Psychological Bulletin

0033-2909/14/$12.00 DOI: 10.1037/a0035740

The Effects of Single-Sex Compared With Coeducational Schooling on Students' Performance and Attitudes: A Meta-Analysis

Erin Pahlke
Whitman College

Janet Shibley Hyde and Carlie M. Allison
University of Wisconsin—Madison

Proponents of single-sex (SS) education believe that separating boys and girls, by classrooms or schools, increases students' achievement and academic interest. In this article, we use meta-analysis to analyze studies that have tested the effects on students of SS compared with coeducational (CE) schooling. We meta-analyzed data from 184 studies, representing the testing of 1.6 million students in Grades K–12 from 21 nations, for multiple outcomes (e.g., mathematics performance, mathematics attitudes, science performance, educational aspirations, self-concept, gender stereotyping). To address concerns about the quality of research designs, we categorized studies as uncontrolled (no controls for selection effects, no random assignment) or controlled (random assignment or controls for selection effects). Based on mixed-effects analyses, uncontrolled studies showed some modest advantages for single-sex schooling, for both girls and boys, for outcomes such as mathematics performance but not for science performance. Controlled studies, however, showed only trivial differences between students in SS versus CE, for mathematics performance ($g = 0.10$ for girls, 0.06 for boys) and science performance ($g = 0.06$ for girls, 0.04 for boys), and in some cases showed small differences favoring CE schooling (e.g., for girls' educational aspirations, $g = -0.26$). Separate analyses of U.S. studies yielded similar findings (e.g., for mathematics performance $g = 0.14$ for girls and 0.14 for boys). Results from the highest quality studies, then, do not support the view that SS schooling provides benefits compared with CE schooling. Claims that SS schooling is particularly effective for U.S. ethnic minority boys could not be tested due to the lack of controlled studies on this question.

Keywords: single-sex, coeducational, performance, attitudes, meta-analysis

Supplemental materials: http://dx.doi.org/10.1037/a0035740.supp

Experts decry the poor performance of American children on standard tests of mathematics and science knowledge, by comparison with their peers from other nations (Else-Quest, Hyde, & Linn, 2010; OECD, 2010). This poor performance has led to calls for changes in public school education. One solution that has been proposed is single-sex classrooms or schools (Gurian, Henley, & Trueman, 2001; James, 2009; Sax, 2005). Public schools across the country have adopted this potential solution; on the basis of follow-up analyses of data from the Office of Civil Rights 2010 data collection, the Feminist Majority Foundation (2011) estimated that thousands of U.S. public schools offered single-sex academic classes during the 2009–2010 school year. Attempts to synthesize research on the effects of single-sex schooling have been contradictory or equivocal (e.g., Mael, Alonso, Gibson, Rogers, & Smith, 2005; Morse, 1998), perhaps because none of the reports used the rigorous method of meta-analysis to synthesize the evidence. Moreover, since those reports appeared, and with the approval of federal funding for single-sex programs in U.S. public schools beginning in 2006, much more research has appeared. The purpose of the research reported here was to use meta-analysis to synthesize the results of research comparing single-sex with coeducational schooling in regard to multiple student outcomes, including mathematics and science performance and academic performance in other areas, as well as motivation, interest, and attitudes. Thousands of children attend single-sex schools each day, and, in the case of public schools, millions of taxpayer dollars are being spent on single-sex schooling. It is essential that scientists, educators, and policy makers know whether single-sex schooling is a more effective learning environment for students, compared with coeducational schooling.

Theoretical Frameworks

In designing the current study, we set out to conduct a theory-driven (as opposed to a theory-testing) meta-analysis. That is, we used theory to inform the research questions and approaches, including moderator analyses. Three theoretical approaches from psychology were particularly relevant to this meta-analysis, as they can be used to understand why single-sex schooling might or

Erin Pahlke, Department of Psychology, Whitman College; Janet Shibley Hyde and Carlie M. Allison, Department of Psychology, University of Wisconsin–Madison.

This research was supported by Grant DRL 1138114 from the National Science Foundation. Any opinions expressed are those of the authors and not the National Science Foundation. The authors thank Larry Hedges for consultation during the project.

Correspondence concerning this article should be addressed to Erin Pahlke, Department of Psychology, Whitman College, Walla Walla, WA 99362. E-mail: pahlke@whitman.edu

might not be effective in improving student outcomes: expectancy-value theory, developmental intergroup theory, and views of large biological gender differences in learning.

First, Eccles and colleagues' expectancy-value theoretical model was originally proposed to explain the gender gap in mathematics performance as well as the underrepresentation of women in careers in science and engineering (e.g., Eccles, 1994; Jacobs, Davis-Kean, Bleeker, Eccles, & Malanchuk, 2005; Meece, Eccles-Parsons, Kaczala, Goff, & Futterman, 1982). This model can also be applied to the question of how classroom composition may influence student outcomes. According to the model, two categories of factors contribute to an individual's decision to pursue a challenge such as taking an advanced mathematics course in high school or embarking on a PhD in physics: (a) expectations for success and (b) values. With regard to the first factor, people do not undertake a challenge unless they have some expectation of success. According to the expectancy-value theoretical model, expectations of success are shaped by the person's aptitude, relevant past events such as grades in the subject and scores on standardized tests, socializers' attitudes and expectations, the person's interpretations of and attributions for these events, and the person's self-concept of his or her ability. Perceptions of the value of the task (e.g., taking the challenging mathematics course) are shaped by the cultural milieu (e.g., gender segregation of occupations, cultural stereotypes about the subject matter, teachers' attitudes) and the person's short-term and long-term goals (e.g., becoming an elementary school teacher and thinking one does not need advanced mathematics or becoming a civil engineer and knowing that one does). The theory has received abundant empirical support (e.g., Eccles, 1994; Frome & Eccles, 1998). For our purposes, it provides a clear model for why single-sex schooling may influence girls' achievement and interest in mathematics and science. School and classroom environments are themselves cultural milieus. A classroom environment based on beliefs in substantial, biologically based gender differences that drive some single-sex programs (reviewed below) may have an adverse impact on girls and women entering science, technology, engineering, and mathematics (STEM) careers. The very gender segregation of the classroom may highlight the gender segregation of adult occupations, increasing girls' belief that they do not belong in STEM occupations in which few women are found. In contrast, the "girl power" views that drive other single-sex programs (reviewed below) may have a positive impact on girls and women by increasing expectations for success.

Expectancy-value theory also provides guidance as to the outcomes that should be considered if the goal is to maximize students' achievement. These outcomes include not only academic performance (grades and test scores) but also interest and motivation, self-concept of ability in mathematics and science, and gender stereotyping. For this reason, we examined the effect of single-sex schooling across multiple domains.

Second, developmental intergroup theory (DIT; Bigler & Liben, 2006, 2007) is also relevant to this study, as it speaks directly to questions about the impacts that single-sex schooling may have on children's endorsement of gender stereotypes. Building on intergroup theory and social-cognitive development theory, DIT attempts to explain why certain social dimensions (such as gender and race) rather than other dimensions (such as handedness) become the basis of stereotyping and prejudice. DIT suggests that biases develop when a dimension acquires psychological salience, which occurs through a combination of four factors: perceptual discriminability of groups, unequal group size, explicit labeling of group membership, and implicit use of groups. In single-sex schools and classes, the category of gender meets all of these requirements and therefore is more salient. According to DIT, once gender gains psychological salience among children, gender biases and stereotypes are more likely to develop. Of importance, single-sex schooling may facilitate an increase in all of these factors through children seeing the segregation of the genders and hearing teachers' and schools' messages about the differences between girls and boys. As a result, single-sex schooling may lead to an increase in children's endorsement of gender stereotypes.

A third theoretical perspective holds that there are large, biologically based differences between boys and girls that lead to large differences in learning styles, requiring substantially different classroom teaching techniques for boys and girls (Gurian et al., 2001; Sax, 2005). Supporters of this perspective argue, for example, that girls learn more when the instruction is cooperation based, whereas boys flourish in competition-based learning environments. Supporters also claim that research indicates that girls have better hearing than boys; teachers, they argue, can improve student outcomes by talking more loudly to all-male classrooms than to all-female classrooms (Sax, 2010). From this perspective, single-sex schooling, particularly when it is differentially targeted toward "boy" and "girl" ways of learning, may lead to improved academic and social outcomes for children.

Assumptions Underlying Single-Sex Programs

Many proponents of single-sex education believe that separating boys and girls increases students' achievement and academic interest. Other proponents, it should be noted, take the stance that regardless of the effects of single-sex schooling, single-sex schooling should be available as an option for interested families. In this case, however, parents and school districts making the choice need accurate information about whether single-sex programs yield better outcomes than coed programs. The question of whether single-sex schooling improves student outcomes is still important, particularly because it is expensive and cumbersome to implement in public schools (Datnow, Hubbard, & Woody, 2001; Pahlke, Patterson, & Galligan, 2012). Proponents who believe single-sex schooling increases students' achievement and interests draw on a number of perspectives to support their claims about the efficacy of single-sex schooling, the most prevalent being (a) views that gender differences in psychological characteristics relevant to learning are substantial and/or are biological in nature; (b) social psychological and "girl power" approaches that highlight the negative effects of sexism in coeducational classrooms; and (c) views that biological and social psychological perspectives make single-sex schooling particularly effective for low-income African American and Hispanic boys.

From the biological difference perspective, as noted above, some supporters of single-sex education argue that boys and girls do better when they receive instruction that is targeted toward the substantial, biologically based differences they believe exist between boys and girls (Gurian et al., 2001; Sax, 2005). Related to this perspective, thousands of teachers have attended trainings through the Gurian Institute and the National Association for

Public Single-Sex Education to learn how to teach to boys' and girls' supposed naturally different ways of learning (Gurian, Stevens, & Daniels, 2009).

Other supporters of single-sex schooling hold what we term the "girl power" view, citing the problem of domineering boys in coeducational classrooms as a reason for separating boys and girls. In coeducational classrooms, boys tend to seek out and receive the majority of teachers' attention, particularly in math and science (Lee, Marks, & Byrd, 1994). Furthermore, educators worry that boys' sexist attitudes and behaviors decrease girls' interest in traditionally masculine STEM fields (Lee et al., 1994; Sadker & Sadker, 1994; Sadker, Sadker, & Zittleman, 2009). Classrooms that do not include males, they argue, are more supportive of girls' academic achievement in counterstereotypic domains (Shapka & Keating, 2003). The reasoning goes that, in single-sex classrooms, girls can develop self-confidence in mathematics and science; that is, single-sex classrooms are empowering to girls (hence our term "girl power"). This view is consistent with social psychologists' emphasis on the crucial importance of social context and social interaction in influencing students' behavior (Rudman & Glick, 2008).

Finally, a third group of supporters of single-sex schooling focuses on the supposed benefits for low-income U.S. African American and Hispanic boys (Hopkins, 1997). This emphasis merges the theoretical perspectives focused on innate differences and social influences. Proponents cite the reduction in discipline problems and increase in academic focus in many low-income, high-minority all-boys schools (Riordan, 1994). Working from a social psychological perspective, proponents cite concerns about the negative stereotypes, low expectations, and relative lack of student and adult role models in coeducational schools (McCluskey, 1993; Riordan, 1994; Singh, Vaught, & Mitchell, 1998). These educators hope that schools targeted toward low-income, minority boys will address these issues.

In the United States, single-sex schools or classrooms have often been initiated on the basis of one or more of these sets of assumptions. Moreover, these assumptions have been conveyed to teachers in teacher-training programs as well as manuals for teachers (e.g., Gurian et al., 2001). These assumptions, especially as they are conveyed to teachers, students, and parents, would be likely to have an influence on the effects of the single-sex schooling. For example, in all-girls schools with a "girl power" view, teachers, students, and parents are often explicitly told that a goal of the school is to increase girls' participation in STEM and to fight against gender bias. Schools that take a biological difference perspective, in comparison, may encourage gender-essentialist thinking through teacher and parent trainings and student workshops that include messages about the perceived differences between girls' and boys' preferences and learning strategies.

Methodological Issues

One of the reasons that the primary research on these topics is contradictory is that much of it—both in support of and in opposition to single-sex schools—is marred by methodological weaknesses. Ideally, evaluations would use experimental designs in which students are randomly assigned to single-sex or coeducational schooling. However, because current U.S. federal regulations require that enrollment in single-sex settings be voluntary, randomized designs are difficult to implement. Thus, much of the existing research is not based on random assignment and confounds single-sex schooling effects with other factors such as the effects of religious values, financial privilege, selective admissions, small class size, or highly motivated teachers associated with the single-sex school being studied (Arms, 2007; Bracey, 2006; Hayes, Pahlke, & Bigler, 2011; Salomone, 2006).

Prior attempts to review the research on the effects of single-sex schooling have been contradictory or equivocal. The American Association of University Women (AAUW; Morse, 1998) and Thompson and Ungerleider (2004) completed literature reviews that did not use meta-analytic techniques. Although helpful in pointing out trends, qualitative/narrative reviews are vulnerable to using crude vote-counting methods, which can lead to erroneous conclusions (Borenstein, Hedges, Higgins, & Rothstein, 2009). The U.S. Department of Education commissioned a quantitative analysis of single-sex schooling research. However, Mael et al. (2005) did not compute effect sizes or use contemporary meta-analytic statistical methods. In the current meta-analysis, we rely on effect sizes and advanced statistical models to address these gaps.

Furthermore, prior reviews of single-sex schooling research have generally included studies completed in both the United States and other westernized countries. School systems around the world vary, and, as such, results from New Zealand or European nations may not be relevant for U.S. schools. This is particularly likely because single-sex schools and classrooms in the United States, especially in the public educational system, are a recent phenomenon, whereas they have been common in many other parts of the world for decades. In the current meta-analysis, we report statistics for all nations combined and separately for U.S. studies, to allow for clearer interpretation and an assessment of policy implications for the United States.

Third, none of the previous reviews included studies of single-sex classes (as opposed to schools). This omission is particularly important in the current educational climate, because public U.S. schools have been implementing single-sex classes in their coeducational schools. Educators who are making decisions about policies need to know if there are differences in the effect of single-sex classes versus single-sex schools.

Finally, the previous reviews are limited by the studies they included. Of importance, none of the previous reviews included studies that have been completed since 2006, which marks the beginning of the boom in federally funded single-sex schooling programs in the United States.

The Current Study

Our purpose in the current study was to perform a meta-analysis to quantitatively synthesize the results of studies that have compared single-sex (SS) with coeducational (CE) schooling for a wide array of student outcomes, including mathematics performance and attitudes, science performance and attitudes, verbal performance and attitudes, attitudes about school, gender stereotyping, self-concept, interpersonal relations, aggression, victimization, and body image. In the present meta-analysis, we addressed the issue of quality of studies by coding each study as controlled (higher quality, including controls for selection effects or random assignment) or uncontrolled (lower quality, no controls for selec-

tion effects, no random assignment). Moderator analyses examined whether the effects of SS schooling varied systematically as a function of factors such as age, the context of single-sex instruction, and socioeconomic status (SES); for U.S. studies, race/ethnicity was examined as a moderator to determine whether, as claimed, SS schooling is particularly effective for ethnic minority youth. Assumptions underlying the SS program (substantial biological differences vs. girl power) were coded for each study.

Method

Sample of Studies

We used multiple methods to obtain relevant research for inclusion in the current study. First, computerized database searches of ERIC, PsycINFO, and Sociological Abstracts were used to generate a pool of potential articles. The following search terms were used: *coeducation, single-sex, single-gender,* and *same sex education.* Studies that included male or female single-sex samples were included. Search limits restricted the results to articles that discussed research with human populations and that were published in English at any time through 2011. These three searches identified a total of 3,171 articles. Second, we included all studies from the reviews by Mael et al. (2005); Morse (1998), and Thompson and Ungerleider (2004). Finally, we posted notices on listservs for educational psychologists and sociologists, made announcements at the American Educational Research Association annual meeting, and contacted prominent single-sex schooling researchers. Through this third step, we gained access to three additional data sets.

Two strategies were used to overcome file drawer effects (i.e., the tendency for studies with nonsignificant results to remain unpublished; Rosenthal, 1979). Both PsycINFO and ERIC index dissertations and other unpublished works, which thus were captured in the literature search. In addition, as noted, we contacted key researchers in the field and asked for unpublished data.

Finally, because the number of controlled studies was smaller than we hoped, in the summer of 2013 we searched for controlled studies that appeared within the last year and added them to the study. This resulted in five additional studies.

All abstracts and citations were uploaded into Refworks, an online reference manager, and duplicates were eliminated. This resulted in a pool of 2,382 potentially usable studies. Each abstract was read by either the first or the third author to determine whether the study was likely to have usable data based on the selection criteria.

Selection Criteria

To be included, studies had to meet four criteria.

1. Contain quantitative data on student outcomes. Exclusively qualitative studies were not included.

2. Assess K–12 schooling (studies of preschools and colleges were not included) and examine student outcomes (studies measuring teachers' attitudes, for example, were not included).

3. Measure one or more of the relevant outcome domains: (a) mathematics performance, (b) mathematics attitudes, (c) science performance, (d) science attitudes, (e) verbal performance, (f) verbal attitudes, (g) general achievement, (h) school attitudes, (i) gender stereotyping, (j) educational aspirations, (k) occupational aspirations, (l), self-concept, (m) interpersonal relations, (n) aggression, (o) victimization, and (p) body image.

4. Include separate groups of students that were in SS classes or schools and in CE classes or schools. Within-subjects designs that involved switching from SS to CE or the reverse were excluded because typically they confounded school type with age and grade in school.

In all, 454 studies met the inclusion criteria based on the content of their abstracts. A pdf of each of these articles was obtained for coding. These articles were then examined by either the first or the third author to determine whether they presented sufficient statistics for an effect size calculation. If articles were deemed eligible but did not provide sufficient information for coding and were not more than 7 years old, we contacted the authors for the information via e-mail. We contacted the first authors of 26 articles. Of those, 10 (38%) provided usable data. In cases in which authors did not respond with usable information or the article had been published more than 7 years ago, effect sizes were estimated (as opposed to being exactly computed) where possible. For example, if an article reported that a t test for differences between SS and CE was significant at $p < .05$, but the t value was not reported, we worked backward to the t value that would yield $p < .05$ for that sample size and used that t value to compute the effect size. In Table 1, estimated effect sizes are indicated with a superscript e.

In the case of longitudinal studies that measured the same outcome variable repeatedly at successive ages, we analyzed the data for the oldest age because it represented the longest exposure to school type.

In general, to maintain independence of observations, in cases in which there were multiple publications based on a single sample, the same sample was not included twice within an outcome domain (e.g., mathematics performance). In the case of High School and Beyond (HSB), however, a debate occurred between Lee and Bryk (1986) and Marsh (1989) as to proper controls in assessing SS versus CE effects. We retained and included effect sizes from both papers in the interest of recognizing both approaches. Riordan's (1994) analysis of a subsample of racial/ethnic minority students in HSB was retained because of the special interest in whether SS has beneficial effects for racial/ethnic minority students. Thompson's research (2003), based on HSB, was also included because it examined an outcome variable, college major, that was in a distinct category from those examined by Lee and Bryk, Marsh, or Riordan. In the case of the National Educational Longitudinal Studies, we used one study that looked at high school achievement (LePore & Warren, 1997) and one that examined choice of college major (Billger, 2009).

If a study reported outcomes in two different domains, both were included. Because we never averaged effect sizes across domains, independence of observations was not threatened.

