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Corrigendum to Stereotype Threat and Its Problems: Theory Misspecification in Research, Consequences, and Remedies

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Several errors in the raw data used in the above mentioned article were reported. The article has now been updated of the following changes:

1. There has been some revision in Figure 1, the change has been indicated in bold.

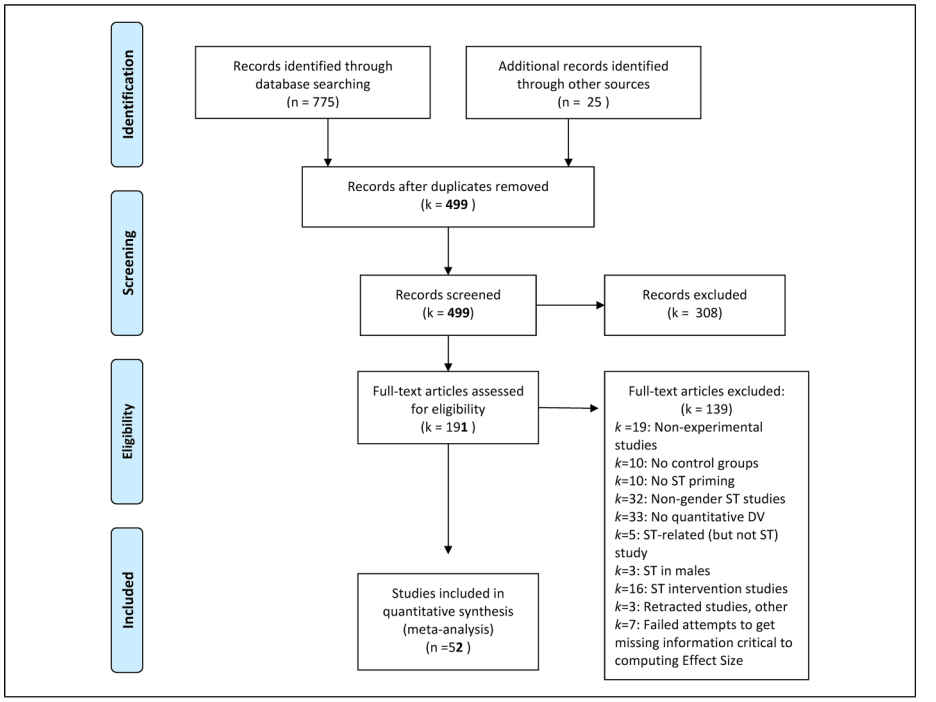

Figure 1. Flow diagram: excluded studies.

2. *Dependent variable.* under 'Definition and Coding of Dependent, Independent, and Covariate Variables' has been revised as following:

The primary outcome of interest was stereotype threat effects on mathematics performance. Stereotype threat **Hedge's g*** effect sizes were computed using an effect size calculator (Huedo-Medina & Johnson, 2011). Effect sizes were represented as (*M*mathematics performance of control – *M*performance of treatment group) / **pooled standard deviation of treatment and control groups** such that positive effect sizes denoted lower mean performance in the stereotype threat (treatment) group or stereotype threat effects, and vice versa.

3. *Power.* under 'Study covariates' has been revised as following:

Using available data on research design and number of participants in control and experimental groups, power for each study was calculated with G-Power 3.1 (Faul et al., 2009). Power was treated as a continuous variable in the analyses.

4. Table 1 has several reporting errors in the column previously labeled "d" and now labeled "g*" that has been revised, please see the updates in bold in the following table:

Table 1. Study Characteristics.

