily because they are the right thing to do, not just because they might enhance student development.

Limitations

The NSSL data have several limitations that should be kept in mind when one interprets these findings. First, although the overall sample was multi-institutional and comprised a broad range of 2- and 4-year institutions from 16 states, the inclusion of only 23 institutions means that one cannot necessarily generalize the results to all 2- and 4-year institutions.

Similarly, although we attempted in the initial sampling design and subsequent sample weighting to make the sample as representative as possible at each institution, the time commitments and work required of each student participant led to some self-selection. The responses of the students who were willing to participate in the study might have differed from those of the students who were invited to participate but declined.

Finally, the NSSL analyses conducted for this study were limited by the fact that the sample was traced only over the first year of college. The results reported here might not hold for subsequent years in college.

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