The search and review procedures led to a final sample of 184 articles (63 of them unpublished studies). These studies comprised

Table 1
Effect Sizes and Study Characteristics

Study	Domain[a]	Quality[b]	Female *g*	Male *g*	*n* Female SS	*n* Female CE	*n* Male SS	*n* Male CE	*n* Mixed CE	Age	Nation/ethnicity	School or class[c]	SS public/private	CE public/private
Adkinson (2008)	6	1	0.29	−0.32	77	39	75	36		11.00	U.S., mixed	2	Public	Public
Ainley & Daly	5	1	0.17	0.05	1,875	1,875	1,875	1,875		17.00	Australia	1	Mixed	Mixed
(2002)	5	2	0.00[d]	0.00[d]	1,875	1,875	1,875	1,875		17.00	Australia	1	Mixed	Mixed
Baker et al.	6	1	−0.05	−0.06	922	434	922	434		17.00	Belgium	1	N/A	N/A
(1995)	6	1	0.13	0.08	277	299	277	299		17.00	New Zealand	1	N/A	N/A
	6	1	0.63	−0.37	347	1,480	347	1,480		17.00	Thailand	1	N/A	N/A
	6	1	0.10	−0.39	347	1,480	347	1,480		17.00	Japan	1	N/A	N/A
	6	2	0.00[d]	0.11[d]	922	434	922	434		17.00	Belgium	1	N/A	N/A
	6	2	0.00[d]	0.00[d]	277	299	277	299		17.00	New Zealand	1	N/A	N/A
	6	2	0.20[d]	0.20[d]	347	1,480	347	1,480		17.00	Thailand	1	N/A	N/A
	6	2	0.18[d]	0.18[d]	347	1,480	347	1,480		17.00	Japan	1	N/A	N/A
Banu (1986)	7	1	−0.01	0.42	75		75		300	16.00	Nigeria	1	Public	Public
Basilo (2008)	16	1		0.54	0	0	20	60		8.00	U.S., N/A	2	N/A	N/A
	16	1		−0.45	0	0	12	52		10.00	U.S., N/A	2	N/A	N/A
	16	1		0.40	0	0	17	52		11.00	U.S., N/A	2	N/A	N/A
Bastick (2000)	1	1	−0.17	0.23	319	390	199	279		14.30	Jamaica	1	N/A	N/A
Baur (2004)	12	1	−0.24		195	108	0	0		15.19	U.S., White	1	Parochial	Parochial
Belcher et al.	6	1	−0.27	−0.02	24	23	22	29		11.00	U.S., N/A	2	Public	Public
(2006)	16	1	0.15	−0.27	24	23	22	29		11.00	U.S., N/A	2	Public	Public
Bell (1989)	5	2	0.09	0.22	639	1,538	450	1,636		15.00	U.K.	1	N/A	N/A
	5	1	0.44	0.54	639	1,538	450	1,636		15.00	U.K.	1	N/A	N/A
Billger (2009)	11	1	0.38	−0.18	171	398	170	369		16.00	U.S., N/A	1	Private	Private
Blechle (2008)	6	1	0.08	−0.51	10		9		30	16.50	U.S., White	2	Public	Public
	8	1	0.33	−0.46	10		9		30	16.50	U.S., White	2	Public	Public
Bloomfield & Soyibo (2008)	5	1	−0.36	−1.37	109		52		196	17.00	Jamaica	1	N/A	N/A
Bradley (2009)	6	2	0.56	−0.06	24	27	35	26		6.50	U.S., mixed	2	Public	Public
	16	2	0.68	−0.31	24	27	35	26		6.50	U.S., mixed	2	Public	Public
Brathwaite (2010)	6	1	0.36	0.09	36	96	21	120		8.00	U.S., Black	1	Public	Public
	6	1	−0.16	0.27	27	125	26	118		9.00	U.S., Black	1	Public	Public
	16	1	0.02	−0.04	36	96	21	120		8.00	U.S., Black	1	Public	Public
	16	1	0.61	0.09	27	125	26	118		9.00	U.S., Black	1	Public	Public
Brutsaert (2006)	10	1	−0.15	0.08	2,228	1,142	1,972	1,085		14.50	Belgium	1	Parochial	Parochial
Calder (2006)	5	1	0.34	0.33	30	29	21	20		13.00	U.S., White	2	Public	Public
	6	1	−0.15	0.28	30	29	21	20		13.00	U.S., White	2	Public	Public
	16	1	−0.90	−0.18	30	29	21	20		13.00	U.S., White	2	Public	Public
Campbell & Evans (1997)	8	2	1.74		11	4	0	0		16.00	U.S., N/A	2	Parochial	Parochial
Campbell (1969)	14	1	0.88[d]		52	53	0	0		12.50	U.S., N/A	2	N/A	N/A
Carpenter (1985)	9	1	0.03		75	428	0	0		17.00	Australia	1	N/A	N/A
Carpenter &	9	2	0.03		230	230	0	0		17.00	Australia	1	Mixed	Mixed
Hayden (1987)	9	2	0.28		289	288	0	0		17.00	Australia	1	Mixed	Mixed
Caspi (1995)	9	2	0.20		449	527	0	0		16.00	New Zealand	1	N/A	N/A

(*table continues*)

Table 1 (*continued*)

					n									
Study	Domain[a]	Quality[b]	Female g	Male g	Female SS	Female CE	Male SS	Male CE	Mixed CE	Age	Nation/ethnicity	School or class[c]	SS public/private	CE public/private
Caspi et al. (1993)	1	1	0.0[d]		144	121	0	0		15.00	New Zealand	1	N/A	N/A
Cherney & Campbell (2011)	3	1	0.30	0.19	101	68	50	54		16.00	U.S., White	1	Private	Mixed
	6	1	0.81	1.45	101	68	50	54		16.00	U.S., White	1	Private	Mixed
	8	1	−0.17	0.08	101	68	50	54		16.00	U.S., White	1	Private	Mixed
	14	1	0.22	0.13	101	68	50	54		16.00	U.S., White	1	Private	Mixed
Chouinard et al. (2008)	8	1	−0.12		38	58	0	0		16.00	Canada	1	Public	Public
	15	1	0.23		60	30	0	0		16.00	Canada	1	Public	Public
Cipriani-Sklar (1997)	3	2	−0.02		103	110	0	0		14.00	U.S., mixed	1	Parochial	N/A
	7	2	0.23		103	110	0	0		14.00	U.S., mixed	1	Parochial	N/A
	8	2	0.88		103	110	0	0		14.00	U.S., mixed	1	Parochial	N/A
Conway (1997)	3	1	0.06		148	145	0	0		17.00	U.S., Latino	1	Parochial	Parochial
	6	1	0.13		130	140	0	0		17.00	U.S., Latino	1	Parochial	Parochial
	16	1	0.14		148	145	0	0		17.00	U.S., Latino	1	Parochial	Parochial
Crombie et al. (2002)	7	1	0.83		63	32	0	0		16	Canada	2	N/A	N/A
	10	1	0.31		63	32	0	0		16	Canada	2	N/A	N/A
	11	1	0.58		63	32	0	0		16	Canada	2	N/A	N/A
	13	1	0.57		63	32	0	0		16	Canada	2	N/A	N/A
Crump (2004)	3	1	−0.20		51	29	0	0		14.40	U.S., mixed	1	N/A	N/A
	3	1	0.12		15	16	0	0		17.60	U.S., mixed	1	N/A	N/A
	14	1	−0.16		51	29	0	0		14.40	U.S., mixed	1	N/A	N/A
	14	1	0.15		15	16	0	0		17.60	U.S., mixed	1	N/A	N/A
	16	1	−0.82		51	29	0	0		14.40	U.S., mixed	1	N/A	N/A
	16	1	0.61		15	16	0	0		17.60	U.S., mixed	1	N/A	N/A
Cruz-Duran (2009)	10	1	−0.25		323	92	0	0		15.91	U.S., mixed	1	Parochial	Parochial
Cuddy (2003)	3	1	0.21		35	33	0	0		11.00	U.S., N/A	1	Private	Private
	3	1	−0.08		26	23	0	0		14.00	U.S., N/A	1	Private	Private
	3	1	−0.79		36	17	0	0		17.00	U.S., N/A	1	Private	Private
Dagenais et al. (1994)	5	1	−0.85		13	10	0	0		16.00	U.S., N/A	2	N/A	N/A
Dale (1969)	14	1	−0.08	−0.10	275	275	278	275		11.00	U.K.	1	N/A	N/A
Daly (1996)	6	1	0.05		442	635	0	0		16.00	U.K.	1	N/A	N/A
	6	1	0.05		338	444	0	0		16.00	U.K.	1	N/A	N/A
	16	1	0.01		442	635	0	0		16.00	U.K.	1	N/A	N/A
	16	1	0.15		338	444	0	0		16.00	U.K.	1	N/A	N/A
Daly & Defty (2004)	6	2	0.10	0.10	4,576	18,070	1,285	18,070		15.50	U.K.	1	N/A	N/A
Daly & Shuttleworth (1997)	6	1	0.07	0.01	313		543		983	16.00	U.K.	1	N/A	N/A
	6	1	−0.02	0.01	180		184		495	16.00	U.K.	1	N/A	N/A
	6	1	0.03	0.11	219		253		959	16.00	U.K.	1	N/A	N/A
Danishevky (2008)	8	1	0.47[d]	0.75[d]	51	51	41	39		12.00	U.S., N/A	2	Public	Public
Davey et al. (2011)	10	1	0.37		52	43	0	0		18.25	Australia	1	N/A	N/A
	12	1	0.23		52	43	0	0		18.25	Australia	1	N/A	N/A

(*table continues*)

Table 1 (*continued*)

Study	Domain[a]	Quality[b]	Female *g*	Male *g*	*n* Female SS	Female CE	Male SS	Male CE	Mixed CE	Age	Nation/ethnicity	School or class[c]	SS public/private	CE public/private
Davey et al. (2011)	14	1	−0.09		52	43	0	0		18.25	Australia	1	N/A	N/A
Delfabbro et al. (2006)	4	1	−0.30	0.12	143	624	76	441		15.20	Australia	1	Private	Mixed
Dhindsa & Chung	5	2	0.71	0.25	156	164	155	137		14.00	Brunei	1	Public	Public
(2003)	7	2	0.33	0.23	156	164	155	137		14.00	Brunei	1	Public	Public
Diehm (2009)	16	2	0.37[d]	0.59[d]	22	43	18	40		5.00	U.S., N/A	2	N/A	N/A
Doris et al. (2013)	6	2	0.05	0.13	1,047	2,627	1,009	2,433		9.00	Irish	1	Mixed	Mixed
Dorman (2009)	2	1	0.18	−0.06	435	423	428	433		16.00	Australia	1	Parochial	Parochial
Drury (2010)	3	1	0.16		147	336	0	0		10.13	Colombia	1	N/A	N/A
	10	1	0.52		147	336	0	0		10.13	Colombia	1	N/A	N/A
Dyer & Tiggemann (1996)	12	2	0.39		63	79	0	0		15.50	Australia	1	Private	Private
Edwards (2002)	6	1	0.77		19	12	0	0		15.30	U.S., White	2	Public	Public
	6	2	0.00		19	12	0	0		15.30	U.S., White	2	Public	Public
	8	1	0.28		19	12	0	0		15.30	U.S., White	2	Public	Public
	8	2	0.00		19	12	0	0		15.30	U.S., White	2	Public	Public
Egbochuku & Aihie (2009)	3	1	0.09	0.52	26	68	12	10		17.00	Nigeria	1	N/A	N/A
Esfandiari &	7	1	0.52	0.74	50	44	44	15		17.00	Iran	1	N/A	N/A
Jahromi (1989)	8	1	0.00	0.67	50	44	44	15		17.00	Iran	1	N/A	N/A
Fear et al. (1996)	12	1	0.00		184	179	0	0		15.00	New Zealand	1	Public	Public
	12	2	0.06[d]		184	179	0	0		15.00	New Zealand	1	Public	Public
Feather (1974)	2	1	0.00[d]	0.16[d]	231	352	296	428		16.00	Australia	1	Public	Public
	14	1	0.00[d]	0.00[d]	231	352	296	428		16.00	Australia	1	Public	Public
Feniger (2011)	11	1	0.18		975	8,581	0	0		17.00	Israel	1	Parochial	Mixed
Foon (1988)	5	1	0.21	0.00	616	163	702	194		15.00	Australia	1	Private	Private
	6	1	−0.19	0.00	616	163	702	194		15.00	Australia	1	Private	Private
Fox (1993)	10	1	0.22		44	45	0	0		17.00	U.S., mixed	1	Parochial	Parochial
Fritz (1996)	5	1	−0.14	−0.33	38	81	32	77		14.50	U.S., N/A	1	Private	Mixed
Gibb et al. (2008)	11	1	0.52	0.70	175	295	156	314		15.00	New Zealand	1	N/A	N/A
Gillibrand et al.	7	1	0.17		51	7	0	0		14.00	U.K.	2	N/A	N/A
(1999)	11	1	0.84		51	7	0	0		14.00	U.K.	2	N/A	N/A
Gilroy (1990)	6	1	0.51	0.13	73	106	174	104		17.00	U.S., White	1	Private	Private
	16	1	0.59	0.18	73	106	174	104		17.00	U.S., White	1	Private	Private
	16	2		0.31	73	106	174	104		17.00	U.S., White	1	Private	Private
Gilson (1999)	6	1	−0.15		195	137	0	0		12.00	U.S., N/A	1	Private	Private
	6	1	0.76		116	49	0	0		13.00	U.S., N/A	1	Private	Private
	8	1	−0.09		439	306	0	0		12.50	U.S., N/A	1	Private	Private
Githua & Mwangi (2003)	8	1	0.02	0.33	144	141	174	189		15.50	Kenya	1	N/A	N/A
Gordon et al.	3	1		0.58	0	0	29	32		13.88	U.S., Black	2	Public	Public
(2009)	6	1		1.10	0	0	29	32		13.88	U.S., Black	2	Public	Public
	6	2		0.50	0	0	29	32		13.88	U.S., Black	2	Public	Public

(*table continues*)

Table 1 (*continued*)

Study	Domain[a]	Quality[b]	Female g	Male g	*n* Female SS	*n* Female CE	*n* Male SS	*n* Male CE	*n* Mixed CE	Age	Nation/ethnicity	School or class[c]	SS public/private	CE public/private
Gordon et al.	16	1		0.44	0	0	29	32		13.88	U.S., Black	2	Public	Public
(2009)	16	2		0.00	0	0	29	32		13.88	U.S., Black	2	Public	Public
Granleese & Joseph (1993)	3	2	−0.05		143	24	0	0		13.00	U.K.	1	Parochial	Parochial
Harker (2000)	6	1	0.12	0.10	505	1,413	713	787		17.00	New Zealand	1	Mixed	Mixed
	16	1	−0.03	0.22	505	1,413	713	787		17.00	New Zealand	1	Mixed	Mixed
	16	2	0.00[d]		505	1,413	713	787		17.00	New Zealand	1	Mixed	Mixed
Harrah (2000)	10	1	0.08	0.75	57	41	87	12		15.82	U.S.,White	1	Parochial	Parochial
Harvey (1985)	5	1	0.06[d]		1024	682	0	0		11.00	U.K.	1	N/A	N/A
Harvey & Stables (1986)	7	1	0.24	−0.40	450	717	456	688		16.00	U.K.	1	N/A	N/A
Harvey & Wareham (1984)	16	1	−0.55	−0.35	62		75		150	14.00	U.K.	2	N/A	N/A
Hayes et al.	6	1	0.33		114	107	0	0		13.00	U.S., mixed	1	Public	Public
(2011)	6	2	0.24		114	107	0	0		13.00	U.S., mixed	1	Public	Public
	16	1	0.42		114	107	0	0		13.00	U.S., mixed	1	Public	Public
	16	2	0.34		114	107	0	0		13.00	U.S., mixed	1	Public	Public
Hoffman et al.	6	1	−0.34	−0.20	163	164	166	174		15.00	U.S., mixed	2	Public	Public
(2008)	16	1	−0.12	−0.24	163	164	166	174		15.00	U.S., mixed	2	Public	Public
Huon et al. (2000)	12	1	0.01		151	152	0	0		13.63	Australia	1	N/A	N/A
Jackson (2012)	6	1	0.72	0.76	24,648	87,625	19,689	86,642		15.00	Trinidad and Tobago	1	Mixed	Mixed
	6	2		0.00[d]	24,648	87,625	19,689	86,642		15.00	Trinidad and Tobago	1	Mixed	Mixed
	16	1	0.65	0.75	24,648	87,625	19,689	86,642		15.00	Trinidad and Tobago	1	Mixed	Mixed
	16	2		0.00[d]	24,648	87,625	19,689	86,642		15.00	Trinidad and Tobago	1	Mixed	Mixed
James (2001)	8	1		−0.09	0	0	275	137		16.00	U.S., N/A	1	N/A	N/A
	15	1		0.31	0	0	275	137		16.00	U.S., N/A	1	N/A	N/A
Jimenez &	6	1	0.29	−0.24	502	1,076	567	1,120		13.00	Thailand	1	N/A	N/A
Lockheed	6	2	0.40	−0.26	502	1,076	567	1,120		13.00	Thailand	1	N/A	N/A
(1989)	11	1	0.35	0.14	502	1,076	567	1,120		13.00	Thailand	1	N/A	N/A
Johnson (2009)	4	1	−0.65	−0.12	337	6,203	390	6,203		15.00	U.S., mixed	1	Mixed	Mixed
	10	1	−0.05	0.11	337	6,203	390	6,203		15.00	U.S., mixed	1	Mixed	Mixed
Jones & Clark (1995)	7	1	0.29		131	100	0	0		15.00	Australia	1	Mixed	Mixed
Karpiak et al.	10	1	−0.04	−0.16	136	614	116	344		16.00	U.S., White	1	Parochial	Mixed
(2007)	10	1	0.09	0.36	151	151	94	94		16.00	U.S., White	1	Parochial	Mixed
Kawasha (2011)	6	1	−0.32	0.79	21	29	13	23		11.5	U.S., White	2	N/A	Public
	6	1	0.22	0.65	41	46	39	29		11.5	U.S., mixed	2	N/A	Public
	8	1	−0.32	0.11	62	75	52	52		11.5	U.S., mixed	2	N/A	Public
	10	1	0.09	0.08	62	75	52	52		11.5	U.S., mixed	2	N/A	Public
Keane (2004)	3	1	0.23		61	80	0	0		16.00	U.S., N/A	1	Private	Private

(*table continues*)

Table 1 (*continued*)