Study	Moderator	Sample	Sample Size	g*	Ed Level	Country	U.S. Region
Ambady et al., (2004)_ Study1a_individuated	Individuation	Canadian female undergraduates	20	−0.425	college	USA	Northeast
Ambady et al., (2004)_Study1a_non individuated	Individuation	Canadian female undergraduates	20	0.864	college	USA	Northeast
Ambady et al., (2004) _Study1b_individuated	Individuation	Causcasian female undergraduates	19	−0.531	college	USA	Northeast
Ambady, et al., (2004) _Study1_S1b_nonindividuated	Individuation	Causcasian female undergraduates	37	0.825	college	USA	Northeast
Anderson (2001)	Basic ST	Undergraduate freshmen	604	0.069	college	USA	South
Aramovich (2014)_group testing	Type of testing	Female undergraduates	20	−0.31	college	USA	Northeast
Aramovich (2014)_individual testing	Type of testing	Female undergraduates	29	0.533	college	USA	Northeast
Ben-Zeev et al., (2004) _S2_femaleminority	Sex composition	Undergraduates-psychology students	18	−0.652	college	USA	Northeast
Ben-Zeev et al., (2004)_S2_samesex	Sex composition	Undergraduates - psychology students	18	0.872	college	USA	Northeast
Brodish & Devine (2009)_state anxiety after	State anxiety	Female introductory psychology students	28	0.352	college	USA	Midwest
Brodish & Devine (2009)_state anxiety before	State anxiety	Female introductory psychology students	70	0.471	college	USA	Midwest
Burns & Friedman (2012)	Emotion expression	Female undergraduates	73	0.441	college	USA	Midwest
Cadinu et al., (2006)_external locus of control	Locus of control	Female psychology students	25	−0.034	college	Italy	N/A
Cadinu et al., (2006)_internal locus of control	Locus of control	Female psychology students	38	1.521	college	Italy	N/A

(continued)

Table 1. (continued)

Study	Moderator	Sample	Sample Size	g*	Ed Level	Country	U.S. Region
Cadinu et al. (2005)_S1	Negative thoughts	Female psychology students	60	0.542	college	Italy	N/A
Campbell & Collaer (2009)	Basic ST	Undergrads- private liberal arts college	70	0.611	college	USA	Northeast
Chalabev et al. (2012)_S1_no achvt goal	Achievement goals	White female undergraduates	28	1.09	college	USA	West
Chalabev et (2012)_S1_performance approach	Achievement goals	White female undergraduates	18	0.366	college	USA	West
Chalabev et al., (2012) _S1_performance avoid	Achievement goals	White female undergraduates	28	−0.284	college	USA	West
Chalabev et al., (2012)_S2_no achvt goal	Achievement goals	Female undergraduates	18	0.765	college	USA	West
Chalabev et al., (2012) _S2_performance approach	Achievement goals	Female undergraduates	32	−0.616	college	USA	West
Chalabev et al., (2012) _S2_performance avoidance	Achievement goals	Female undergraduates	18	−0.87	college	USA	West
Cherney & Campbell (2011)_coed	Type of school	High school students	137	−0.511	k12	USA	Midwest
Cherney & Campbell (2011)_ss	Type of school	High school students	202	−0.293	k12	USA	Midwest
Cotting (2003)	Basic ST	Undergradutes at an HBCU	78	0.129	college	USA	Northeast
Crisp (2009)_S2_Psychology	Academic domain	Female undergraduates	40	0.416	college	UK	N/A
Crisp (2009)_S2_STEM	Academic domain	Female undergraduates	40	−0.43	college	UK	N/A
Dunst et al., (2013)	Basic ST	Austrian adolescents	26	0.46	k12	Austria	N/A
Elizaga & Markman (2008) _female_poorexemplar	Role models	Female undergraduates, introductory psychology	40	0.989	college	USA	Midwest

(continued)

Table 1. (continued)

Study	Moderator	Sample	Sample Size	g*	Ed Level	Country	U.S. Region
Elizaga & Markman (2008) _female_strongexemplar	Role models	Female undergraduates, introductory psychology	40	−0.076	college	USA	Midwest
Elizaga & Markman (2008) _male_poorexemplar	Role models	Female undergraduates, introductory psychology	38	−0.092	college	USA	Midwest
Elizaga & Markman (2008) _male_strongexemplar	Role models	Female undergraduates, introductory psychology	38	0.624	college	USA	Midwest
Finnigan & Corker (2016) _S1_NoGoals	Performance goals	Female undergraduates	590	0.083	college	USA	.
Finnigan & Corker (2016) _S1_PerfAvoidanceGoals	Performance goals	Female undergraduates	590	0.045	college	USA	.
Fogliatti & Bussey (2013)	Basic ST study	Undergraduate, introductory psychology students	54	0.683	college	Australia	N/A
Ford, Ferguson & Brooks (2004)	Humor	Female students- intro psychology & sociology	44	0.7	college	USA	Midwest
Good, Aronson & Harder (2007)	Basic ST study	Undergraduate, calculus students	173	0.235	college	USA	Southwest
Galdi, Cadinu & Tomasetto (2014) _STconsistent	Automatic associations	First grade students	80	0.558	k12	Italy	N/A
Ganley et al. (2013)_S1	Basic ST study	8th grade students	110	−0.137	k12	USA	Midwest
Ganley et al. (2013)_S2_7th grade	Grade level	7th grade students	115	−0.276	k12	USA	Midwest
Ganley et al. (2013)_S2_8th grade	Grade level	8th grade students	99	0.158	k12	USA	Midwest
Ganley et al. (2013) _S3_elementary4th	Grade level	4th grade students	29	−0.165	k12	USA	Midwest
Ganley et al. (2013)_S3_highschool	Grade level	8th grade students	76	0.26	k12	USA	Midwest