Study	Domain[a]	Quality[b]	Female *g*	Male *g*	*n* Female SS	*n* Female CE	*n* Male SS	*n* Male CE	*n* Mixed CE	Age	Nation/ethnicity	School or class[c]	SS public/private	CE public/private
Keeler (1998)	3	1	0.12		169	83	0	0		17.00	U.S., White	1	Parochial	Parochial
	10	1	−0.27		169	83	0	0		17.00	U.S., White	1	Parochial	Parochial
Kessels &	7	1	0.49	−0.07	129	81	101	90		14.00	Germany	2	Public	Public
Hannover (2008)	10	1	0.10	−0.69	46	23	29	22		14.00	Germany	2	Public	Public
Kibera (1995)	11	1	1.11	0.43	146	161	84	328		16.00	U.S., N/A	1	N/A	N/A
Kim & Law	6	1	0.01	0.37	1,469	2,516	1,191	2,516		15.00	Korea	1	Mixed	Mixed
(2012)	6	1	0.47	0.38	487	1981	196	1,981		15.00	Hong Kong	1	Mixed	Mixed
	6	2	0.21	0.23	1,469	2,516	1,191	2,516		15.00	Korea	1	Mixed	Mixed
	6	2	−0.18	0.02	487	1,981	196	1,981		15.00	Hong Kong	1	Mixed	Mixed
Lambert (1998)	3	2	0.00[d]		38	12	0	0		17.50	U.S., N/A	1	Parochial	Parochial
	9	1	1.55		38	12	0	0		17.50	U.S., N/A	1	Parochial	Parochial
Langlois (2006)	3	1	0.10		50	50	0	0		15.00	U.S., mixed	1	Parochial	Parochial
Laster (2004)	6	1	0.17	−0.29	33	16	33	16		11.00	U.S., N/A	2	Public	Public
	16	1	0.13	0.61	33	16	33	16		11.00	U.S., N/A	2	Public	Public
Lawrie & Brown	7	1	0.19	0.00	124	46	72	42		14.50	U.K.	1	Private	Private
(1992)	8	1	0.56	−0.06	124	46	72	42		14.50	U.K.	1	Private	Private
Lee & Bryk	3	2	0.02	0.09	382	382	499	474		17.00	U.S., White	1	Parochial	Parochial
(1986)	5	2	0.20	0.01	382	382	499	474		17.00	U.S., White	1	Parochial	Parochial
	6	2	0.04	0.00	382	382	499	474		17.00	U.S., White	1	Parochial	Parochial
	8	2	0.23	0.12	382	382	499	474		17.00	U.S., White	1	Parochial	Parochial
	16	2	0.14	0.05	382	382	499	474		17.00	U.S., White	1	Parochial	Parochial
Lee & Lockheed	6	1	0.65	0.11	78	149	442	343		15.00	Nigeria	1	Public	Public
(1990)	8	1	0.46	0.27	78	149	442	343		15.00	Nigeria	1	Public	Public
	10	1	−0.29	0.14	78	149	442	343		15.00	Nigeria	1	Public	Public
	11	1	0.14	0.16	78	149	442	343		15.00	Nigeria	1	Public	Public
LePore & Warren	3	1	−0.06	0.17	85	227	157	190		17.00	U.S., mixed	1	Parochial	Parochial
(1997)	3	2	−0.08	0.03	85	227	157	190		17.00	U.S., mixed	1	Parochial	Parochial
	5	1	−0.16	0.22	85	227	157	190		17.00	U.S., mixed	1	Parochial	Parochial
	5	2	−0.10	−0.04	85	227	157	190		17.00	U.S., mixed	1	Parochial	Parochial
	6	1	0.03	0.33	85	227	157	190		17.00	U.S., mixed	1	Parochial	Parochial
	6	2	0.02	−0.02	85	227	157	190		17.00	U.S., mixed	1	Parochial	Parochial
LePore & Warren	16	1	−0.02	0.30	85	227	157	190		17.00	U.S., mixed	1	Parochial	Parochial
(1997)	16	2	−0.04	0.00	85	227	157	190		17.00	U.S., mixed	1	Parochial	Parochial
Limbert (2001)	2	1	−0.20		137	458	0	0		16.00	U.K.	1	N/A	N/A
	12	1	0.11		137	458	0	0		16.00	U.K.	1	N/A	N/A
Malacova (2007)	9	1	0.47	0.56	9,530	4,952	8,036	5,996		16.00	U.K.	1	Public	Mixed
	9	1	0.10	0.06	23,976	209,803	15,821	219,047		16.00	U.K.	1	Mixed	Mixed
Mallam (1993)	8	1	0.80		100	67	0	0		15.00	Nigeria	1	Mixed	Mixed
	8	1	1.35		40	33	0	0		15.00	Nigeria	1	Mixed	Mixed
Mandelberg	3	1	−0.32		32	21	0	0		16.00	U.S., mixed	1	Private	Private
(2004)	12	1	−0.47		32	21	0	0		16.00	U.S., mixed	1	Private	Private
	14	1	0.33		32	21	0	0		16.00	U.S., mixed	1	Private	Private

(*table continues*)

Table 1 (*continued*)

Study	Domain[a]	Quality[b]	Female g	Male g	n Female SS	n Female CE	n Male SS	n Male CE	n Mixed CE	Age	Nation/ethnicity	School or class[c]	SS public/private	CE public/private
Marsh (1989)	3	2	−0.04	−0.04	444	513	629	746		17.00	U.S., White	1	Parochial	Parochial
	5	2	−0.08	0.00	444	513	629	746		17.00	U.S., White	1	Parochial	Parochial
	6	2	−0.02	0.04	444	513	629	746		17.00	U.S., White	1	Parochial	Parochial
	16	2	−0.14	−0.08	444	513	629	746		17.00	U.S., White	1	Parochial	Parochial
Marsh & Rowe (1996)	6	2	−0.10	0.26	98	26	108	29		12.50	U.K.	2	Private	Private
	8	2	−0.11	0.28	98	26	108	29		12.50	U.K.	2	Private	Private
	10	2	0.59	0.51	98	26	108	29		12.50	U.K.	2	Private	Private
Marsh et al. (1988)	3	1	0.20	−0.34	93	121	93	121		13.00	Australia	1	N/A	N/A
McEwen et al. (1997)	5	1	−0.08	−0.29	409	463	444	284		17.00	U.K.	1	N/A	N/A
McVey (2004)	9	1	−0.19		72	87	0	0		15.00	U.S., mixed	1	Private	Private
	10	1	−0.05		72	87	0	0		15.00	U.S., mixed	1	Private	Private
	16	1	−0.76		72	87	0	0		15.00	U.S., mixed	1	Private	Private
Mensinger (2003)	12	1	0.18		226	76	0	0		16.00	Mixed	1	Parochial	Parochial
	12	1	−0.19		79	104	0	0		16.00	Mixed	1	Private	Private
Miller & Dale (1974)	13	1		−0.03	0	0	221	221		16.00	U.K.	1	N/A	N/A
Mulholland et al. (2004)	6	2	−0.58	0.04	29	66	26	85		14.00	Australia	2	Public	Public
	16	2	0.62	0.38	29	66	26	85		14.00	Australia	2	Public	Public
Norfleet James & Richards (2003)	8	1		−0.28	0	0	68	68		17.00	U.S., N/A	1	Mixed	Mixed
	8	1		0.12	0	0	68	68		17.00	U.S., N/A	1	Mixed	Mixed
	8	1		−0.22	0	0	68	68		17.00	U.S., N/A	1	Mixed	Mixed
	15	1		0.45	0	0	68	68		17.00	U.S., N/A	1	Mixed	Mixed
	15	1		0.23	0	0	68	68		17.00	U.S., N/A	1	Mixed	Mixed
	15	1		0.27	0	0	68	68		17.00	U.S., N/A	1	Mixed	Mixed
Norton & Rennie (1998)	8	1	−0.50	0.00	30	60	30	60		13.00	Australia	1	Private	Mixed
	8	1	0.26	−0.07	30	60	30	60		14.00	Australia	1	Private	Mixed
	8	1	0.24	0.39	30	60	30	60		15.00	Australia	1	Private	Mixed
	8	1	0.08	1.04	30	60	30	60		16.00	Australia	1	Private	Mixed
	8	1	0.54	0.36	30	60	30	60		17.00	Austalia	1	Private	Mixed
	10	1	−0.40	−0.54	30	60	30	60		13.00	Australia	1	Private	Mixed
	10	1	−0.59	0.08	30	60	30	60		14.00	Australia	1	Private	Mixed
	10	1	−0.15	−0.36	30	60	30	60		15.00	Australia	1	Private	Mixed
	10	1	−0.45	−0.16	30	60	30	60		16.00	Australia	1	Private	Mixed
	10	1	−0.82	0.02	30	60	30	60		17.00	Australia	1	Private	Mixed
Olson (2010)	6	1	0.66	0.36	42	56	47	57		9.50	U.S., White	2	Public	Public
	16	1	0.73	0.54	42	56	47	57		9.50	U.S., White	2	Public	Public
Osborne-Oliver (2009)	1	1	0.29		45	59	0	0		10.19	U.S., mixed	1	Mixed	Mixed
	2	1	−0.22		45	59	0	0		10.19	U.S., mixed	1	Mixed	Mixed
	4	1	0.13		45	59	0	0		10.19	U.S., mixed	1	Mixed	Mixed
Pahlke et al. (2013)	5	1	−0.04	0.04	877	1,139	957	1,267		15.00	Korea	1	Public	Public
Pahlke et al. (2013)	5	2	0.01	0.02	877	1,139	957	1,267		15.00	Korea	1	Public	Public
	6	1	−0.08	0.02	877	1139	957	1,267		15.00	Korea	1	Public	Public
	6	2	−0.01	−0.01	877	1139	957	1,267		15.00	Korea	1	Public	Public

(*table continues*)

Table 1 (*continued*)

Study	Domain[a]	Quality[b]	Female *g*	Male *g*	*n* Female SS	*n* Female CE	*n* Male SS	*n* Male CE	*n* Mixed CE	Age	Nation/ethnicity	School or class[c]	SS public/private	CE public/private
Park & Behrman (2010)	11	1	0.07	0.13	1,167	678	1,565	961		18.00	Korea	1	Public	Public
Park et al. (2013)	11	2	0.01	0.01	42,162	42,042	46,191	45,879		18.00	Korea	1	Public	Public
	16	2	0.07	0.12	42,162	42,042	46,191	45,879		18.00	Korea	1	Public	Public
Phillipps (2008)	6	1	0.25		52	48	0	0		12.00	U.S., White	1	Private	N/A
	6	1	0.53		103	72	0	0		12.00	U.S., White	1	Private	N/A
	6	2	0.17		52	48	0	0		12.00	U.S., White	1	Private	N/A
	6	2	0.37		103	72	0	0		12.00	U.S., White	1	Private	N/A
Phillips (1979)	10	1		0.46	0	0	44	1,091		11.00	Australia	1	Private	Public
Price &	6	2	0[d]	0[d]	20	11	17	10		6.00	U.S., N/A	1	Private	Private
Rosemeier (1972)	16	2	0.00	0.71	20	11	17	10		6.00	U.S., N/A	1	Private	Private
Proach (1999)	5	1	−0.57		30	25	0	0		15.00	U.S., White	1	Parochial	Parochial
	5	2	0.68		30	25	0	0		15.00	U.S., White	1	Parochial	Parochial
Rauscher (2008)	2	1	0.08		37	38	0	0		14.00	U.S., White	1	Parochial	Parochial
	2	1	−0.21		41	34	0	0		16.00	U.S., White	1	Parochial	Parochial
Rennie & Parker (1997)	4	1	−0.40	0.26	75	75	75	75		14.00	Australia	2	N/A	N/A
Richardson (1990)	14	1	0.79	0.06	67	45	56	41		11.40	Barbados	1	N/A	N/A
Riordan (1985)	6	2	0.47	0.09	126	98	156	119		17.00	U.S., White	1	Parochial	Parochial
	16	2	0.38	−0.22	126	98	156	119		17.00	U.S., White	1	Parochial	Parochial
Riordan (1994)	3	2	−0.09	−0.28	297	94	211	88		17.00	U.S., Black/Latino	1	Parochial	Parochial
	9	2	0.21	0.21	297	94	211	88		17.00	U.S., Black/Latino	1	Parochial	Parochial
Riordan et al.	6	1	−0.52	−0.39	43		121		120	9.00	U.S., Black	1	Public	Public
(2008)	16	1	0.17	0.49	43	60	121	60		9.00	U.S., Black	1	Public	Public
Robinson &	9	1	−0.12	0.39	8,662	2,440	4,026	2,623		17.00	U.K.	1	Mixed	Mixed
Smithers (1997)	9	1	0.29	0.44	4,270	2,196	2,501	2,318		17.00	U.K.	1	Mixed	Mixed
	9	1	0.11	0.18	549	366	61	366		17.00	U.K.	1	Mixed	Mixed
	9	1	0.14	−0.04	732	305	183	488		17.00	U.K.	1	Mixed	Mixed
Robinson &	5	1	−0.37	0.07	26	26	25	25		13.00	U.K.	2	N/A	N/A
Gillibrand (2004)	5	1	−0.28	−0.38	53	53	66	66		13.00	U.K.	2	N/A	N/A
Rosenthal &	10	1	1.03	−1.18	25	10	25	15		6.00	Australia	1	Private	Private
Chapman	10	1	0.42	0.70	30	11	25	15		9.00	Australia	1	Private	Private
(1980)	10	1	0.30	−0.12	29	12	25	9		11.00	Australia	1	Private	Private
Roth (2009)	5	1	0.02	0.29	252	130	295	219		13.00	U.S., Black	2	Public	Public
	6	1	0.15	0.31	252	130	295	219		13.00	U.S., Black	2	Public	Public
	16	1	0.19	0.56	252	130	295	219		13.00	U.S., Black	2	Public	Public
Rubenfeld &	10	1	−2.25		15	15	0	0		16.00	U.S., N/A	1	N/A	N/A
Gilroy (1991)	10	1	−0.51		15	15	0	0		16.00	U.S., N/A	1	N/A	N/A

(*table continues*)

Table 1 (*continued*)

Study	Domain[a]	Quality[b]	Female *g*	Male *g*	*n* Female SS	*n* Female CE	*n* Male SS	*n* Male CE	*n* Mixed CE	Age	Nation/ethnicity	School or class[c]	SS public/private	CE public/private
Russotto (2009)	6	1	−0.18	0.28	11	11	11	11		8.00	U.S., Black	2	Public	Public
	6	1	0.04	0.82	21	21	21	21		9.00	U.S., Black	2	Public	Public
	6	1	1.20	0.48	21	21	21	21		10.00	U.S., Black	2	Public	Public
	6	1	−0.18	0.50	18	18	18	18		11.00	U.S., Black	2	Public	Public
	16	1	−0.23	0.06	11	11	11	11		8.00	U.S., Black	2	Public	Public
	16	1	0.67	1.06	21	21	21	21		9.00	U.S., Black	2	Public	Public
	16	1	1.43	0.74	21	21	21	21		10.00	U.S., Black	2	Public	Public
	16	1	0.56	0.65	18	18	18	18		11.00	U.S., Black	2	Public	Public
Sampson & Watkins (1976)	14	1	0.00[d]	0.00[d]	429	1,506	572	2,078		8.00	Australia	1	N/A	N/A
Sanders (1992)	3	2		−0.83[d]	0	0	27	42		8.00	U.S., Black	1	Public	Public
	3	2		0.00[d]	0	0	20	29		9.00	U.S., Black	1	Public	Public
	3	2		0.00[d]	0	0	16	19		10.00	U.S., Black	1	Public	Public
	14	2		−0.53[d]	0	0	27	42		8.00	U.S., Black	1	Public	Public
	14	2		0.00[d]	0	0	20	29		9.00	U.S., Black	1	Public	Public
	14	2		0.00[d]	0	0	16	19		10.00	U.S., Black	1	Public	Public
Santos et al. (2013)	3	2		0.02	0	0	83	154		13.00	U.S., mixed	2	Public	Public
	6	2		−0.36	0	0	83	154		13.00	U.S., mixed	2	Public	Public
Sax et al (2009)	9	1	0.43		825	5,587	0	0		16.00	U.S., mixed	1	Private	Private
	9	1	0.32		5,727	9,097	0	0		16.00	U.S., mixed	1	Parochial	Parochial
	9	2	0.09		7,235	7,235	0	0		16.00	U.S., mixed	1	Private	Private
	9	2	0.23		303	303	0	0		16.00	U.S., mixed	1	Parochial	Parochial
Sax et al. (2011)	8	1	0.23		825	4,515	0	0		16.00	U.S., mixed	1	Private	Private
	8	1	0.06		5,674	7,800	0	0		16.00	U.S., mixed	1	Parochial	Parochial
	8	2	0.03		825	4,515	0	0		16.00	U.S., mixed	1	Private	Private
	8	2	0.05		5,674	7,800	0	0		16.00	U.S., mixed	1	Parochial	Parochial
Scheiner (1969)	6	1	0.22	0.34	16		48		156	6.00	U.S., N/A	2	Public	Public
	16	1	0.81	0.20	16		48		156	6.00	U.S., N/A	2	Public	Public
Schlosberg (1998)	6	1	0.22		56	46	0	0		16.00	U.S., mixed	1	Private	Private
	8	1	0.34		61	33	0	0		12.00	U.S., mixed	1	Private	Private
	8	1	0.03		51	42	0	0		14.00	U.S., mixed	1	Private	Private
	8	1	0.00		56	46	0	0		16.00	U.S., mixed	1	Private	Private
	16	1	0.49		56	46	0	0		16.00	U.S., mixed	1	Private	Private
Schneider et al. (1988)	3	2	−0.30	−0.23	295	215	294	210		15.00	Canada	1	Parochial	Parochial
	3	2	−0.12	−0.12	297	212	295	211		17.00	Canada	1	Parochial	Parochial
	14	2	−0.33	−0.22	295	215	294	210		15.00	Canada	1	Parochial	Parochial
	14	2	−0.06	0.19	297	212	295	211		17.00	Canada	1	Parochial	Parochial
Seminara (1997)	5	1	1.81	0.46	20	8	5	8		15.50	U.S., N/A	1	Private	Private
	7	1	0.66	0.15	20	8	5	8		15.50	U.S., N/A	1	Private	Private
Shapka (2009)	6	1	0.20		26	42	0	0		17.00	Canada	1	Public	Public
	6	2	−0.06		26	42	0	0		17.00	Canada	1	Public	Public
	8	1	−0.23		26	42	0	0		17.00	Canada	1	Public	Public
	8	2	0.11		26	42	0	0		17.00	Canada	1	Public	Public
Shapka & Keating (2003)	5	2	0.36		85	319	0	0		14.50	Canada	2	Public	Public
	6	2	0.30		85	319	0	0		14.50	Canada	2	Public	Public
	8	2	0.13		85	319	0	0		14.50	Canada	2	Public	Public

(*table continues*)

Table 1 (*continued*)

					n									
Study	Domain[a]	Quality[b]	Female *g*	Male *g*	Female SS	Female CE	Male SS	Male CE	Mixed CE	Age	Nation/ethnicity	School or class[c]	SS public/private	CE public/private
Shields (1991)	6	1	0.01		84	72	0	0		17.00	U.S., mixed	1	Private	Private
	6	1	−0.05		40	40	0	0		13.00	U.S., mixed	1	Private	Private
	6	1	−0.26		40	40	0	0		15.00	U.S., mixed	1	Private	Private
	8	1	0.29		40	40	0	0		17.00	U.S., mixed	1	Private	Private
	8	1	0.28		40	40	0	0		13.00	U.S., mixed	1	Private	Private
	8	1	−0.04		40	40	0	0		15.00	U.S., mixed	1	Private	Private
	10	1	−0.43		40	40	0	0		13.00	U.S., mixed	1	Private	Private
	10	1	−0.37		40	40	0	0		15.00	U.S., mixed	1	Private	Private
	10	1	0.21		40	40	0	0		17.00	U.S., mixed	1	Private	Private
Shikakura (2003)	10	1	−0.13		158	93	0	0		17.00	Japan	1	Private	Private
	11	1	−0.28		158	93	0	0		17.00	Japan	1	Private	Private
Shmurak (1993)	10	1	0.31		3,300	1,594	0	0		16.00	U.S., N/A	1	Private	Private
	10	1	0.14		1,975	1,294	0	0		16.00	U.S., N/A	1	Private	Private
	10	1	−0.06		31	25	0	0		15.00	U.S., mixed	1	Private	Private
	10	2	0.16		31	25	0	0		15.00	U.S., mixed	1	Private	Private
Signorella et al. (1996)	10	1	−0.20		36	16	0	0		7.50	U.S., White	1	Private	Private
	10	1	−0.10		30	3	0	0		9.50	U.S., White	1	Private	Private
	10	2	0.25		36	16	0	0		7.50	U.S., White	1	Private	Private
	10	2	0.01		30	3	0	0		9.50	U.S., White	1	Private	Private
Singh et al. (1998)	5	1	−0.60	−0.71	27	19	25	19		10.00	U.S., Black	2	Public	Public
	6	1	0.31	−0.68	27	19	25	19		10.00	U.S., Black	2	Public	Public
	16	1	0.11	0.22	27	19	25	19		10.00	U.S., Black	2	Public	Public
Spielhofer et al. (2004)	5	1	0.77	0.67	18,039	162,771	12,389	162,771		17.00	U.K.	1	Mixed	Mixed
	6	1		0.70			12,389	162,771		17.00	U.K.	1	Mixed	Mixed
Spikes (2009)	6	2	−0.25		21	12	0	0		13.00	U.S., N/A	2	Public	Public
Stables (1990)	14	1	−0.26	0.17	450	703	456	703		13.50	U.K.	1	Public	Public
Steinbrecher (1991)	11	1	−0.32		373	343	0	0		16.00	U.S., White	1	Parochial	Parochial
Stent & Gillies (2000)	10	1	−0.02		78	64	0	0		17.00	Australia	1	Private	Mixed
Stephens (2009)	6	2	1.69	2.03	18		23		22	10.00	U.S., N/A	2	Public	Public
	16	2	0.66	0.27	18		23		22	10.00	U.S., N/A	2	Public	Public
Stotsky et al. (2010)	6	2	0.13	0.39	16	11	21	12		9.50	U.S., N/A	2	Public	Public
	6	2	0.17	−0.10	23	10	24	13		10.50	U.S., N/A	2	Public	Public
	16	2	0.47	0.79	16	11	21	12		9.50	U.S., N/A	2	Public	Public
	16	2	−0.40	−0.55	23	10	24	13		10.50	U.S., N/A	2	Public	Public
Stowe (1991)	7	1	0.34[d]	0.00[d]	64	64	64	64		16.00	U.S., N/A	2	Private	Private
Streitmatter (1998)	5	1	2.45		32	14	0	0		17.00	U.S., White	2	Public	Public
Subotnik & Strauss (1995)	6	2	−0.28	0.25	36	32	15	37		17.00	U.S., N/A	2	Public	Public
Sudler (2009)	5	1	0.21	−0.83	58	65	60	61		12.00	U.S., Black	2	Public	Public
	6	1	−0.12	−0.60	58	65	60	61		12.00	U.S., Black	2	Public	Public
Sullivan (2009)	8	2	0.05	−0.05	2,906	2,906	3,048	3,048		16.00	U.K.	1	Mixed	Mixed
	15	2	−0.06	0.12	2,906	2,906	3,048	3,048		16.00	U.K.	1	Mixed	Mixed