(continued)

Table 1. (continued)

Study	Moderator	Sample	Sample Size	g*	Ed Level	Country	U.S. Region
Ganley et al. (2013) _S3_middleschool	Grade level	12th grade students	65	−0.141	k12	USA	Midwest
Grand et al. (2011) _S1_facevalidmath	Test content	Female undergraduates	345	0.064	college	USA	.
Grand et al. (2011) _s1_facevalidmechanical	Test content	Female undergraduates	345	−0.115	college	USA	.
Grand et al. (2011)_s1_genericmath	Test content	Female undergraduates	345	−0.236	college	USA	.
Grand et al. (2011) _s1_genericmechanical	Test content	Female undergraduates	345	−0.196	college	USA	.
Harder (1999)_publicevaluation	Public vs private evaluation	White, female calucus students	18	−0.15	college	USA	South
Harder (1999)_privateevaluation	Public vs private evaluation	White, female calucus students	19	0.181	college	USA	South
Harder (1999)_no evaluation	Public vs private evaluation	White, female calucus students	28	−0.239	college	USA	South
Jamieson (2009)_S1	Basic ST	Undergraduates	28	0.79	college	USA	Northeast
Jamieson (2009)_S2_cf easy	Problem type and difficulty	Female undergraduates	28	0.729	college	USA	Northeast
Jamieson (2009)_S2_cf difficult	Problem type and difficulty	Female undergraduates	28	1.46	college	USA	Northeast
Jamieson (2009)_S2_solve easy	Problem type and difficulty	Female undergraduates	28	−0.483	college	USA	Northeast
Jamieson (2009)_S2_solve difficult	Problem type and difficulty	Female undergraduates	32	−0.241	college	USA	Northeast
		Female undergraduates	32	−0.305	college	USA	Northeast

(continued)

Table 1. (continued)

Study	Moderator	Sample	Sample Size	g*	Ed Level	Country	U.S. Region
Jamieson (2009)_S3_no instruction + solve	Instruction and problem type						
Jamieson (2009)_S3_cf + no instruction	Instruction and problem type	Female undergraduates	36	2.085	college	USA	Northeast
Jamieson (2009)_S4	Basic ST	Undergraduates	41	0.629	college	USA	Northeast
Jamieson (2009)_S5	Basic ST	Undergraduates	57	0.691	college	USA	Northeast
Johnson et al., (2012)_ST	Basic ST	Students at large, private university	169	0.262	college	USA	South
Keller (2002)_coed	Sex Comp	High school students	75	0.401	k12	Germany	N/A
Lesko & Corpus (2006)	Math identification	Undergradutes at liberal arts college	68	0.613	college	USA	South
McIntyre et al., (2010)_S1_no rolemodel	Role model deservingness	Women	60	0.684		USA	South
McIntyre et al., (2010)_S2_threat no rolemodel	Role model success	Women	77	0.821		USA	South
McGlone & Aronson (2006)	Group identification	Undergradute females at liberal arts college	43	0.734	college	USA	Northeast
Mrazek et al. (2011)_Study 2	Basic st experiment	Female undergraduates	72	0.495	college	USA	West
Neuburger et al. (2012)	Basic st experiment	mixed sex undergraduates	216	0.143	college	Germany	N/A
Oswald & Harvey (2001)_hostile	Hostile Environment	Female undergraduates	38	−0.702	college	USA	Midwest
Oswald & Harvey (2001)_nonhostile	Hostile Environment	Female undergraduates	19	0.533	college	USA	Midwest
Perry & Sktikta (2009) _S1_highdefensive pessimism	Defensive pessimism	Female introductory psychology students	80	−0.619	college	USA	Midwest

(continued)

Table 1. (continued)

Study	Moderator	Sample	Sample Size	g*	Ed Level	Country	U.S. Region
Perry & Sktikta (2009) _S1_lowdefensivepessimism	Defensive pessimism	Female introductory psychology students	80	2.174	college	USA	Midwest
Picho & Stephens (2011)_coed school	Type of school	High school students	51	0.744	k12	Uganda	N/A
Picho & Stephens (2011)_SSschool	Type of school	High school students	31	0.135	k12	Uganda	N/A
Picho & Schmader (2017)	Perceived researcher expectation	High school students	128	0.01	k12	Uganda	N/A
Picho & Grimm_S1_kyambogo	Basic ST Study	High school students	122	−0.094	k12	Uganda	N/A
Picho & Grimm_s2_kitante	regulatory focus	High school students	123	−0.291	k12	Uganda	N/A
Rivardo et al., (2011)	ST attribution	Catholic liberal arts undergraduates	39	−0.883	college	USA	Northeast
Rucks (2008)_collective ST	Collective vs personal threat	Female undergraduates	33	−0.667	college	USA	Midwest
Rucks (2008)_personal ST	Collective vs personal threat	Female undergraduates	33	0.114	college	USA	Midwest
Rucks (2008)_personal × collective ST	Collective vs personal threat	Female undergraduates	33	0.265	college	USA	Midwest
Rydell et al., (2009)_S1_genderID	Group identification	Female undergraduates	56	1.357	college	USA	Midwest
Rydell et al., (2009)_S2_genderID	Group identification	Female undergraduates	48	1.282	college	USA	Midwest
Rydell et al., (2009)_S3_genderID	Group identification	Female undergraduates	27	1.039	college	USA	Midwest
Rydell, VanLoo & Boucher (2014)_S2	Working memory	Female undergraduates	90	1.07	college	USA	Midwest

(continued)

Table 1. (continued)

Study	Moderator	Sample	Sample Size	g*	Ed Level	Country	U.S. Region
Rydell, VanLoo & Boucher (2014)_S3	Working memory	Female undergraduates	81	0.476	college	USA	Midwest
Schmader & Johns (2003)_S3	Working memory	Female undergraduates	70	0.87	college	USA	West
Seitchik, Jamieson & Harkins (2014)	Type of threat	Coed undergraduates	108	0.581	college	USA	Northeast
Sekaquaptewa & Thompson (2002)_ solo status	Solo status	White undergraduate psychology students	40	0.537	college	USA	Midwest
Sekaquaptewa & Thompson (2002)_ nonsolo status	Solo status	White undergraduate psychology students	40	0.657	college	USA	Midwest
Taillander-Schmitt et. Al (2012)	Basic ST study	Female nursing students	40	0.414	College	France	N/A
Tapia (2014)	Basic ST study	Female undergraduates	34	0.404	College	USA	West
Thoman et al., (2008)_ST_ability	Ability vs effort based stereotypes	Female undergraduates	22	−0.158	college	USA	West
Thoman et al., (2008)_ST_effort	Ability vs effort based stereotypes	Female undergraduates	34	−0.502	college	USA	West
Tomasetto & Appolini (2013) _STknowledge	ST Knowledge	Female undergraduates	118	0.658	college	italy	N/A
Wen et al. (2016)	cooperation	Female undergraduates	135	0.509	college	China	N/A
Wout et al., (2008)_S1_selfthreat	Group vs self threat	Female undergraduates	28	0.667	college	USA	Midwest
Wout et al.,(2008)_S1_groupthreat	Group vs self threat	Female undergraduates	29	0.566	college	USA	Midwest
Wout et al., (2008)_S1_standard ST	Group vs self threat	Female undergraduates	30	1.055	college	USA	Midwest
Wright-Adams (2014)	Basic ST study	Undergraduates	105	−0.576	college	USA	Northeast
Picho & Grimm_S1_kyambogo	Basic ST Study	High school students	122	−0.094	k12	Uganda	N/A
Picho & Grimm_s2_kitante	regulatory focus	High school students	123	−0.291	k12	Uganda	N/A

5. Data in Table 2 has been revised.

Table 2. Average ST Effects.