(*table continues*)

Table 1 (*continued*)

Study	Domain[a]	Quality[b]	Female g	Male g	n Female SS	n Female CE	n Male SS	n Male CE	n Mixed CE	Age	Nation/ethnicity	School or class[c]	SS public/private	CE public/private
Sullivan et al.	9	1	0.83	0.66	2,385	2,385	2,481	2,481		16.00	U.K.	1	Mixed	Mixed
(2010)	9	2	0.16	0.01	2,385	2,385	2,481	2,481		16.00	U.K.	1	Mixed	Mixed
	11	1	0.70	0.55	2,153	2,153	2,153	2,153		16.00	U.K.	1	Mixed	Mixed
	11	2	0.04	0.00	2,153	2,153	2,153	2,153		16.00	U.K.	1	Mixed	Mixed
Sutton (2011)	6	1	0.16	0.04	63	244	62	220		12.00	U.S., mixed	2	Public	Public
Szabo (2005)	10	1	−0.42		147	232	0	0		16.00	U.S., N/A	1	N/A	N/A
Taylor (2002)	2	1	−0.01	0.53	78	85	80	104		16.00	U.S., N/A	1	Parochial	Parochial
	6	1	−0.43	−0.27	78	85	80	104		16.00	U.S., N/A	1	Parochial	Parochial
	11	1	0.40	1.26	78	85	80	104		16.00	U.S., N/A	1	Parochial	Parochial
	12	1	−0.93	1.86	78	85	80	104		16.00	U.S., N/A	1	Parochial	Parochial
	16	1	0.00	0.71	78	85	80	104		16.00	U.S., N/A	1	Parochial	Parochial
Thom (2006)	6	1	0.57	0.18	56	56	69	69		12.00	U.S., mixed	2	Public	Public
	16	1	0.39	0.29	56	56	69	69		12.00	U.S., mixed	2	Public	Public
Thompson (2003)	10	1	−0.38		373	343	0	0		16.00	U.S., White	1	Parochial	Parochial
	10	2	−0.98		373	343	0	0		16.00	U.S., White	1	Parochial	Parochial
Tickner (1992)	14	1		−0.34	0	0	39	23		9.00	U.S., N/A	1	Private	Private
Tiggemann (2001)	12	1	−0.23		144	117	0	0		16.10	Australia	1	Parochial	Parochial
Tsolidis &	9	1	0.29		151	2,800	0	0		17.00	Australia	1	Public	Public
Dobson (2006)	9	1	0.60	0.38	876	894	367	1,123		17.00	Australia	1	Parochial	Parochial
	9	1	0.00	0.07	692	628	789	548		17.00	Australia	1	Private	Private
Tully & Jacobs (2010)	8	1	0.46	0.16	14	19	20	42		16.00	Australia	1	N/A	N/A
Ulkins (2007)	2	1	0.32		15	16	0	0		13.00	U.S., N/A	2	Public	Public
	5	2	0.23		15	16	0	0		13.00	U.S., N/A	2	Public	Public
	7	1	−0.46		15	16	0	0		13.00	U.S., N/A	2	Public	Public
	13	1	−0.07		15	16	0	0		13.00	U.S., N/A	2	Public	Public
Van de gaer et al.	6	2	0.06	0.07	863	1,295	790	1,184		13.50	Belgium	1	Mixed	Mixed
(2004)	16	2	0.04	0.05	863	1,295	790	1,184		13.50	Belgium	1	Mixed	Mixed
Vockell & Lobonc (1981)	10	1	0.09		476	280	0	0		16.50	U.S., N/A	1	Parochial	Public
Vrooman (2010)	6	1	0.13	0.06	407	437	242	259		11.00	U.S., mixed	2	Public	Public
	6	1	0.18	0.08	404	429	236	241		12.00	U.S., mixed	2	Public	Public
	6	1	−0.24	−0.23	418	465	269	273		13.00	U.S., mixed	2	Public	Public
	16	1	−0.03	0.00	407	437	242	259		11.00	U.S., mixed	2	Public	Public
	16	1	0.05	0.04	404	429	236	241		12.00	U.S., mixed	2	Public	Public
	16	1	0.00	−0.19	418	465	269	273		13.00	U.S., mixed	2	Public	Public
Walter (1997)	8	1	0.48		49	35	0	0		12.00	Bermuda	1	Private	Private
	8	1	0.58		40	31	0	0		16.00	Bermuda	1	Private	Private
	10	1	−0.49		49	35	0	0		12.00	Bermuda	1	Private	Private
	10	1	−0.56		40	31	0	0		16.00	Bermuda	1	Private	Private
Weinberger-Litman et al. (2008)	12	1	−0.05		191	97	0	0		16.00	U.S., N/A	1	Mixed	Mixed
Wisenthal (1965)	9	1	0.25	−0.03	205	149	196	179		7.00	U.K.	1	N/A	N/A
	9	1	0.29	−0.04	183	165	214	204		12.00	U.K.	1	N/A	N/A

(*table continues*)

Table 1 (*continued*)

Study	Domain[a]	Quality[b]	Female *g*	Male *g*	*n* Female SS	*n* Female CE	*n* Male SS	*n* Male CE	*n* Mixed CE	Age	Nation/ethnicity	School or class[c]	SS public/private	CE public/private
Wong et al.	6	1	0.83	0.14	3924	11,892	1,588	6,601		17.00	Hong Kong	1	Mixed	Mixed
(2002)	6	1	0.76	−0.05	2015	6,861	3,809	8,394		17.00	Hong Kong	1	Mixed	Mixed
Wood & Brown (1997)	6	2	−0.23		40	20	0	0		14.00	U.S., N/A	2	Public	Public
Woodward et al.	9	1	0.87	0.97	133	200	115	209		16.00	New Zealand	1	Mixed	Mixed
(1999)	16	1	0.48	0.42	133	200	115	209		16.00	New Zealand	1	Mixed	Mixed
Young & Fraser (1990)	5	2	0.09[d]	0.12[d]	1,001	998	866	773		14.00	Australia	1	Private	Mixed
Zubernis (2005)	10	2	−0.14		26	12	0	0		14.00	U.S., N/A	1	Private	Private
	10	2	0.03		36	17	0	0		17.00	U.S., N/A	1	Private	Private
	10	2	0.23		35	18	0	0		11.00	U.S., N/A	1	Private	Private
	11	2	−0.69		26	12	0	0		14.00	U.S., N/A	1	Private	Private
	11	2	−0.67		36	17	0	0		17.00	U.S., N/A	1	Private	Private
	11	2	0.02		35	18	0	0		11.00	U.S., N/A	1	Private	Private

Note. Age is in years. SS = single-sex environment; CE = coeducational environment; U.K. = United Kingdom; N/A = not available.
[a] 1 = aggression; 2 = interpersonal relations; 3 = self-concept; 4 = victimization; 5 = science performance; 6 = mathematics performance; 7 = science attitudes; 8 = mathematics attitudes; 9 = general achievement; 10 = gender stereotyping; 11 = educational aspirations; 12 = body image; 13 = occupational aspirations in math/science; 14 = school attitudes; 15 = verbal attitudes; 16 = verbal performance. [b] 1 = uncontrolled studies (without controls); 2 = controlled studies (random assignment or controls for selection effects). [c] 1 = single-sex school environment; 2 = single-sex classroom environment. [d] Indicates estimated effect size.

1,663,662 participants. See Table 1 for a summary of all studies included in the meta-analysis.

Coding the Studies

During the coding of the studies, we recorded information about a range of characteristics of the study design, sample, and publication. These characteristics included the following: (a) dosage of SS instruction (a single class vs. all classes; i.e., the entire school), (b) age of students, (c) SES of sample, (d) nationality, (e) year of publication, (f) publication type (published or unpublished), (g) number of months of SS exposure, (h) focus of the article (SS schooling vs. something else), (i) theoretical orientation of single-sex program (large biological gender differences vs. girl power), and (j) type of SS and CE school (public, private, parochial). Among the U.S.-based studies, we also coded for the race/ethnicity of the sample. Our intentions in coding these characteristics of the studies were twofold. The first was to collect descriptive information about the types of samples being used in the SS schooling literature. The second was to examine the impact of these variables through moderator analyses.

We took several steps to ensure that coding was reliable. When establishing the coding process at the beginning of the project, the two main coders double coded 10 articles, to establish that the codes were being used consistently. Several months into the process, 20 different articles were double coded to determine interrater reliability. Agreement for coding of the moderators was good (kappas $>$ 0.80 for all variables). Discrepancies were resolved by discussion after a review of the article. Finally, we held weekly meetings to discuss coding questions and concerns. During those meetings, we discussed over 100 additional articles. The meetings helped to resolve difficult coding questions and to ensure that we avoided drift in coding. Taken together, this process led at least two of the authors to be involved in the coding of 29% of the articles included in the meta-analysis.

When studies had a measure that included multiple subscales measuring a broad construct, we used the subscale that most closely matched our category. For example, on the Fennema–Sherman scales that measure math attitudes, we used the self-confidence subscale because it is most representative of our category of mathematics attitudes. If that variable was unavailable, we took mathematics anxiety. The subscale regarding math as a male domain was categorized as a gender stereotyping measure. If a study included multiple measures of a construct that were all equally relevant, we followed procedures described by Borenstein et al. (2009) for averaging effect sizes to obtain a single effect size.

Statistical Analyses

Overall, statistical analyses were conducted with methods described by Lipsey and Wilson (2001) and Borenstein et al. (2009). We used a mixed-effects model, which allows both moderator variables and random error to account for variation between studies (Lipsey & Wilson, 2001). Effect sizes were computed as $d = (M_{SS} - M_{CE})/s_w$, where M_{SS} is the mean score for students in SS schooling, M_{CE} is the mean score for students in CE schooling, and s_w is the pooled within-groups standard deviation. We corrected all values of d for bias in estimation of the population effect size, using the formula provided by Hedges (1981); the corrected value is sometimes called g, and we use that notation in this manuscript. When means and standard deviations were not available in the original report, we computed d from t, r, χ^2, or other statistics, using formulas provided by Lipsey and Wilson (2001, Table B10, pp. 198 ff.). In cases in which ordinary least squares regression was used and no means were available, we used the regression coefficient B (unstandardized) for the SS–CE dummy comparison as an estimate of mean difference between SS and CE groups.

The set of effect sizes was evaluated for outliers, defined as values that were more than 2 standard deviations from the mean of all of the effect sizes associated with a particular domain. These outliers were then Winsorized (Lipsey & Wilson, 2001) to just 2 standard deviations from the mean. Twenty effect sizes were Winsorized in this way. By using this procedure, we retained all studies, but outliers were reduced so that they did not exert disproportionate effects on the results.

All reported effect sizes reflect the difference between SS and CE schooling in the domains of interest. Positive values indicate that, on average, SS schooling is associated with higher performance (or more positive attitudes) than is CE schooling; negative values indicate that, on average, CE schooling is associated with higher performance (or more positive attitudes) than is SS schooling. All effect sizes are interpreted according to Cohen's (1988) criteria: a g value of 0.20 is small, of 0.50 is medium, and of 0.80 is large. Additionally, values of $g \leq .10$ are considered trivial (Hyde, 2005).

The complexity of design issues in evaluating the effects of SS schooling necessitated an additional method of classification. Each study was categorized as controlled or uncontrolled. Controlled studies controlled for selection effects in at least one of the following ways: (a) used random assignments of students to SS or CE; (b) controlled for family SES (e.g., parental education, income); (c) controlled for initial performance on the target domain; and (d) checked for initial differences between SS and CE groups on SES or initial performance, found no differences, and, concluding that the groups were equivalent, proceeded with statistical analyses with no control variables. Controlled studies therefore represent the studies with the best research methods. Uncontrolled studies simply examined differences between student outcomes in SS versus CE schooling, with no controls for selection effects. In cases in which a controlled study also presented data for the uncontrolled question, both effects (with and without controls) were computed.

Weighted mean effect sizes were computed with formulas provided by Lipsey and Wilson (2001), which weight effect sizes by sample size. These weighted effect sizes are denoted g_w. However, there was a large range of sample sizes across studies, with some studies based on extremely large samples. For example, Jackson (2012) had a sample of 112,273 girls and 106,331 boys. In these cases, a single study was exerting disproportionate influence on the mean effect size. We therefore also computed an unweighted mean effect size, g_u, and report it as well.

Moderator Analyses

To examine the sources of variation in effect sizes, we examined whether four variables moderated the magnitude of the effect size for differences between students in SS versus CE schooling. Anal-

yses of moderators are warranted in meta-analytic studies only when there is a sufficient number of independent effect sizes and there is significant variance in effect sizes. Thus, before running moderator analyses, we established that there were at least 10 independent effect sizes available for that outcome and, second, tested the homogeneity statistic (i.e., Q_T) against the critical value of χ^2 with degrees of freedom $k - 1$, consistent with the procedures specified by Hedges and Becker (1986) and Lipsey and Wilson (2001). Only in cases in which Q_T was larger than the critical value of χ^2 (indicated in Tables 2, 3, 6, and 7) did we proceed with moderator analyses. When appropriate, we examined the potential effects of four key moderators: dosage of SS instruction (i.e., class or school), student age (i.e., elementary, middle school, or high school age), student SES (75% or more of the sample middle or upper SES, mixed SES, or 75% or more low SES), and student race/ethnicity (75% or more White, mixed race, or 75% or more African American or Latino; examined only among U.S. samples).

Other characteristics of the studies were not examined as potential moderators as a function of either the availability of the information (for example, only 8% of the studies reported information on the underlying assumptions of the SS program) or on the relative potential impact for theory and future work (for example, although most studies reported on the school type of SS and CE schools, we chose to focus on other potential moderators that are more closely tied to current theory; for reference, approximately 30% of the schools were public, 14% parochial, 20% private, 17% mixture of public and private, and 19% not specified.)

Results

Overview

Data analysis proceeded in four major steps. In the first step, mean effect sizes were calculated separately for controlled and uncontrolled studies, for each outcome and for each sex (i.e., girls and boys). During this first step, we combined U.S. and international samples, in an effort to increase the number of effect sizes available for analysis and maximize the ability to conduct moderator analyses. We report average effect sizes only where there are at least 3 independent effect sizes available to average. There were a sufficient number of independent effect sizes to examine results in every domain of interest other than students' occupational aspirations. During this first step, we focused on studies that reported results from girls and boys separately. Results from the 11 studies with mixed gender samples are available in the online supplemental materials (see Table S1). In the second step we examined the role of the three potential moderators (i.e., dosage of single-sex instruction, student age, and student SES). In the third step, we examined the overall weighted effect sizes in each of the domains of interest separately for U.S. studies, given policy interest in these issues in the United States. Finally, in the fourth step, we examined the effect of student race/ethnicity as a potential moderator among the U.S. studies. This set of analyses allowed us to test the claim by some single-sex schooling advocates that single-sex schooling has differential positive effects for African American and Latino students.

Table 2
Controlled Studies: Unweighted Mean Effect Sizes (g_U), Number of Effect Sizes (k), Weighted Mean Effect Sizes (g_W), 95% Confidence Intervals (95% CI), and Homogeneity Statistics (Q_T) for Schooling Type Differences for Analyses of U.S. and International Samples Combined

Content domain	Gender	g_u	k	g_w	95% CI	Q_T
Mathematics performance	Girls	0.09	31	0.10	0.08 to 0.11	134.44***
	Boys	0.10	26	0.06	0.05 to 0.07	158.18***
Mathematics attitudes	Girls	0.23	10	0.06	0.04 to 0.09	42.66***
	Boys	0.12	3	−0.02	−0.07 to 0.03	8.04*
Science performance	Girls	0.20	11	0.06	0.02 to 0.09	57.72***
	Boys	0.07	8	0.04	0.00 to 0.08	12.87
Verbal performance	Girls	0.21	15	0.07	0.07 to 0.08	44.91***
	Boys	0.13	16	0.11	0.11 to 0.12	178.98***
General achievement	Girls	0.17	7	0.12	0.09 to 0.14	12.55
	Boys	N/A	N/A	N/A	N/A	N/A
School attitudes	Girls	N/A	N/A	N/A	N/A	N/A
	Boys	0.19	5	0.03	−0.03 to 0.09	8.10
Gender stereotyping	Girls	0.02	8	−0.57	−0.70 to −0.45	83.59***
	Boys	N/A	N/A	N/A	N/A	N/A
Educational aspirations	Girls	−0.26	5	0.01	0.01 to 0.02	9.56*
	Boys	N/A	N/A	N/A	N/A	N/A
Self-concept	Girls	−0.08	9	−0.08	−0.14 to −0.01	8.84
	Boys	−0.11	10	−0.06	−0.12 to 0.01	17.14*

Note. Not enough studies were available for us to examine the domains of aggression, body image, interpersonal relations, occupational aspirations in mathematics/science, science attitudes, verbal attitudes, and victimization. N/A = not available.
* $p < .05$. *** $p < .001$.

Combined U.S. and International Samples

Mathematics performance.

Mean effect size. The results for controlled studies, which include appropriate controls for student and/or school selection effects, are presented in Table 2. Among girls, averaged over 31 independent effect sizes, the weighted difference in mathematics performance between SS and CE schooling was 0.10. Among boys, averaged over 26 independent effect sizes, the weighted effect size was 0.06. Given that the effect sizes are positive, the results suggest that there is a positive effect of SS schooling, in comparison to CE schooling, on students' mathematics performance among both girls and boys; however, given that the effect sizes are very small, these effects can be interpreted as being close to zero. In other words, once the appropriate controls are included, there is a negligible effect of SS compared with CE schooling on students' mathematics performance.