Variable	*k*	*g**	CI_{95}	Fail Safe *N*
Culture				
WESTERN	94	.28	.16, .39***	1038*
Australia	1	.68	–	0
Europe	13	.45	.20, .70***	60
North America	74	.23	.10, .36***	300
Non-Western	6	.16	−.15, .46	0
Asia	1	.51	–	0
Africa	5	.05	−.25, .35	0
Region (U.S.)				
Northeast	26	.24	−.03, .49	0
Midwest	32	.34	.12, .56***	12
South	5	.10	−.04, .24	0
West	18	.23	−.02, .48	0
Age-Group				
Adult	85	.30	.18, .42 ***	1080*
(Pre)-adolescent	15	.08	−.08, .23	0
Domain				
STEM	6	−.01	−.31, .29	0
Non-STEM	28	.39	.17, .61**	248*
Math Identification				
Yes	10	−.07	−.34, .21	0
No	90	.30	.18, .41***	1181*
Test Type				
Standardized	71	.29	.16, .41***	917*
Unstandardized	25	.14	−.03, .31	0
ST Essential Conditions				
None	4	.31	−.41, 1.03	0
One	51	.40	.25, .55***	1046*
Two	44	.11	−.04, .25	0
Three	1	.24	–	0
Power				
0.8 and above	22	.00	−.18, .19	0
Below 0.8	78	.36	.24, .48***	2105*

Note. Discrepancies in study sample sizes in some rows is due to missing data (e.g. West).
* Asterisk next to fail safe number indicates robust *FSN* (i.e., > 5n + 10), *** $p < .001$ ** $p < .01$, * $p < .05$. (Rosenberg, 2005).

6. *Methodological quality* has been revised as following:

There was considerably large variability in methodological quality among stereotype threat studies: Scores ranged from 23.8% to 77.5%, with a mean methodological quality score of 53.4% ($SD = 13.23$). Stereotype threat studies were also found, on average, to be underpowered ($M = 0.55$, $SD = 0.25$), with only **21.8%** of the studies in the meta-analysis ($k = \mathbf{22}$) having power of 0.8 and above. Stereotype threat effects also appeared smaller in unstandardized assessments, although the 95% CI for this mean effect was wide, implying relatively unstable results.

7. Figure 2 has been revised, the online file has been updated.

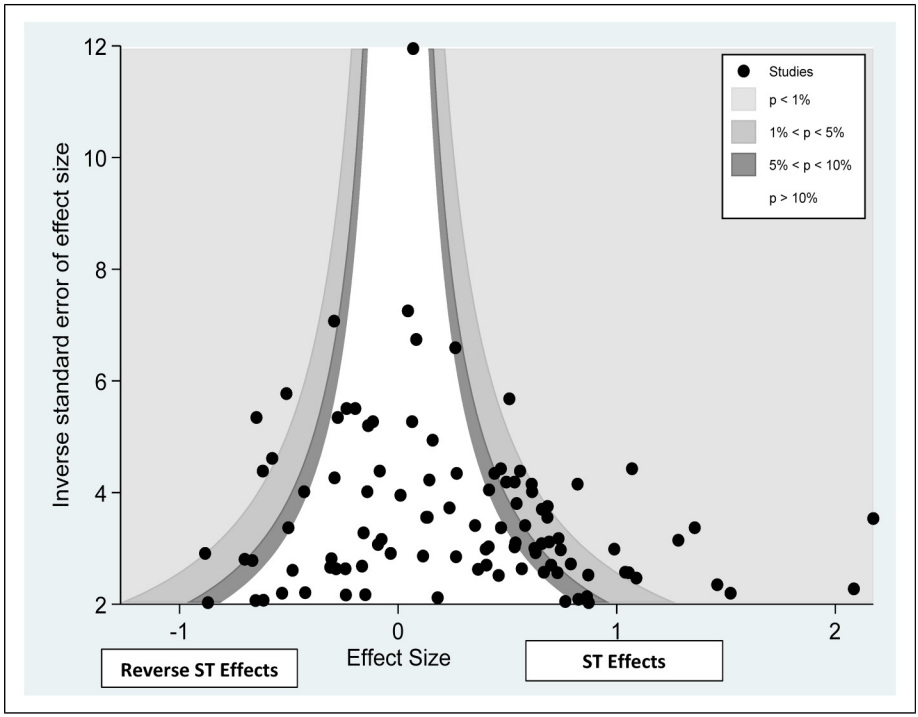

Figure 2. Funnel plot of stereotype threat studies.

8. Table 3 has been revised, the online file has been updated.

Table 3. Multi-Level Meta-Analytic Model.