The uncontrolled results, which do not include appropriate controls for selection effects, are presented in Table 3. The unweighted and weighted effect sizes for the difference between SS and CE schooling in students' mathematics performance are inconsistent. The average unweighted effect size (i.e., the average of the effect sizes of all studies, not accounting for sample size or variance) was small, based on Cohen's (1988) criteria (among girls $g_u = 0.17$ and among boys $g_u = 0.13$). Given that the effect sizes are positive, the results suggest that there is a small positive effect of SS schooling, in comparison to CE schooling, in students' mathematics performance when appropriate statistical controls are not included (i.e., in uncontrolled studies). The average weighted effect sizes, in comparison, suggest that the difference between SS and CE schooling in students' mathematics performance was medium (among girls $g_u = 0.57$ and among boys $g_u = 0.54$). Differences between the unweighted and weighted effect sizes are due to a few studies that included very large sample sizes and that reported large effect sizes; for example, Jackson (2012) examined data from 112,273 girls and 106,331 boys and reported effect sizes of 0.65 among girls and 0.75 among boys in uncontrolled analyses (see Table 1; the same study was also included in controlled analyses). We present both the unweighted and the weighted effect sizes here (and throughout the article) in an effort to increase transparency and provide readers with the opportunity to draw their own interpretations.

Moderator analyses. Because the sets of effect sizes were heterogeneous (see Tables 2 and 3), moderator analyses were warranted. Results of moderator analyses among controlled studies

Table 3

Uncontrolled Studies: Unweighted Mean Effect Sizes (g_U)*, Number of Effect Sizes* (k)*, Weighted Mean Effect Sizes* (g_w)*, 95% Confidence Intervals (95% CI), and Homogeneity Statistics* (Q_T) *for Schooling Type Differences for Analyses of U.S. and International Samples Combined*

Content domain	Gender	g_u	k	g_w	95% CI	Q_T
Mathematics performance	Girls	0.17	60	0.57	0.56 to 0.59	1897.15***
	Boys	0.13	48	0.54	0.53 to 0.55	2964.41***
Mathematics attitudes	Girls	0.21	30	0.10	0.07 to 0.13	105.86***
	Boys	0.17	18	0.17	0.10 to 0.24	49.99***
Science performance	Girls	0.06	20	0.69	0.68 to 0.71	909.42***
	Boys	−0.06	16	0.58	0.57 to 0.60	752.81***
Science attitudes	Girls	0.30	11	0.27	0.19 to 0.36	19.15*
	Boys	0.12	7	−0.21	−0.30 to −0.12	45.56***
Verbal performance	Girls	0.19	34	0.28	0.25 to 0.32	326.27***
	Boys	0.25	30	0.68	0.66 to 0.70	544.42***
Verbal attitudes	Girls	N/A	N/A	N/A	N/A	N/A
	Boys	0.31	4	0.31	0.17 to 0.45	0.89
General achievement	Girls	0.32	18	0.34	0.32 to 0.36	491.67***
	Boys	0.30	12	0.18	0.17 to 0.19	956.30***
School attitudes	Girls	0.13	11	−0.04	−0.10 to 0.02	46.63***
	Boys	−0.01	7	0.03	−0.03 to 0.09	10.37
Gender stereotyping	Girls	−0.10	40	−0.02	−0.06 to 0.02	189.60***
	Boys	−0.02	17	0.09	0.04 to 0.14	45.32***
Educational aspirations	Girls	0.34	13	0.33	0.28 to 0.38	163.36***
	Boys	0.40	8	0.33	0.28 to 0.38	88.31***
Self-concept	Girls	0.02	15	0.10	0.01 to 0.18	13.57
	Boys	0.21	5	0.03	−0.13 to 0.20	13.57**
Interpersonal relations	Girls	−0.02	8	0.02	−0.06 to 0.10	13.68
	Boys	0.21	3	0.08	−0.01 to 0.18	13.62**
Aggression	Girls	.04	3	−0.08	−0.20 to 0.04	5.42
	Boys	N/A	N/A	N/A	N/A	N/A
Victimization	Girls	−0.30	4	−0.63	−0.66 to −0.59	30.25***
	Boys	0.09	3	−0.11	−0.15 to −0.08	9.21*
Body image	Girls	−0.14	11	−0.10	−0.18 to −.02	40.53***
	Boys	N/A	N/A	N/A	N/A	N/A

Note. Not enough studies were available for us to examine occupational aspirations in mathematics/science. N/A = not available.
* $p < .05$. ** $p < .01$. *** $p < .001$.

for the domain of mathematics performance are shown in Table 4. Significant between-groups heterogeneity appeared for age of students among both girls and boys. Among girls, there was a medium advantage of SS in middle school and a trivial difference between SS and CE in elementary school and high school. Among boys, there was a small advantage for SS in elementary school, a small advantage for CE in middle school, and a trivial difference between SS and CE in high school. Significant between-groups heterogeneity also appeared for dosage among boys (but not girls). There was a small advantage for SS when SS instruction was provided in an entire school and a trivial difference between SS and CE when SS instruction was provided in classes.

Throughout, we present the results of moderator analyses of uncontrolled studies in supplemental tables but do not discuss them because of the poor quality designs (see Table S2 in the supplemental materials for results).

Mathematics attitudes.

Mean effect size. The average weighted effect sizes for controlled studies indicate that the difference between SS and CE schooling in mathematics attitudes was close to zero for both girls and boys (see Table 2).The uncontrolled averaged effect sizes, in comparison, indicate that the difference between SS and CE schooling in mathematics attitudes was close to zero for girls and small for boys (see Table 3).

Moderator analyses. Moderator analyses were appropriate for the domain of mathematics attitudes in controlled and uncontrolled studies among girls and in uncontrolled (but not controlled) studies among boys. Looking at controlled studies among girls, significant between-group heterogeneity did not appear for dosage, $\chi^2(1, N = 2) = 2.20$, $p > .05$. Results suggested that there was a close to zero effect of SS (vs. CE) schooling when SS instruction was provided in classes ($g_w = 0.05$, $k = 6$, $Q_W = 3.10$) and when SS instruction was provided in an entire school ($g_w = 0.09$, $k = 4$, $Q_W = 37.36$). Results from uncontrolled studies are presented in Table S2 in the supplemental materials.

Table 4
Variables Potentially Moderating the Magnitude of the Difference Between Schooling Types for Mathematics Performance, Based on U.S. and International Combined Samples in Controlled Studies

Gender	Variable	Between-groups Q	k	g_w	Within-group Q
Girls	Dosage	1.21			
	Class		12	0.05	25.03**
	School		19	0.10	108.20***
	Age	29.67***			
	Elementary		5	0.08	8.61
	Middle school		7	0.34	9.75
	High school		19	0.09	86.41***
	SES	3.72			
	Low		0	N/A	N/A
	Mixed		11	0.06	61.08***
	Middle/upper		3	0.28	1.31
Boys	Dosage	5.22*			
	Class		9	0.15	8.75
	School		17	0.06	144.21***
	Age	44.58***			
	Elementary		5	0.14	5.83
	Middle school		4	−0.24	6.89
	High school		17	0.06	100.88***

Note. N/A = not available; SES = socioeconomic status.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Science performance.

Mean effect size. Weighted effect sizes for controlled studies suggest a close to zero difference between SS and CE schooling in science performance among girls ($g_w = 0.06$) and among boys ($g_w = 0.04$; see Table 2).

As in the analyses associated with mathematics performance, results of the uncontrolled unweighted and weighted effect sizes for the difference between SS and CE schooling in students' science performance are not consistent. The size of the effect is either close to zero (unweighted) or medium (weighted; see Table 3).

Moderator analyses. Moderator analyses were appropriate for the domain of science performance in controlled and uncontrolled studies among girls and in uncontrolled (but not controlled) studies among boys. Looking at controlled studies among girls, significant between-group heterogeneity appeared for dosage, $\chi^2(1, N = 2) = 6.43$, $p < .01$. Results suggested that there was a small positive effect of SS (vs. CE) schooling when SS instruction was provided in classes ($g_w = 0.35$, $k = 2$, $Q_W = 0.05$), whereas when SS instruction was provided in an entire school, the effect of SS (vs. CE) schooling was close to zero ($g_w = 0.05$, $k = 9$, $Q_W = 51.24$). Note that the finding for SS classes is based on only 2 studies.

Science attitudes. There were not a sufficient number of controlled studies to examine the difference between SS and CE schooling in either girls' or boys' science attitudes. The uncontrolled averaged effect sizes indicate that the difference between SS and CE schooling in science attitudes was small for both girls and boys, with girls in SS schooling reporting more positive attitudes about science than girls in CE schooling and boys in CE schooling reporting more positive attitudes than boys in SS schooling (see Table 3). These effects were small, however, and do not take into account selection effects.

Moderator analyses were warranted only for uncontrolled studies among girls and are not discussed (see Table S2 in the supplemental materials).

Verbal performance.

Mean effect size. Effect sizes for controlled studies, with appropriate controls for selection effects, suggest a close to zero difference between SS and CE schooling in verbal performance among girls ($g_w = 0.07$) and boys ($g_w = 0.11$; see Table 2). The weighted effect sizes for uncontrolled studies suggest a small to medium advantage for SS schooling in verbal performance among girls ($g_w = 0.28$) and boys ($g_w = 0.68$; see Table 3). As in the analyses associated with mathematics and science performance, results of the uncontrolled unweighted and weighted effect sizes are somewhat inconsistent. The size of the unweighted effect was 0.19 among girls and 0.25 among boys (see Table 3).

Moderator analyses. Because the set of effect sizes was heterogeneous (see Table 2), moderator analyses were warranted. Results of moderator analyses for the domain of verbal performance among controlled studies are shown in Table 5. Significant between-groups heterogeneity appeared for dosage of instruction among girls (but not boys). Among girls, larger effects were found when SS versus CE instruction occurred in classes than in schools. There was significant between-groups heterogeneity for age among girls (but not boys) in controlled studies. Among girls, the

Table 5
Variables Potentially Moderating the Magnitude of the Difference Between Schooling Types for Verbal Performance, Based on U.S. and International Combined Samples in Controlled Studies

Gender	Variable	Between-groups Q	k	g_w	Within-group Q
Girls	Dosage	11.76***			
	Class		6	0.47	7.07
	School		9	0.07	26.08***
	Age	10.60**			
	Elementary		5	0.47	2.71
	Middle school		2	0.25	3.47
	High school		8	0.07	28.13***
Boys	Dosage	0.29			
	Class		7	0.17	14.12*
	School		9	0.11	164.57***
	Age	5.57			
	Elementary		5	0.31	9.60*
	Middle school		1	−0.52	0
	High school		10	0.11	163.81***

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

advantage of SS was medium in elementary school, small in middle school, and close to zero in high school. There were not a sufficient number of controlled studies that reported SES to examine SES as a potential moderator. Results from uncontrolled studies are presented in Table S2 in the supplemental materials.

Verbal attitudes. There were not a sufficient number of studies available to examine controlled effects among boys or effects (regardless of design quality) among girls. Averaged over 4 independent uncontrolled effect sizes, the difference between SS and CE schooling in verbal attitudes among boys was 0.31 (see Table 3), thus suggesting that in studies that do not include the appropriate controls, there is a small advantage of SS versus CE schooling in positive verbal attitudes. Moderator analyses could not be conducted due to the small number of studies.

General school achievement. The number of controlled studies was insufficient to examine differences between SS and CE schooling in general school achievement among boys; among girls, averaged over 7 independent effect sizes, the difference in general school achievement was small ($g_w = 0.12$; see Table 2). Thus, when selection effects are controlled, there is a small advantage of SS versus CE schooling in girls' general school achievement. Among uncontrolled studies, averaged over 18 independent effect sizes, the difference between SS and CE schooling in students' general school achievement among girls was $g_w = 0.34$ (see Table 3). Averaged over 12 independent effect sizes, the uncontrolled difference among boys was 0.18 (see Table 3). Moderator analyses could not be conducted due to the small number of controlled studies and the lack of variability in the uncontrolled studies (i.e., not enough studies included elementary- or middle-school-age samples).

School attitudes.

Mean effect size. Among boys, averaged over 5 independent controlled effect sizes, the difference in school attitudes was close to zero ($g_w = 0.03$; see Table 2). There were an insufficient number of controlled studies of girls for us to examine the difference between SS and CE schooling. The uncontrolled averaged effect sizes indicate that the difference between SS and CE schooling in school attitudes was close to zero for both girls ($g_w = -0.04$) and boys ($g_w = 0.03$; Table 3).

Because of the small number of studies that examined school attitudes among boys (at both the controlled and uncontrolled level) and the small number of controlled studies among girls, moderator analyses were warranted only for uncontrolled studies among girls and are not discussed (see Table S2 in the supplemental materials).

Gender stereotypes. Averaged across 8 independent effect sizes for controlled studies, the weighted difference between SS and CE schooling in gender stereotyping endorsement among girls was −0.57. The effect size is negative and so can be interpreted as suggesting that CE female students are moderately more likely than their SS peers to endorse gender stereotypes. As in the analyses associated with mathematics, science, and verbal performance, results of the unweighted and weighted effect sizes are inconsistent. The size of the unweighted effect was 0.02 among girls (see Table 2). Given the inconsistency between the weighted and unweighted effect size, we recommend interpreting these findings with caution. The number of studies was insufficient for us to examine effects among boys in controlled studies.

Turning to uncontrolled studies, results suggest a close to zero difference between SS and CE schooling in gender stereotype endorsement among both girls and boys (see Table 3).

There were too few controlled studies to permit an examination of moderators. Moderators of uncontrolled effect sizes are presented in Table S2 in the supplemental materials.

Educational aspirations.

Mean effect size. Averaged across 5 independent effect sizes, the controlled difference in educational aspirations between SS and CE girls was 0.01 (see Table 2). The number of controlled studies of boys was insufficient for us to compute an effect size. The uncontrolled difference between SS and CE schooling in educational aspirations was 0.33 among girls and 0.33 among boys (see Table 3).

The number of controlled studies of educational aspirations was insufficient for moderator analyses. Moderators of uncontrolled effect sizes are presented in Table S2 in the supplemental materials.

Self-concept.

Mean effect size. The controlled studies, which included random assignment or appropriate controls for student and/or school selection effects, indicate that the difference between SS and CE schooling in self-concept was close to zero for both girls and boys; among girls the weighted effect size was −0.08, and among boys the weighted effect size was −0.06 (see Table 2). The uncontrolled averaged weighted effect sizes indicated similar results; among girls the weighted effect size was 0.10, and among boys the weighted effect size was 0.03 (see Table 3). Overall, then, there is no evidence of SS schooling having an advantage for students' self-concept.

Moderator analyses. Moderator analyses were appropriate for the domain of self-concept in controlled studies among boys. The between-group heterogeneity was not significant for age, $\chi^2(1, N = 2) = 1.52$, $p > .05$. Results suggested that there was a close to zero to small negative effect of SS (vs. CE) schooling among elementary students ($g_w = -0.24$, $k = 3$, $Q_W = 2.85$), middle school students ($g_w = 0.02$, $k = 1$, $Q_W = 0$), and high school

students ($g_w = -0.06$, $k = 6$, $Q_W = 12.77$). Moderator analyses were not possible among uncontrolled studies because of the nonsignificant heterogeneity.

Interpersonal relations. The number of controlled studies was insufficient for us to examine the difference between SS and CE schooling in interpersonal relations. Among uncontrolled studies, the difference between SS and CE schooling in students' interpersonal relations among girls was 0.02 (see Table 3). Among boys, the uncontrolled difference between SS and CE schooling was 0.08 (see Table 3). These results suggest a close to zero effect of schooling type on students' reports of their interpersonal relations.

Moderator analyses could not be conducted due to the small number of studies.

Aggression. The number of studies was insufficient for us to examine controlled effects among girls or effects (regardless of design quality) among boys. Averaged over 3 independent uncontrolled effect sizes, the difference between SS and CE schooling in aggression among girls was close to zero ($g_w = -0.08$; see Table 3).

Moderator analyses could not be conducted due to the small number of studies.

Victimization. Too few controlled studies of victimization were available to calculate effect sizes. Among uncontrolled studies, averaged over 4 independent effect sizes, the weighted difference between SS and CE schooling in victimization among girls was -0.63, suggesting that more victimization was reported among female CE students than among female SS students (see Table 3). Among boys, averaged over 3 independent uncontrolled effect sizes, the difference between SS and CE schooling in victimization was small ($g_w = -0.11$; see Table 3).

Moderator analyses could not be conducted due to the small number of studies.

Body image. Too few studies were available for us to examine controlled effects among girls or effects (regardless of design quality) among boys. Averaged over 11 independent uncontrolled effect sizes, the difference between SS and CE schooling in body image among girls was close to zero ($g_w = -0.10$; see Table 3).

Moderator analyses were not possible in the domain of body image, owing to too few controlled studies and the lack of variability in moderators among uncontrolled studies (e.g., all studies were based only on high school samples).

U.S. Samples

Results based only on the U.S. samples are presented below by domain. The number of studies with U.S. samples was insufficient for us to examine the domains of aggression, occupational aspirations in mathematics or science, or victimization. Only race/ethnicity was considered as a moderator for U.S. samples, because the other moderators were tested extensively with U.S. and international samples combined. Unfortunately, there were not enough controlled studies in any domain to allow for moderator analyses. Results of moderator analyses of uncontrolled studies are presented in Table S3 in the supplemental materials.

Mathematics performance. Averaging across controlled studies, the weighted effect size of the difference between SS and CE schooling in mathematics performance was 0.09 among U.S. girls and 0.02 among U.S. boys, suggesting that there is a close to zero effect of schooling type on mathematics performance in the United States (see Table 6). The uncontrolled studies similarly suggest that the effect is very small or close to zero. Averaged over 40 independent effect sizes, the uncontrolled difference between SS and CE schooling among U.S. girls was 0.09 (see Table 7).