Fixed Effects	Coefficient (SE)	*Z*	*p*	CI_{95}
ST conditions	−.19(.09)	−2.03	.042*	−.38, -.007
Power	−.36(.23)	−1.61	.107	−.81, .08
(Pre)/Adolescents	−.21(.17)	−1.19	.232	−.55, .13
Non-Western	.14 (.25)	.57	.568	−.35, .64
Intercept	.77(.18)	4.22	.000	.42, 1.13

Table 3b. (supplemental analysis with no power included). Multi-level meta-analytic model.

Fixed Effects	Coefficient (SE)	*Z*	*p*	CI_{95}
ST conditions	−.21(.10)	−2.18	.030*	−.40, -.02
(Pre)/Adolescents	−.23 (.18)	−1.26	.207	−.59, .13
Non-Western	.11 (.26)	.43	669	−.40, .62
Intercept	.59(.15)	3.94	.000	.30, .89

9. A few corrections in Table 3 have led to the revision of the following text:

Multilevel Meta-Analysis

To what extent does the non- or partial inclusion of stereotype threat essential conditions in empirical studies impact estimation of gender-related stereotype threat effects?

A multilevel meta-analysis was conducted to examine the impact of excluding stereotype threat essential conditions on gender-related stereotype threat outcomes. The current study had **101** effect sizes nested in 64 experiments reported in 52 articles, dissertations, and reports. Thus, a multilevel analysis was necessary to mitigate inflating type 1 error associated with ignoring data dependence (Hedges et al., 2010). We posited a three-level multilevel meta-analytic model in Stata 15 using maximum likelihood estimation.

First, a means-only (i.e., intercept or null) model without independent variables or covariates was fitted. The null model yielded an average mean stereotype threat effect of d(SE) = 0.27(.06), CI95 = [0.15, 0.39], $p < .001$, which could be considered a small effect. This effect size was comparable with those reported in previously published meta-analyses on gender-related stereotype threat**,** that is, Nguyen and Ryan (2008), d = 0.21; Flore and Wicherts (2015), d = 0.22; and Picho et al. (2013), d = 0.24. T**he Q statistic revealed between study heterogeneity ($\chi 2$ (100) = 4.66, p < .001), and the I2 statistic indicated that 78% of the observed variance in the distribution of effect sizes could potentially be explained by study level covariates in the model.** Next, a second and

final model that included the primary independent variable— stereotype threat essential conditions and study covariates (power, cultural context, and age group) —was fitted. Results of this model are shown in Table 3. Based on results from the final model, the predicted average stereotype threat effect was moderate- large and statistically significant ($d = 0.77$ (.06) CI 95 [.42, 1.13] $p < .001$). Importantly, results also showed that after adjusting for power, age group, and cultural context, the inclusion of more stereotype threat essential conditions was associated with smaller stereotype threat effects ($\boldsymbol{d = -0.19}$, $p = .04$).

9. ST Essential conditions

As shown in Table 2, a very small proportion of studies **(1%)** included all three stereotype threat essential conditions in their sample selection process. About **9.6% ($k = 5$)** and 3.8% ($k = 2$) of the studies had included math identification and stereotype awareness, respectively, to preselect study participants. However, if manipulation check after stereotype threat priming were to be used as a proxy for situational stereotype awareness, then this essential condition was met in 53.8% of studies ($k = 28$). Per the descriptive statistics in Table 2, the largest stereotype threat effects were observed in studies that included only one of the stereotype threat essential conditions. Furthermore, stereotype threat effects appeared to decline as more stereotype threat essential conditions were included in sample selection.

10. Publication Bias

Begg's test was not statistically significant, indicating the absence of small study effects and therefore no publication bias ($z = 1.76$, $p = .08$).

11. Discussion

The finding of large stereotype threat effects ($\boldsymbol{d = 0.77}$, $p < .001$) for underpowered studies that had excluded all stereotype threat essential conditions.

12. Method

The initial article search yielded 800 articles. These articles were screened in two stages. First, abstracts were reviewed to screen for and include papers that had focused on stereotype threat effects on academic tasks (see Figure 1 for details). A total of **191** articles met this criterion and made it past this screening stage. Second, these articles were further screened for inclusion in the meta-analysis based on eligibility criteria discussed below.

Eligibility criteria

Therefore, from the original pool of 19**1** articles, reports, and dissertations, the final pool of studies was narrowed down to 5**2** for the meta-analysis based on the abovementioned inclusion criteria. Research reports not included in the study and reasons for their exclusion are shown in Figure 1.

13. Study characteristics

Study samples mostly constituted college students (8**5.2**%) from predominantly non-STEM disciplines (**88.7**%).