Table 6
Controlled Studies: Unweighted Mean Effect Sizes (g_U), Number of Effect Sizes (k), Weighted Mean Effect Sizes (g_W), 95% Confidence Intervals (95% CI), and Homogeneity Statistics (Q_T) for Schooling Type Differences for Analyses of U.S. Samples

Content domain	Gender	g_u	k	g_w	95% CI	Q_T
Mathematics performance	Girls	0.14	16	0.09	0.02 to 0.16	29.95*
	Boys	0.14	12	0.02	−0.05 to 0.09	19.67*
Mathematics attitudes	Girls	0.36	6	0.07	0.04 to 0.10	41.20***
	Boys	N/A	N/A	N/A	N/A	N/A
Science performance	Girls	0.19	5	0.04	−0.05 to 0.12	14.70**
	Boys	−0.01	3	0.00	−0.08 to 0.09	0.09
Verbal performance	Girls	0.22	11	0.06	−0.01 to 0.14	37.04***
	Boys	0.13	12	0.01	−0.06 to 0.08	28.99**
General achievement	Girls	0.18	3	0.10	0.07 to 0.13	3.65
	Boys	N/A	N/A	N/A	N/A	N/A
School attitudes	Girls	N/A	N/A	N/A	N/A	N/A
	Boys	−0.18	3	−0.23	−0.55 to 0.09	2.54
Gender stereotyping	Girls	−0.06	7	−0.68	−0.81 to −0.55	53.83***
	Boys	N/A	N/A	N/A	N/A	N/A
Educational aspirations	Girls	−0.45	3	−0.41	−0.76 to −0.06	3.60
	Boys	N/A	N/A	N/A	N/A	N/A
Self-concept	Girls	−0.04	6	−0.03	−0.10 to 0.05	0.87
	Boys	−0.09	8	−0.02	−0.09 to 0.06	11.97

Note. Not enough studies were available for us to examine the domains of aggression, body image, interpersonal relations, occupational aspirations, science attitudes, verbal attitudes, and victimization. N/A = not available.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 7
Uncontrolled Studies: Unweighted Mean Effect Sizes (g_U)*, Number of Effect Sizes* (k)*, Weighted Mean Effect Sizes* (g_W)*, 95% Confidence Intervals (95% CI), and Homogeneity Statistics* (Q_T) *for Schooling Type Differences for Analyses of U.S. Samples*

Content domain	Gender	g_u	k	g_w	95% CI	Q_T
Mathematics performance	Girls	0.14	40	0.09	0.04 to 0.14	152.71***
	Boys	0.15	30	0.05	0.00 to 0.11	121.96***
Mathematics attitudes	Girls	0.12	14	0.08	0.05 to 0.11	37.00***
	Boys	0.00	8	−0.02	−0.14 to 0.10	18.24*
Science performance	Girls	0.06	10	−0.01	−0.14 to 0.12	31.05***
	Boys	−0.08	7	0.05	−0.07 to 0.18	41.09***
Science attitudes	Girls	0.20	3	0.25	−0.04 to 0.54	4.71
	Boys	N/A	N/A	N/A	N/A	N/A
Verbal performance	Girls	0.20	28	0.10	0.05 to 0.16	93.69***
	Boys	0.25	26	0.16	0.10 to 0.21	107.08***
Verbal attitudes	Girls	N/A	N/A	N/A	N/A	N/A
	Boys	0.31	4	0.31	0.17 to 0.45	0.89
General achievement	Girls	0.40	4	0.34	0.31 to 0.37	21.94***
	Boys	N/A	N/A	N/A	N/A	N/A
School attitudes	Girls	0.14	4	0.14	−0.07 to 0.36	2.49
	Boys	N/A	N/A	N/A	N/A	N/A
Gender stereotyping	Girls	−0.15	23	0.02	−0.03 to 0.07	111.52***
	Boys	0.23	5	0.13	0.04 to 0.22	8.71
Educational aspirations	Girls	0.18	3	0.01	−0.13 to 0.16	17.85***
	Boys	N/A	N/A	N/A	N/A	N/A
Self-concept	Girls	−0.01	12	0.06	−0.04 to 0.17	12.11
	Boys	0.30	3	0.24	0.02 to 0.46	1.49
Interpersonal relations	Girls	−0.03	5	−0.06	−0.24 to 0.13	2.24
	Boys	0.21	3	0.08	−0.01 to 0.18	13.62**
Body image	Girls	−0.28	6	−0.26	−0.39 to −0.14	23.78***
	Boys	N/A	N/A	N/A	N/A	N/A

Note. Not enough studies were available for us to examine the domains of aggression, body image, general achievement, occupational aspirations, science attitudes, and victimization. N/A = not available.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Averaged over 30 independent effect sizes, the uncontrolled difference among U.S. boys was 0.05 (see Table 7).

Mathematics attitudes. Averaged across 6 independent controlled effect sizes, the difference between SS and CE schooling in mathematics attitudes among U.S. girls was 0.07 (see Table 6). There were no controlled studies of boys. For uncontrolled effect sizes, the difference between SS and CE schooling in mathematics attitudes among U.S. girls was 0.08 (see Table 7). The uncontrolled difference among boys was −0.02. Overall, then, the effects of SS schooling on mathematics attitudes have not been examined with high-quality methods for U.S. boys. The effect of single-sex schooling among girls, however, is close to zero.

Science performance. The controlled studies indicated that the difference between SS and CE schooling in U.S. students' science performance was close to zero among both girls (g_w = 0.04) and boys (g_w = 0.00; see Table 6). The results for uncontrolled studies were similar; the average effect size among U.S. girls was −0.01 and among U.S. boys was 0.05 (see Table 7).

Science attitudes. There were not a sufficient number of controlled studies available to examine effects in the domain of science attitudes among U.S. girls or effects (regardless of design quality) among U.S. boys. Averaged over 3 independent uncontrolled effect sizes, the difference between SS and CE schooling in science attitudes among U.S. girls was 0.25 (see Table 7).

Verbal performance. The controlled studies indicated that the difference between SS and CE schooling in verbal performance was close to zero among both U.S. girls and U.S. boys (see Table 6). The uncontrolled effect sizes indicated a small effect associated with SS versus CE schooling; the weighted effect size was 0.10 among U.S. girls and 0.16 among U.S. boys (see Table 7).

Verbal attitudes. All of the studies of verbal attitudes came from U.S. samples, and so the U.S. results are identical to the combined results presented above. There were not a sufficient number of studies available to examine controlled effects among U.S. boys or effects (regardless of design quality) among U.S. girls. Averaged over 4 independent uncontrolled effect sizes, the difference between SS and CE schooling in verbal attitudes among U.S. boys was 0.31 (see Table 7).

General school achievement. The number of studies was insufficient for us to examine controlled effects among U.S. boys. Among U.S. girls, the controlled difference between SS and CE schooling in general school achievement was 0.10 (see Table 6), which suggests that when appropriate controls are included there is a trivial effect of SS versus CE schooling on U.S. girls' general school achievement. There were not a sufficient number of studies available to examine uncontrolled effects among U.S. boys. Among U.S. girls, however, the uncontrolled averaged effect size was 0.34 (see Table 7).

School attitudes. The number of studies was insufficient for us to examine controlled effects among U.S. girls. Among U.S. boys, the controlled difference between SS and CE schooling in school attitudes was −0.23 (see Table 6), which suggests that

when appropriate controls are included there is a small positive effect of CE versus SS schooling on U.S. boys' attitudes about school. There was not a sufficient number of studies available to examine uncontrolled effects among U.S. boys. Among U.S. girls, however, the uncontrolled averaged effect size was 0.14 (see Table 7), which suggests that when appropriate controls are not included there is a small positive effect of SS versus CE schooling on U.S. girls' attitudes about school.

Gender stereotypes. The controlled weighted and unweighted effect sizes for the differences between SS and CE schooling in gender stereotype endorsement among U.S. girls are not consistent. The weighted effect size suggests a medium large effect (with CE girls endorsing more stereotypes than SS girls), whereas the unweighted effect size suggests a close to zero difference (see Table 6). Controlled effects among U.S. boys could not be examined due to an insufficient number of studies. Turning to the uncontrolled studies, the weighted and unweighted effects are fairly consistent; among girls the weighted effect was close to zero ($g_w = 0.02$), whereas among boys the weighted effect was small ($g_w = 0.13$), with SS boys endorsing more stereotypes than CE boys (see Table 7).

Educational aspirations. Averaging across 3 independent effect sizes, the controlled difference between SS and CE schooling among U.S. girls was −0.41 (see Table 6), with U.S. girls in CE schooling reporting higher levels of educational aspirations than did those in SS schooling. There were not a sufficient number of controlled or uncontrolled studies for us to examine effects in the domain of educational aspirations among U.S. boys. Among U.S. girls, however, the uncontrolled averaged effect was 0.01 (see Table 7).

Self-concept. The controlled results suggest that the difference between SS and CE schooling in self-concept among U.S. students was close to zero among both boys and girls (see Table 6). For uncontrolled studies of U.S. girls, the result was consistent with the controlled result; the schooling differences among U.S. girls in uncontrolled studies was close to zero ($g_w = 0.06$; see Table 7). Based on only 3 independent uncontrolled effect sizes for U.S. boys, the weighted average was 0.24 (see Table 7).

Interpersonal relations. There were not enough controlled studies for us to examine effects in the domain of interpersonal relations among either U.S. girls or boys. The uncontrolled difference between SS and CE schooling in U.S. students' interpersonal relations was −0.06 among girls and 0.08 among boys (see Table 7).

Body image. There were not a sufficient number of controlled studies available for us to examine effects in the domain of body image among U.S. girls or effects (regardless of design quality) among U.S. boys. Averaged over 6 independent uncontrolled effect sizes, the difference between SS and CE schooling in body image among U.S. girls was −0.26, with U.S. girls in CE schooling reporting a more positive body image than did U.S. girls in SS schooling when the appropriate statistical controls were not included in the models (see Table 7).

Discussion

In the present meta-analysis, we synthesized research on the effects of single-sex compared with coeducational schooling on a wide array of variables, including mathematics performance and attitudes, science and verbal performance, gender stereotyping, self-concept, and interpersonal relations. In all, the analyses were based on the results of 184 studies and 1,663,662 students. The quality of the studies was addressed by coding studies as controlled (random assignment or selection effects were controlled in some fashion) or uncontrolled (no random assignment and no controls were included for selection effects). In moderator analyses, the effects of variables such as dosage (class vs. school) and age were examined. Among U.S. studies, ethnicity was examined as a moderator.

Before proceeding to a detailed discussion of the findings, we must consider whether there were enough high-quality studies to reach any conclusions. We were dismayed, as previous reviewers have been (e.g., Mael et al., 2005), by the number of studies with weak designs not using random assignment or controlling for selection effects. That said, we believe that there are enough high-quality, controlled studies, some of them very large, to reach evidence-based conclusions. Overall, we were able to locate 57 controlled studies, and 12 of those involved actual random assignment of students to SS or CE schooling. Another 16 studies utilized SS and CE groups that they established as equivalent (e.g., by testing for preexisting differences). The remaining controlled studies utilized a combination of statistical controls and pre/posttest designs to account for preexisting differences. These studies include elementary, middle school, and high school age samples at public, private, and parochial schools from countries around the world. Many of these studies involved advanced statistical methods, such as multilevel modeling, to account for the nesting of students within schools. The controlled studies involve data from 569,149 students. Many of the individual controlled studies are impressive. For example, Jackson (2012) studied youth in Trinidad and Tobago, where students are assigned to SS or CE based on an algorithm that allowed the researcher to control for selection bias; total sample size was 219,849 students. As a second example, Pahlke, Hyde, and Mertz (2013) analyzed both 2003 and 2007 TIMSS data for eighth graders in Korea, where students were randomly assigned to SS or CE schools; sample size was 4,240 in 2007 and 5,309 in 2003. Studies such as these indicate that, despite the plethora of uncontrolled studies, there are sufficient numbers of very strong controlled studies to justify the conclusions that follow.

Overall Differences Between Single-Sex and Coeducational Schooling

Overall, does SS schooling confer the advantages claimed by its proponents? According to this meta-analysis, the answer appears to be no, or not much. When one looks at the results for the controlled studies (i.e., those that used the best research methods), SS schooling generally produced only trivial advantages over CE, with most weighted effect sizes smaller than 0.10 (U.S. and international combined; see Table 2). There is little evidence of an advantage of SS schooling for girls or boys for any of the outcomes.

Why do advocates for SS schooling believe that it has such positive effects when the data suggest otherwise? Many reasons are possible, but here we will consider whether some reasons may lie in the data. A comparison of Tables 2 (controlled studies) and

3 (uncontrolled studies) shows that substantial advantages are found for SS schooling in studies with inadequate methods, when selection effects are not controlled. These studies may fuel some of the beliefs in SS schooling. However, when studies using better methods are examined (see Table 2), they show little or no advantage for SS schooling.

Moderator Analyses

Does SS schooling confer an advantage for certain types of students and perhaps not for others? Moderator analyses of the controlled studies indicate that the effects of SS schooling do not generally vary depending on dosage (i.e., whether the SS format is for just one class or for the entire school). This finding occurred for mathematics performance (see Table 4), science performance, and verbal performance (see Table 5). In fact, in several of these analyses, the advantage of SS was larger for the smaller dosage. If SS schooling does confer advantages, this result seems counterintuitive.

In regard to age and grade in school, SS schooling appeared to produce no advantage in high school for either boys or girls. It showed a medium advantage in middle school for girls, for both mathematics and science performance, but the effects are based on only small numbers of studies and should be interpreted with caution. For boys, SS showed a small advantage in elementary school, but CE showed the advantage in middle school; again these are based on small numbers of studies.

In regard to social class, advantages have been claimed for low SES students. However, too few controlled studies of low SES students were available to compute effects for any of the outcomes.

Is Single-Sex Schooling Particularly Effective for Ethnic Minorities in the United States?

Proponents of single-sex schooling have claimed that it is particularly effective for ethnic minority students in the United States and especially for ethnic minority boys (Riordan, 1994). Moderator analyses of U.S. studies were impossible due to insufficient numbers of controlled studies conducted with ethnic minority youth. Uncontrolled studies fail to find substantial advantages of SS schooling for African Americans and Latinos (see Table S3 in the supplemental materials). Overall, then, there is no evidence of an advantage for SS schooling for U.S. ethnic minorities, but the issue has not been sufficiently studied with high-quality methods.

Implications for Theory

The current study was designed as a theory-driven (rather than a theory-testing) meta-analysis, and so the results cannot be used to support or refute a specific theory. It is, however, nonetheless valuable to compare the results against the theories that framed the research.

Developmental intergroup theory (DIT) posits that social factors that make gender salient, such as single-sex schooling, will lead to greater gender stereotyping (Bigler & Liben, 2006, 2007). DIT therefore does not make specific predictions for outcomes such as mathematics performance, but it does make predictions about gender stereotyping in SS schooling. The results for controlled studies (see Table 2) indicate that, for girls' gender stereotyping, $g = -0.57$ (i.e., girls in coed classrooms are more gender stereotyped, a pattern that is the opposite of predictions from DIT). This contradiction, however, may be due in part to the way in which we operationalized "gender stereotyping." In the current meta-analysis, we utilized a broad definition of gender stereotyping (including, for example, studies that used Bem's Sex Role Inventory, which measures masculinity, femininity, and androgyny). Too few controlled studies of gender stereotyping among boys were available for us to compute an effect size, so we cannot address the question for boys.

The theoretical approach termed "girl power" argues that girls are dominated by boys in coed classrooms, especially in male-stereotyped domains such as mathematics and science; the result is that girls' performance suffers. Girls therefore should thrive in mathematics and science in SS schools. This approach is silent as to how boys will fare under the two different conditions. The girl power approach is not supported by the data shown in Table 2. Girls in SS schooling showed only trivial differences from girls in coed schooling for the outcomes of mathematics performance, mathematics attitudes, and science performance. Moreover, girls' educational aspirations were not higher when they were in SS schooling, nor was their self-concept more positive under conditions of SS schooling.

A theoretical assumption underlying many SS programs is the view that gender differences in psychological characteristics relevant to learning are substantial and are biological in nature—what we have called the large biological differences assumption. Boys and girls therefore need to be taught differently. According to this view, both boys and girls should have better outcomes in SS classrooms compared with CE classrooms. The data in Table 2 show no support for these assumptions. The controlled studies showed no substantial advantages of SS schooling for either girls or boys, across an array of academic outcomes.

Expectancy-value theory provided guidance on the kinds of outcomes that should be considered, including not only academic performance but also attitudes and self-concept. Expectancy-value theory suggests that SS schooling, by highlighting gender segregation, may make the gender segregation of adult STEM occupations more salient, thereby reducing girls' performance and motivation in those areas. In general, though, the results indicated few differences between girls in SS schooling and girls in coed schooling.

Methodological Implications

Examination of Tables 2 and 6 reveals that, for certain outcomes, there is a paucity of top-quality, controlled studies of the effects of SS schooling compared with CE schooling. Mathematics performance and verbal performance have been studied the most. Outcomes such as gender stereotyping and educational aspirations are important and have been claimed as advantages for SS schooling, yet they have been studied little, especially for U.S. boys. One direction for future research, then, is for researchers to mount high-quality studies of SS compared with CE schooling for outcomes that have been studied very little, including school attitudes, gender stereotyping, and educational aspirations.

The other major lacuna, for U.S. research, is the paucity of studies of ethnic minority youth and low SES youth. Claims that SS schooling is particularly effective with African American boys

have emerged (Hopkins, 1997). Insufficient numbers of controlled studies have been conducted in the United States to support or refute these claims. Research on the effects of SS schooling for ethnic minority U.S. youth, both boys and girls, will be another important future direction.

In theory, the assumptions underlying the SS program, especially for research with U.S. schools, should be important in the effects that are obtained. We labeled two common sets of assumptions as *large biological differences* and *girl power.* We hypothesize, for example, that gender stereotyping is likely to be particularly high in SS schools that are based on the assumption that there are large biological differences between genders; if administrators and teachers endorse the view that essential differences exist between boys and girls, those messages are likely to be transmitted to the students. Unfortunately, however, only 8% of the studies we coded included information about the schools' underlying assumptions. Researchers should attempt to learn the guiding assumptions of the SS programs that they study and report this information in the resulting article. Only then can we determine whether the effects of SS programs depend on the messages that are conveyed to teachers, students, and parents.

One future direction for research is clear. Uncontrolled studies that do not control for selection effects are not needed, if they ever were. What is needed are controlled studies that use random assignment or control for selection effects. This can be done with a variety of designs, including longitudinal designs that examine change over time, propensity score matching that identifies and then compares students in single-sex and coeducational environments, and multilevel models that account for the nesting of students in classrooms and schools. The ideal design involves random assignment of students to SS or CE schooling, and such designs are possible in certain circumstances.

References

References marked with an asterisk indicate studies included in the meta-analysis.

*Adkinson, J. E. (2008). Does cooperative learning affect girls' and boys' learning and attitudes toward mathematic transformation skills in single-sex and mixed-sex classrooms? *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 68*(11), 4639.

*Ainley, J., & Daly, P. (2002). Participation in science courses in the final year of high school in Australia: The influences of single-sex and coeducational schools. In A. Datnow & L. Hubbard (Eds.), *Gender in policy and practice: Perspectives on single-sex and coeducational schooling* (pp. 243–262). New York, NY: Routledge.

Arms, E. (2007). Gender equity in coeducational and single-sex environments. In S. S. Klein et al. (Eds.), *Handbook for achieving gender equity through education* (2nd ed., pp. 171–190). Mahwah, NJ: Erlbaum.

*Baker, D. P., Riordan, C., & Schaub, M. (1995). The effects of sex-grouped schooling on achievement: The role of national context. *Comparative Education Review, 39,* 468–482. doi:10.1086/447341

*Banu, D. P. (1986). Secondary school students' attitudes towards science. *Research in Science & Technological Education, 4,* 195–202. doi:10.1080/0263514860040209

*Basilo, E. G. (2008). Case studies of reading performance of male students and the single-sex classroom. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 69*(6), 2199.

*Bastick, T. (2000, April). *Mediation of anti-social adolescent behavior by single-sex and co-educational schooling.* Revision of paper presented at the Western Psychological Association convention, Portland, OR. (ERIC Document Reproductions Service No. ED463042)

*Baur, A. A. (2004). The effect of gender composition in the school setting on body image development and eating disorder prevalence in adolescent females. *Dissertation Abstracts International: Section B. Sciences and Engineering, 64*(8), 4022.

*Belcher, C., Frey, A., & Yankeelov, P. (2006). The effects of single-sex classrooms on classroom environment, self-esteem, and standardized test scores. *School Social Work Journal, 31,* 61–75.

*Bell, J. F. (1989). A comparison of science performance and uptake by fifteen-year-old boys and girls in co-educational and single-sex schools—APU survey findings. *Educational Studies, 15,* 193–203. doi:10.1080/0305569890150209

Bigler, R. S., & Liben, L. S. (2006). A developmental intergroup theory of social stereotypes and prejudice. *Advances in Child Development and Behavior, 34,* 39–89. doi:10.1016/S0065-2407(06)80004-2

Bigler, R. S., & Liben, L. S. (2007). Developmental intergroup theory: Explaining and reducing children's stereotyping and prejudice. *Current Directions in Psychological Science, 16,* 162–166. doi:10.1111/j.1467-8721.2007.00496.x

*Billger, S. M. (2009). On reconstructing school segregation: The efficacy and equity of single-sex schooling. *Economics of Education Review, 28,* 393–402. doi:10.1016/j.econedurev.2007.08.005

*Blechle, N. M. (2008). Attitudes toward mathematics and mathematical performance: A comparison of single-sex and mixed-sex mathematics classrooms in a mixed-sex United States public school. *Dissertation Abstracts International: Section A. Humanities and Social Science, 68*(12), 5010.

*Bloomfield, D. P., & Soyibo, K. (2008). Correlations among Jamaican 12th-graders' five variables and performance in genetics. *Eurasia Journal of Mathematics, Science & Technology Education, 4*(1), 63–69.

Borenstein, M., Hedges, L. V., Higgins, J., & Rothstein, H. R. (2009). *Introduction to meta-analysis.* New York, NY: Wiley.

*Bornholt, L. J. (2000). The gendered nature of competence: Specific and general aspects of self-knowledge in social contexts. *Journal of Applied Social Psychology, 30,* 350–370. doi:10.1111/j.1559-1816.2000.tb02320.x

Bracey, G. W. (2006). *Separate but superior? A review of issues and data bearing on single-sex education.* Tempe, AZ: Educational Policy Research Unit.

*Bradley, K. (2009). *An investigation of single-sex education and its impact on academic achievement, discipline referral frequency, and attendance for first and second grade public school students* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3374139)

*Brathwaite, D. A. (2010). A comparative analysis of single-sex schools in terms of achievement in reading and math and student attendance. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 71*(4), 1148.

*Brutsaert, H. (2006). Gender-role identity and perceived peer group acceptance among early adolescents in Belgian mixed and single-sex schools. *Gender and Education, 18,* 635–649. doi:10.1080/09540250600980204

*Calder, L. A. (2006). A comparative study of the impact on academic and psychosocial development of eighth-grade students involved in single-gender versus co-educational classroom setting. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 67*(2), 403.

*Campbell, K. T., & Evans, C. (1997). Gender issues in the classroom: A comparison of mathematics anxiety. *Education, 117,* 332–338.

*Campbell, R. J. (1969). Co-education: Attitudes and self-concepts of girls at three schools. *British Journal of Educational Psychology, 39,* 87. doi:10.1111/j.2044-8279.1969.tb02046.x

*Carpenter, P. (1985). Single-sex schooling and girls' academic achievements. *Australian & New Zealand Journal of Sociology, 21,* 456–472. doi:10.1177/144078338502100309

*Carpenter, P. W., & Hayden, M. (1987). Girls' academic achievements: Single-sex versus coeducational schools in Australia. *Sociology of Education, 60,* 156–167. doi:10.2307/2112273

*Caspi, A. (1995). Puberty and the gender organization of schools: How biology and social context shape the adolescent experience. In L. J. Crockett & A. C. Crouter (Eds.), *Pathways through adolescence: Individual development in relation to social contexts* (pp. 57–74). Hillsdale, NJ: Erlbaum.

*Caspi, A., Lynam, D., Moffitt, T. E., & Silva, P. A. (1993). Unraveling girls' delinquency: Biological, dispositional, and contextual contributions to adolescent misbehavior. *Developmental Psychology, 29,* 19–30. doi:10.1037/0012-1649.29.1.19

*Cherney, I. D., & Campbell, K. L. (2011). A league of their own: Do single-sex schools increase girls' participation in the physical sciences? *Sex Roles, 65,* 712–724. doi:10.1007/s11199-011-0013-6

*Chouinard, R., Vezeau, C., & Bouffard, T. (2008). Coeducational or single-sex school: Does it make a difference on high school girls' academic motivation? *Educational Studies, 34,* 129–144. doi:10.1080/03055690701811180

*Cipriani-Sklar, R. (1997). A quantitative and qualitative examination of the influence of the normative and perceived school environments of a coeducational public school vs. a single-sex Catholic school on ninth-grade girls' science self-concept and anxiety in the area of science education. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 57*(10), 4312.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Hillsdale, NJ: Erlbaum.

*Conway, K. E. (1997). Differential effects of single-sex versus coed education on the mathematical reasoning ability, verbal reasoning ability, and self-concept of high school girls. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 57*(12), 5047.

*Crombie, G., Abarbanel, T., & Trinneer, A. (2002). All-female classes in high school computer science: Positive effects in three years of data. *Journal of Educational Computing Research, 27*(4), 385–409. doi:10.2190/VRD4-69AF-WPQ6-P734

*Crump, T. A. (2004). Psychological and sociocultural correlates of achievement motivation in adolescent females. *Dissertation Abstracts International: Section B. Sciences and Engineering, 64*(9), 4610.

*Cruz-Duran, E. (2009). *Stereotype threat in mathematics: Female high school students in all-girl and coeducation schools* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3365692)

*Cuddy, A. R. (2003). The development of self-concept in adolescent girls attending single-sex and coeducational schools: Exploring the influence of cognitive and social factors. *Dissertation Abstracts International: Section B. Sciences and Engineering, 63*(10), 4941.

*Dagenais, R., Moyer, E., Musial, D., Sloan, M., Torp, L., & Workman, D. (1994). *Calculus-based physics exploratory study* [Summary report]. Aurora: Illinois Mathematics and Science Academy.

*Dale, R. R. (1969). Anxiety about school among first-year grammar school pupils, and its relation to occupational class and co-education. *British Journal of Educational Psychology, 39,* 18–26. doi:10.1111/j.2044-8279.1969.tb02037.x

*Daly, P. (1996). The effects of single-sex and coeducational secondary schooling on girls' achievement. *Research Papers in Education, 11,* 289–306. doi:10.1080/0267152960110306

*Daly, P., & Defty, N. (2004). Extension of single-sex public school provision: Evidential concerns. *Evaluation & Research in Education, 18,* 129–136. doi:10.1080/09500790408668313

*Daly, P., & Shuttleworth, I. (1997). Determinants of public examination entry and attainment in mathematics: Evidence on gender and gender-type of school from the 1980s and 1990s in Northern Ireland. *Evaluation & Research in Education, 11,* 91–101. doi:10.1080/09500799708666919

*Danishevsky, N. E. (2008). The effect of a piloted single-sex math class on student attitudes towards mathematics. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 69*(6), 2190.

Datnow, A., Hubbard, L., & Woody, E. (2001). *Is single gender schooling viable in the public sector? Lessons from California's pilot program. Final report*. Toronto, Ontario, Canada: University of Toronto.

*Davey, Z., Jones, M. K., & Harris, L. M. (2011). A comparison of eating disorder symptomatology, role concerns, figure preference and social comparison between women who have attended single sex and coeducational schools. *Sex Roles, 65,* 751–759. doi:10.1007/s11199-011-9942-3

*Delfabbro, P., Winefield, T., Trainor, S., Dollard, M., Anderson, S., Metzer, J., & Hammarstrom, A. (2006). Peer and teacher bullying/victimization of South Australian secondary school students: Prevalence and psychosocial profiles. *British Journal of Educational Psychology, 76,* 71–90. doi:10.1348/000709904X24645

*Dhindsa, H. S., & Chung, G. (2003). Attitudes and achievement of Bruneian science students. *International Journal of Science Education, 25,* 907–922. doi:10.1080/09500690305025

*Diehm, C. L. (2009). *Achievement of boys and girls in single-gender kindergarten classrooms at one elementary school in western Michigan* (Doctoral dissertation, Eastern Michigan University). Retrieved from http://commons.emich.edu/theses/216

*Doris, A., O'Neill, D., & Sweetman, O. (2013). Gender, single-sex schooling and maths achievement. *Economics of Education Review, 35,* 104–119. doi:10.1016/j.econedurev.2013.04.001

*Dorman, J. P. (2009). Some determinants of classroom psychosocial environment in Australian Catholic high schools: A multilevel analysis. *Catholic Education: A Journal of Inquiry and Practice, 13,* 7–29.

*Drury, K. M. (2010). Gender identity and well-being in early adolescence: Exploring the roles of peer culture and the gender composition of the school context. *Masters Abstracts International, 48*(6), 3902.

*Dyer, G., & Tiggemann, M. (1996). The effect of school environment on body concerns in adolescent women. *Sex Roles, 34,* 127–138. doi:10.1007/BF01544800

Eccles, J. S. (1994). Understanding women's educational and occupational choices: Applying the Eccles et al. model of achievement-related choices. *Psychology of Women Quarterly, 18,* 585–609. doi:10.1111/j.1471-6402.1994.tb01049.x

*Edwards, S. R. (2002). Gender-based and mixed-sex classrooms: The relationship of mathematics anxiety, achievement, and classroom performance in female high school math students. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 62*(8), 2639.

*Egbochuku, E. O., & Aihie, N. O. (2009). Peer group counselling and school influence on adolescents' self-concept. *Journal of Instructional Psychology, 36,* 3–12.

Else-Quest, N. M., Hyde, J. S., & Linn, M. C. (2010). Cross-national patterns of gender differences in mathematics: A meta-analysis. *Psychological Bulletin, 136,* 103–127. doi:10.1037/a0018053

*Esfandiari, M., & Jahromi, S. (1989). A comparison of Iranian high school students in single-sex and mixed-sex bilingual schools: Intelligence and vocational aspiration. *International Journal of Intercultural Relations, 13,* 447–464. doi:10.1016/0147-1767(89)90023-0

*Fear, J. L., Bulik, C. M., & Sullivan, P. F. (1996). The prevalence of disordered eating behaviours and attitudes in adolescent girls. *New Zealand Journal of Psychology, 25,* 7–12.

*Feather, N. T. (1974). Coeducation, values, and satisfaction with school. *Journal of Educational Psychology, 66,* 9–15. doi:10.1037/h0035806

Feminist Majority Foundation. (2011). *State of public school sex segregation in the States: Part 1. Patterns of K-12 single-sex public education in the U.S. 2007-10*. Washington, DC: Author.

*Feniger, Y. (2011). The gender gap in advanced math and science course taking: Does same-sex education make a difference? *Sex Roles, 65,* 670–679. doi:10.1007/s11199-010-9851-x

*Foon, A. E. (1988). The relationship between school type and adolescent self esteem, attribution styles, and affiliation needs: Implications for educational outcome. *British Journal of Educational Psychology, 58,* 44–54. doi:10.1111/j.2044-8279.1988.tb00877.x

*Fox, M. L. (1993). A comparison of female student leaders in single gender and coeducational high schools. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 54*(6), 2110.

*Fritz, R. A. (1996). An inferential study comparing science achievement in single-sex and mixed-sex schools: Testing for interactions between gender and instructional environment. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 57*(3), 1082.

Frome, P. M., & Eccles, J. S. (1998). Parents' influence on children's achievement-related perceptions. *Journal of Personality and Social Psychology, 74,* 435–452. doi:10.1037/0022-3514.74.2.435

*Gibb, S. J., Fergusson, D. M., & Horwood, L. J. (2008). Effects of single-sex and coeducational schooling on the gender gap in educational achievement. *Australian Journal of Education, 52,* 301–317. doi:10.1177/000494410805200307

*Gillibrand, E., Robinson, P., Brawn, R., & Osborn, A. (1999). Girls' participation in physics in single sex classes in mixed schools in relation to confidence and achievement. *International Journal of Science Education, 21,* 349–362. doi:10.1080/095006999290589

*Gilroy, M. K. (1990). Single-sex schooling and its effect on achievement, attitudes and behaviors. *Dissertation Abstracts International: Section B. Sciences and Engineering, 51*(7), 3611.

*Gilson, J. E. (1999, April). *Single-gender education versus coeducation for girls: A study of mathematics achievement and attitudes toward mathematics of middle-school students*. Paper presented at the meeting of the American Educational Research Association, Montreal, Quebec, Canada.

*Githua, B. N., & Mwangi, J. G. (2003). Students' mathematics self-concept and motivation to learn mathematics: Relationship and gender differences among Kenya's secondary-school students in Nairobi and Rift Valley provinces. *International Journal of Educational Development, 23,* 487–499. doi:10.1016/S0738-0593(03)00025-7

*Gordon, D. M., Iwamoto, D. K., Ward, N., Potts, R., & Boyd, E. (2009). Mentoring urban Black middle school male students: Implications for academic achievement. *Journal of Negro Education, 78,* 277–289.

*Granleese, J., & Joseph, S. (1993). Self-perception profile of adolescent girls at a single-sex and a mixed-sex school. *Journal of Genetic Psychology, 154,* 525–530. doi:10.1080/00221325.1993.9914750

Gurian, M., Henley, P., & Trueman, T. (2001). *Boys and girls learn differently! A guide for teachers and parents*. New York, NY: Jossey-Bass.

Gurian, M., Stevens, K., & Daniels, P. (2009). Single-sex classrooms are succeeding. *Educational Horizons, 87,* 234–245.

*Harker, R. (2000). Achievement, gender, and the single-sex/coed debate. *British Journal of Sociology of Education, 21,* 203–218. doi:10.1080/713655349

*Harrah, J. L. (2000). Relationship between MTV viewing and adolescents' attitudes toward women (music television, gender differences). *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 60*(7), 2369.

*Harvey, T. J. (1985). Science in single-sex and mixed teaching groups. *Educational Research, 27,* 179–182. doi:10.1080/0013188850270303

*Harvey, T. J., & Stables, A. A. (1986). Gender differences in attitudes to science for third year pupils: An argument for single-sex teaching groups in mixed schools. *Research in Science & Technological Education, 4,* 163–170. doi:10.1080/0263514860040206

*Harvey, T. J., & Wareham, M. M. (1984). An investigation into sex differences in certain aspects of science practical work with first-year secondary school pupils in single sex and mixed teaching groups. *Research in Science & Technological Education, 2,* 187–195. doi:10.1080/0263514840020210

*Hayes, A., Pahlke, E. E., & Bigler, R. S. (2011). The efficacy of single-sex education: Testing for selection and peer quality effects. *Sex Roles, 65,* 693–703. doi:10.1007/s11199-010-9903-2

Hedges, L. V. (1981). Distribution theory for Glass's estimator of effect size and related estimators. *Journal of Educational Statistics, 6,* 107–128. doi:10.2307/1164588

Hedges, L. V., & Becker, B. J. (1986). Statistical methods in the meta-analysis of research on gender differences. In J. S. Hyde & M. C. Linn (Eds.), *The psychology of gender: Advances through meta-analysis* (pp. 14–50). Baltimore, MD: Johns Hopkins University Press.

*Hoffman, B. H., Badgett, B. A., & Parker, R. P. (2008). The effect of single-sex instruction in a large, urban, at-risk high school. *Journal of Educational Research, 102,* 15–36. doi:10.3200/JOER.102.1.15-36

Hopkins, R. (1997). *Educating Black males: Critical lessons in schooling, community, and power*. Albany: State University of New York Press.

*Huon, G., Gunewardene, A., & Hayne, A. (2000). The gender and SES context of weight-loss dieting among adolescent females. *Eating Disorders: The Journal of Treatment & Prevention, 8,* 147–155. doi:10.1080/10640260008251221

Hyde, J. S. (2005). The gender similarities hypothesis. *American Psychologist, 60,* 581–592. doi:10.1037/0003-066X.60.6.581

*Jackson, C. K. (2012). Single-sex schools, student achievement, and course selection: Evidence from rule-based student assignments in Trinidad and Tobago. *Journal of Public Economics, 96,* 173–187. doi:10.1016/j.jpubeco.2011.09.002

Jacobs, J., Davis-Kean, P., Bleeker, M., Eccles, J., & Malanchuk, O. (2005). "I can, but I don't want to": The impact of parents, interests, and activities on gender differences in math. In A. Gallagher & J. Kaufman (Eds.), *Gender differences in mathematics: An integrative psychological approach* (pp. 73–98). New York, NY: Cambridge University Press.

*James, A. (2001). Educating boys: A comparison of educational attitudes of male graduates of single-sex and coed schools. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 62*(1), 77.

James, A. N. (2009). *Teaching the female brain: How girls learn math and science*. Thousand Oaks, CA: Corwin Press.

*Jimenez, E., & Lockheed, M. E. (1989). Enhancing girls' learning through single-sex education: Evidence and a policy conundrum. *Educational Evaluation and Policy Analysis, 11,* 117–142. doi:10.2307/1163780

*Johnson, D. E. (2009). The dynamics of gender in single sex schooling: Implications for educational policy. Evidence from the education longitudinal study: 2002. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 70*(6), 1862.

*Jones, T., & Clarke, V. A. (1995). Diversity as a determinant of attitudes: A possible explanation of the apparent advantage of single-sex settings. *Journal of Educational Computing Research, 12,* 51–64. doi:10.2190/3HPH-1E8N-XTMW-CANR

*Karpiak, C. P., Buchanan, J. P., Hosey, M., & Smith, A. (2007). University students from single- sex and coeducational high schools: Differences in majors and attitudes at a Catholic university. *Psychology of Women Quarterly, 31,* 282–289. doi:10.1111/j.1471-6402.2007.00371.x

*Kawasha, F. S. S. (2011). A case study of single-sex middle school mathematics classes in a mixed-sex public school. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 72*(1), 116.

*Keane, S. H. (2004). Self-silencing behavior among female high school athletes and nonathletes. *Dissertation Abstracts International: Section B. Sciences and Engineering, 64*(12), 6332.

*Keeler, J. L. (1998). Secondary school academic environment as an influence of sex-role perception and self-efficacy of females. *Dissertation Abstracts International: Section B. Sciences and Engineering, 59*(5), 2456.

*Kessels, U., & Hannover, B. (2008). When being a girl matters less: Accessibility of gender-related self-knowledge in single-sex and coeducational classes and its impact on students' physics-related self-concept of ability. *British Journal of Educational Psychology, 78,* 273–289. doi:10.1348/000709907X215938

*Kibera, L. W. (1995). The effects of school stratification on the career and educational aspirations of girls in Kenya's secondary schools. *Journal of Third World Studies, 12,* 59–79.

*Kim, D. H., & Law, H. (2012). Gender gap in maths test scores in South Korea and Hong Kong: Role of family background and single-sex schooling. *International Journal of Educational Development, 32,* 92–103. doi:10.1016/j.ijedudev.2011.02.009

*Lambert, J. (1998). An investigation of the difference in multidimensional self-concept between adolescent girls in single-sex and coeducational school settings. *Dissertation Abstracts International: Section B. Sciences and Engineering, 59*(2), 0876.

*Langlois, C. (2006). The effects of single-gender versus coeducational environments on the self-esteem development and academic competence of high school females. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 66*(12), 4343.

*Laster, C. (2004). Why we must try same-sex instruction. *Education Digest, 70,* 59–62.

*Lauder, H., & Hughes, D. (1990). Social inequalities and differences in school outcomes. *New Zealand Journal of Educational Studies, 25,* 37–60.

*Lawrie, L., & Brown, R. (1992). Sex stereotypes, school subject preferences and career aspirations as a function of single/mixed-sex schooling and presence/absence of an opposite sex sibling. *British Journal of Educational Psychology, 62,* 132–138. doi:10.1111/j.2044-8279.1992.tb01006.x

*Lee, V. E., & Bryk, A. S. (1986). Effects of single-sex secondary schools on student achievement and attitudes. *Journal of Educational Psychology, 78,* 381–395. doi:10.1037/0022-0663.78.5.381

*Lee, V. E., & Lockheed, M. E. (1990). The effects of single-sex schooling on achievement and attitudes in Nigeria. *Comparative Education Review, 34,* 209–231. doi:10.1086/446918

Lee, V. E., Marks, H. M., & Byrd, T. (1994). Sexism in single-sex and co-educational independent secondary school classrooms. *Sociology of Education, 67,* 92–120. doi:10.2307/2112699

*LePore, P. C., & Warren, J. R. (1997). A comparison of single-sex and coeducational Catholic secondary schooling: Evidence from the National Educational Longitudinal Study of 1988. *American Educational Research Journal, 34,* 485–511. doi:10.3102/00028312034003485

*Limbert, C. (2001). A comparison of female university students from different school backgrounds using the Eating Disorder Inventory. *International Journal of Adolescent Medicine and Health, 13,* 145–154. doi:10.1515/IJAMH.2001.13.2.145

Lipsey, M. W., & Wilson, D. B. (2001). *Practical meta-analysis*. Thousand Oaks, CA: Sage.

Mael, F., Alonso, A., Gibson, D., Rogers, K., & Smith, M. (2005). *Single-sex versus coeducational schooling: A systematic review*. Washington, DC: American Institutes for Research.

*Malacova, E. (2007). Effects of single-sex education on progress in GCSE. *Oxford Review of Education, 33,* 233–259. doi:10.1080/03054980701324610

*Mallam, W. A. (1993). Impact of school-type and sex of the teacher on female students' attitudes toward mathematics in Nigerian secondary schools. *Educational Studies in Mathematics, 24,* 223–229. doi:10.1007/BF01273693

*Mandelberg, R. G. (2004). Women's perceptions of their eating attitudes while in a single-sex versus coeducational high school: A retrospective study. *Dissertation Abstracts International: Section B. Sciences and Engineering, 65*(4), 2102.

*Manning, N. A. (2011). Effects of single gender classrooms and coeducational classrooms on student achievement and school climate for middle school students in a public school system. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 71*(8), 2799.

*Marsh, H. W. (1989). Effects of attending single-sex and coeducational high schools on achievement, attitudes, behaviors, and sex differences. *Journal of Educational Psychology, 81,* 70–85. doi:10.1037/0022-0663.81.1.70

*Marsh, H. W., & Rowe, K. J. (1996). The effects of single-sex and mixed-sex mathematics classes within a coeducational school: A reanalysis and comment. *Australian Journal of Education, 40,* 147–161. doi:10.1177/000494419604000203

*Marsh, H. W., Smith, I. D., Marsh, M., & Owens, L. (1988). The transition from single-sex to coeducational high schools: Effects on multiple dimensions of self-concept and on academic achievement. *American Educational Research Journal, 25,* 237–269. doi:10.3102/00028312025002237

McCluskey, A. T. (1993). The historical context of the single-sex schooling debate among African-Americans. *Western Journal of Black Studies, 17,* 193–201.

*McEwen, A., Knipe, D., & Gallagher, T. (1997). The impact of single-sex and coeducational schooling on participation and achievement in science: A 10-year perspective. *Research in Science & Technological Education, 15,* 223–233. doi:10.1080/0263514970150207

*McVey, L. A. (2004). Single-sex schooling and girls' gender-role identity and creativity. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 64*(8), 2779.

Meece, J., Eccles-Parsons, J., Kaczala, C., Goff, S., & Futterman, R. (1982). Sex differences in math achievement: Toward a model of academic choice. *Psychological Bulletin, 91,* 324–348. doi:10.1037/0033-2909.91.2.324

*Mensinger, J. (2003). *Disordered eating, adherence to the superwoman ideal, and gender socialization in coeducational and single sex school environments* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3083692)

*Miller, P. M., & Dale, R. R. (1974). A comparison of the degree results of university students from co-educational and single-sex schools. *British Journal of Educational Psychology, 44,* 307–308. doi:10.1111/j.2044-8279.1974.tb00785.x

Morse, S. (1998). *Separated by sex: A critical look at single-sex education for girls*. Washington, DC: American Association of University Women Educational Foundation.

*Mulholland, J., Hansen, P., & Kaminski, E. (2004). Do single-gender classrooms in coeducational settings address boys' underachievement? An Australian study. *Educational Studies, 30,* 19–32. doi:10.1080/0305569032000159714

*Norfleet James, A., & Richards, H. C. (2003). Escaping stereotypes: Educational attitudes of male alumni of single-sex and coed schools. *Psychology of Men & Masculinity, 4,* 136–148. doi:10.1037/1524-9220.4.2.136

*Norton, S. J., & Rennie, L. J. (1998). Students' attitudes towards mathematics in single-sex and coeducational schools. *Mathematics Education Research Journal, 10,* 16–36. doi:10.1007/BF03217120

OECD. (2010). *PISA 2009 results*. Retrieved from www.oecd.org/edu/pisa/2009

*Olson, C. A. (2010). The gender divide: The effectiveness of departmentalized gender-inclusive classrooms. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 71*(5), 1524.

*Osborne-Oliver, K. M. (2009). Female bullying behaviors and perceived social support in single- sex and coeducational schools: Do bullying and social support differ by school gender composition? *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 69*(7), 2606.

*Pahlke, E., Hyde, J. S., & Mertz, J. E. (2013). The effects of single-sex compared with coeducational schooling on mathematics and science achievement: Data from Korea. *Journal of Educational Psychology, 105,* 444–452. doi:10.1037/a0031857

Pahlke, E., Patterson, M. M., & Galligan, K. (2012, August). *Rationales for single-sex schooling: Administrator, teacher, parent, and student perspectives*. Paper presented at the meeting of the American Educational Research Association, Vancouver, British Columbia, Canada.

*Park, H., & Behrman, J. R. (2010). *Causal effects of single-sex schools on college attendance: Random assignment in Korean high schools* (PSC Working Paper Series 10–01). Philadelphia: University of Pennsylvania.

*Park, H., Behrman, J. R., & Choi, J. (2013). Causal effects of single-sex schools on college entrance exams and college attendance: Random assignment in Seoul high schools. *Demography, 50,* 447–469. doi:10.1007/s13524-012-0157-1

*Phillipps, S. D. (2008). All-girls mathematics classes in a coeducational setting. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 69*(1), 171.

*Phillips, S. (1979). Sexual prejudice in Sydney middle school children. *Australian and New Zealand Journal of Sociology, 15,* 83–88. doi:10.1177/144078337901500210

*Price, E., & Rosemier, R. (1972). Some cognitive and affective outcomes of same-sex versus coeducational grouping in first grade. *Journal of Experimental Education, 40*(4), 70–77.

*Proach, J. A. (1999). *A study of the attitudes and academic achievement in biology of females in a single-sex school vs. a coeducational school in the Philadelphia Archdiocesan secondary schools* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 9966004)

*Rauscher, M. A. (2008). Adolescent egocentrism and perceived quality of interpersonal relationships in single-sex and mixed-sex high school environments. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 69*(1), 115.

*Rennie, L. J., & Parker, L. H. (1997). Students' and teachers' perceptions of single-sex and mixed-sex mathematics classes. *Mathematics Education Research Journal, 9,* 257–273. doi:10.1007/BF03217318

*Richardson, A. G. (1990). Classroom learning environment: Some differences among school types. *Perceptual and Motor Skills, 71,* 518. doi:10.2466/PMS.71.5.518-518

*Rienks, S. L. (2008). Does gender composition of the classroom matter? A comparison of students' academic and social outcomes in single-gender and coed high school classrooms. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 68*(8), 3285.

*Riordan, C. (1985). Public and Catholic schooling: The effects of gender context policy. *American Journal of Education, 93,* 518–540. doi:10.1086/443821

*Riordan, C. (1994). Single-gender schools: Outcomes for African and Hispanic Americans. *Research in Sociology of Education and Socialization, 10,* 177–205.

*Riordan, C., Faddis, B. J., Beam, M., Seager, A., Tanney, A., DiBiase, R., . . . Valentine, J. (2008). *Early implementation of public single-sex schools: Perceptions and characteristics*. Portland, OR: RMC Research Corporation.

*Robinson, P., & Smithers, A. (1997). *Should the sexes be separated for secondary education?* Retrieved from http://wordpress.buckingham.ac.uk/wp-content/uploads/2010/10/ssreport.pdf

*Robinson, W. P., & Gillibrand, E. (2004). Research report: Single-sex teaching and achievement in science. *International Journal of Science Education, 26,* 659–675. doi:10.1080/0950069032000072737

*Rosenthal, D. A., & Chapman, D. C. (1980). Sex-role stereotypes: Children's perceptions of occupational competence. *Psychological Reports, 46,* 135–139. doi:10.2466/pr0.1980.46.1.135

Rosenthal, R. (1979). The file drawer problem and tolerance for null results. *Psychological Bulletin, 86,* 638–641. doi:10.1037/0033-2909.86.3.638

*Roth, D. J. (2009). *The effectiveness of single-gender eight-grade English, history, mathematics, and science classes* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3429036)

*Rowe, K. (1993). What are the benefits of single-sex maths classes? In I. Livingstone & J. Izard (Eds.), *Best of SET mathematics*. Camberwell, Victoria, Australia: Australian Council for Educational Research.

*Rubenfeld, M. I., & Gilroy, F. D. (1991). Relationship between college women's occupational interests and a single-sex environment. *Career Development Quarterly, 40,* 64–70. doi:10.1002/j.2161-0045.1991.tb00313.x

Rudman, L. A., & Glick, P. (2008). *The social psychology of gender: How power and intimacy shape gender relations*. New York, NY: Guilford Press.

*Russotto, D. (2009). Single-sex education: Effects on achievement and engagement of African-American students in urban public schools. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 70*(6), 1924.

Sadker, M., & Sadker, D. (1994). *Failing at fairness: How our schools cheat girls*. New York, NY: Simon & Schuster.

Sadker, M., Sadker, D., & Zittleman, K. R. (2009). *Still failing at fairness: How gender bias cheats girls and boys in school and what we can do about it*. New York, NY: Simon & Schuster.

Salomone, R. C. (2006). Single-sex programs: Resolving the research conundrum. *Teachers College Record, 108,* 778–802. doi:10.1111/j.1467-9620.2006.00628.x

*Sampson, J., & Watkins, D. (1976). An investigation of adolescents' attitudes to aspects of their school life. *Australian Journal of Social Issues, 11,* 213–221.

*Sanders, E. T. W. (1992, October). *Black inner-city males and the Milwaukee Public Schools Immersion Program: A progress report*. Paper presented at the meeting of the University Council for Educational Administration, Minneapolis, MN.

* Santos, C. E., Galligan, K. M., Pahlke, E., & Fabes, R. A. (2013). Gender stereotyping, boys' achievement and adjustment during junior high school. *American Journal of Orthopsychiatry, 83,* 252–264. doi:10.1111/ajop.12036

Sax, L. (2005). *Why gender matters*. New York, NY: Doubleday.

Sax, L. (2010). Sex differences in hearing: Implications for best practice in the classroom. *Advances in Gender and Education, 2,* 13–21.

*Sax, L. J., Arms, E., Woodruff, M., Riggers, T., & Eagan, K. (2009). *Women graduates of single-sex and coeducational high schools: Differences in their characteristics and the transition to college*. Los Angeles, CA: Sudikoff Family Institute for Education and New Media.

*Sax, L. J., Shapiro, C. A., & Eagan, M. K. (2011). Promoting mathematical and computer self-concept among female college students: Is there a role of single-sex secondary education? *Journal of Women and Minorities in Science and Engineering, 17,* 325–355. doi:10.1615/JWomenMinorScienEng.2011002386

*Scheiner, L. (1969). *A pilot study to assess the academic progress of disadvantaged first graders assigned to class by sex and taught by a teacher of the same sex*. Philadelphia, PA: School District of Philadelphia.

*Schlosberg, K. J. (1998). *A comparison of girls' attitudes toward mathematics in single-sex and coeducational independent schools* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 9905526)

*Schneider, F. W., Coutts, L. M., & Starr, M. W. (1988). In favour of coeducation: The educational attitudes of students from coeducational and single-sex high schools. *Canadian Journal of Education, 13,* 479–496. doi:10.2307/1495288

*Seminara, L. (1997). An exploration of the relationship between conceptual knowledge, sex, attitude and problem-solving in chemistry. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 57*(11), 4692.

*Shapka, J. D. (2009). Trajectories of math achievement and perceived math competence over high school and postsecondary education: Effects of an all-girl curriculum in high school. *Educational Research and Evaluation, 15,* 527–541. doi:10.1080/13803610903354775

*Shapka, J. D., & Keating, D. P. (2003). Effects of a girls-only curriculum during adolescence: Performance, persistence, and engagement in mathematics and science. *American Educational Research Journal, 40,* 929–960. doi:10.3102/00028312040004929

*Shields, N. (1991). The effects of single-sex schooling on female attitudes toward mathematics, achievement in mathematics, and college and career aspirations. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 51*(10), 3380.

*Shikakura, H. (2003). Values, gender, and socialization of high school girls in Japan. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 64*(4), 1216.

*Shmurak, C. B. (1993). Career patterns of women graduates of independent schools: A comparison of coeducational and all-girls high schools. In *Proceedings from '93: Annual Meeting of the American Educational Research Association*. Atlanta, GA: American Educational Research Association.

*Shmurak, C. B. (1995). Attitudes and aspirations of female adolescents: A longitudinal study-in-progress. In *Proceedings from '95: Annual Meeting of the American Educational Research Association*. San Francisco, CA: American Educational Research Association.

*Signorella, M. L., Frieze, I. H., & Hershey, S. W. (1996). Single-sex versus mixed-sex classes and gender schemata in children and adolescents. *Psychology of Women Quarterly, 20,* 599–607. doi:10.1111/j.1471-6402.1996.tb00325.x

*Singh, K., Vaught, C., & Mitchell, E. W. (1998). Single-sex classes and academic achievement in two inner-city schools. *Journal of Negro Education, 67,* 157–167. doi:10.2307/2668225

*Smith, D. M. (2010). *A comparison of single-gender classes and traditional, coeducational classes on student academic achievement, discipline referrals, and attitudes toward subjects* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3413122)

*Spielhofer, T., Benton, T., & Schagen, S. (2004). A study of the effects of school size and single- sex education in English schools. *Research Papers in Education, 19,* 133–159. doi:10.1080/02671520410001695407

*Spikes, E. S. (2009). The effects of single-gender classrooms and previous middle school gifted math experience on the mathematics achievement of gifted girls in public education. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 69*(8), 3081.

*Stables, A. (1990). Differences between pupils from mixed and single-sex schools in their enjoyment of school subjects and in their attitudes to science and to school. *Educational Review, 42,* 221–230. doi:10.1080/0013191900420301

*Steinbrecher, M. J. (1991). *A comparison between female graduates of single-sex and coeducational Catholic high schools and attainment of career leadership positions* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 9128427)

*Stent, P., & Gillies, R. M. (2000). Occupational attitudes and expectations of Year 12 students in single-sex and coeducational schools: A focus on female youth. *Australian Journal of Career Development, 9,* 13–19.

*Stephens, M. (2009). Effects of single-sex classrooms on student achievement in math and reading. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 70*(6), 1934.

*Stotsky, S., Denny, G., & Tschepikow, N. (2010). *Single-sex classes in two Arkansas elementary schools: 2008–2009*. Fayetteville: University of Arkansas.

*Stowe, L. G. (1991). Should physics classes be single sex? *The Physics Teacher, 29,* 380–381. doi:10.1119/1.2343353

*Streitmatter, J. (1998). Single-sex classes: Female physics students state their case. *School Science and Mathematics, 98,* 369–375. doi:10.1111/j.1949-8594.1998.tb17307.x

*Subotnik, R. F., & Strauss, S. M. (1995). Gender differences in classroom participation and achievement: An experiment involving Advanced Placement calculus classes. *Journal of Secondary Gifted Education, 6*(2), 77–85.

*Sudler, D. M. (2009). Single-gender mathematics and science classes and the effects on urban middle school boys and girls. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 70*(6), 1966.

*Sullivan, A. (2009). Academic self-concept, gender and single-sex schooling. *British Educational Research Journal, 35,* 259–288. doi:10.1080/01411920802042960

*Sullivan, A., Joshi, H., & Leonard, D. (2010). Single-sex schooling and academic attainment at school and through the lifecourse. *American Educational Research Journal, 47,* 6–36. doi:10.3102/0002831209350106

*Sutton, A. M. (2011). The impact of single-gender classrooms on student achievement in seventh grade math classes. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 71*(10), 3586.

*Szabo, Z. R. (2005). Sex-role, attributional style, and career choices: A cross-cultural analysis. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 65*(12), 4465.

*Tamayo, F. M., Haberman, M. J., Zapp, M. L., & Horne, W. C. (1971). Adjustment to same sex and opposite sex in coeducational and noncoeducational high schools. *Journal of Psychology: Interdisciplinary and Applied, 79,* 209–212. doi:10.1080/00223980.1971.9921313

*Taylor, L. (2002). *A comparison of academic and non-academic self-concepts of 11th graders within and between single gender and coeducational schools* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3063654)

*Thom, C. E. (2006). *A comparison of the effect of single-sex versus mixed-sex classes on middle school student achievement* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3298772)

*Thompson, J. S. (2003). The effect of single-sex secondary schooling on women's choice of college major. *Sociological Perspectives, 46,* 257–278. doi:10.1525/sop.2003.46.2.257

Thompson, T., & Ungerleider, C. (2004). *Single sex schooling: Final report.* Retrieved from http://www.cmec.ca/Publications/Lists/Publications/Attachments/61/singlegender.en.pdf

*Tickner, A. (1992). *A study of attitudes in an all boys' school* (Unpublished master's thesis). Dominican College.

*Tiggemann, M. (2001). Effect of gender composition of school on body concerns in adolescent women. *International Journal of Eating Disorders, 29,* 239–243. doi:10.1002/1098-108X(200103)29:2<239::AID-EAT1015>3.0.CO;2-A

*Tsolidis, G., & Dobson, I. R. (2006). Single-sex schooling: Is it simply a "class act"? *Gender and Education, 18,* 213–228. doi:10.1080/09540250500380711

*Tully, D., & Jacobs, B. (2010). Effects of single-gender mathematics classrooms on self-perception of mathematical ability and post secondary engineering paths: An Australian case study. *European Journal of Engineering Education, 35,* 455–467. doi:10.1080/03043797.2010.489940

*Ulkins, D. S. (2007). The impact of single-gender classrooms on science achievement of middle school gifted girls. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 68*(3), 964.

*Van de gaer, E., Pustjens, H., Van Damme, J., & De Munter, A. (2004). Effects of single-sex versus co-educational classes and schools on gender differences in progress in language and mathematics achievement.

British Journal of Sociology of Education, 25, 307–322. doi:10.1080/0142569042000216963
*Vockell, E. L., & Lobonc, S. (1981). Sex-role stereotyping by high school females in science. *Journal of Research in Science Teaching, 18,* 209–219. doi:10.1002/tea.3660180304
*Vrooman, M. K. (2010). An examination of the effects of single-gender classes on reading and mathematics achievement test scores of middle school students. *Dissertation Abstracts International: Section A. Humanities and Social Sciences, 70*(8), 2880.
*Walter, H. M. (1997). *An investigation into the affective profiles of girls from single-Sex and co-educational schools, as they relate to the learning of mathematics* (Unpublished master's thesis). University of Exeter, Exeter, United Kingdom.
*Weinberger-Litman, S. L., Rabin, L. A., Fogel, J., & Mensinger, J. L. (2008). Educational setting and eating disorder risk factors among young Jewish women: A comparison between single-gender and coed schools. *Counselling and Spirituality, 27,* 131–156.
*Wisenthal, M. (1965). Sex differences in attitudes and attainment in junior schools. *British Journal of Educational Psychology, 35,* 79–85. doi:10.1111/j.2044-8279.1965.tb01790.x
*Wong, K., Lam, Y. R., & Ho, L. (2002). The effects of schooling on gender differences. *British Educational Research Journal, 28,* 827–843. doi:10.1080/0141192022000019080
*Wood, B. S., & Brown, L. A. (1997). Participation in an all-female Algebra I class: Effects on high school math and science course selection. *Journal of Women and Minorities in Science and Engineering, 3,* 265–277.
*Woodward, L. J., Fergusson, D. M., & Horwood, L. J. (1999). Effects of single-sex and coeducational secondary schooling on children's academic achievement. *Australian Journal of Education, 43,* 142–156. doi:10.1177/000494419904300204
*Young, D. J., & Fraser, B. J. (1990). Science achievement of girls in single-sex and co-educational schools. *Research in Science & Technological Education, 8,* 5–20. doi:10.1080/0263514900080102
*Zubernis, L. S. (2005). Gifted girls: Single sex and coeducational school environments. *Dissertation Abstracts International: Section B. Sciences and Engineering, 66*(2), 1202.

Received April 19, 2013
Revision received December 3, 2013
Accepted December 5, 2013 ■