

# “Girls Are as Good as Boys” Implies Boys Are Better, But Only in the Absence of Explicit Awareness

**Evan Doherty (e\_doherty@coloradocollege.edu)**

Department of Psychology, Colorado College  
14 E. Cache La Poudre St., Colorado Springs, CO 80903, USA

**Stephen J. Flusberg (stephen.flusberg@purchase.edu)**

Department of Psychology, SUNY Purchase College  
735 Anderson Hill Rd., Purchase, NY 10577, USA

**Kevin J. Holmes<sup>1</sup> (kjholfmes@reed.edu)**

Department of Psychology, Reed College  
3203 SE Woodstock Blvd., Portland, OR 97202, USA

<sup>1</sup>This work was completed while K.J.H. was at Colorado College.

## Abstract

The statement “Girls are as good as boys at math” appears to express gender equality, but research has shown that people infer a gender difference from such statements: the group in the complement position (boys) is judged to be superior. Are people aware that the syntax of these statements influences their judgments and do these framing effects generalize to other groups and inferences? We addressed these questions by replicating and extending previous work, showing that (1) syntactic framing effects extend to politically charged inferences about religious groups and terrorism, and (2) a majority of people recognize subject-complement statements as influential in their judgments, but framing effects are found only in those who *fail* to recognize this influence. Those who *do* cite this syntax as influential tend to show a *reverse* framing effect, suggesting they may be sensitive to the bias implicit in such statements and consciously act to resist it.

**Keywords:** language; syntax; framing; gender; terrorism

## Introduction

“Girls are just as good at math as boys” (Rahhal, 2019). This news headline—from an online article describing an fMRI study that revealed gender similarities in the neural processing of math in young children (Kersey, Csumitta, & Cantlon, 2019)—appears to express that girls and boys have equal math skills. However, Chestnut and Markman (2018; henceforth, C&M) found that statements of gender equality with this subject-complement structure—which frames the gender in the complement position as the reference point (Tversky, 1977)—lead people to infer a gender *difference*; in this case reinforcing the common stereotype that boys are better at math.

In C&M’s experiments, participants read several subject-complement statements describing scientific evidence for gender equality in math or verbal ability, with girls and boys in the subject and complement positions, respectively (e.g., “girls performed as well as boys”), or vice versa (“boys performed as well as girls”). Participants consistently attributed more ability to the gender in the *complement* position, suggesting that this syntactic structure can either

perpetuate stereotypes (e.g., when boys are the reference point in statements about math ability) or combat them (e.g., when girls are the reference point in such statements). A follow-up experiment suggested that people are unaware of the implicit messages transmitted by these statements. When explicitly asked whether “Girls do just as well as boys at math” is biased against girls, for example, participants judged this statement to be relatively unbiased.

The apparent covertness of the effects of subject-complement statements mirrors framing effects for other linguistic information, which have been shown to be similarly subtle. For example, Thibodeau and Boroditsky (2011) found that the metaphor used to describe crime (“beast” or “virus”) influenced people’s preferred crime mitigation strategies, yet the vast majority of participants (~95% across four experiments) cited seemingly more substantive information (e.g., crime statistics), rather than the metaphor, as the rationale for their judgments. In another study, Thibodeau and Boroditsky (2013) found that less than half of participants were able to recall which crime metaphor they had seen minutes earlier, yet they were affected by the metaphor just as much as participants who could recall it.

Compared to metaphors, however, subject-complement statements may be more salient and memorable because they typically communicate the most important information in a speaker’s message or a writer’s report (as in the headline that begins this paper). As a result, after reading a report that begins with “Girls are as good at math as boys,” people might be more likely to recall this statement and consciously draw on it when asked to judge which gender is more naturally skilled at math. Note, though, that C&M found that people perceived such statements to be *unbiased* when they were explicitly asked to judge them. As a result, people who *do* consciously reference these statements when judging math ability might *not* show the expected syntactic framing effect—in other words, they might not actually attribute more ability to the gender in the complement position, either because they interpret the statements as

expressing equality, or else because they recognize the bias against girls implicit in the “girls equal boys” frame and subsequently try to mitigate against it in their judgments. If this were the case, then it would imply that the syntactic framing effect observed by C&M is driven by the minority of people for whom the influence of subject-complement statements is covert—that is, people who do not explicitly indicate that these statements influenced their judgments.

Across three experiments, we investigated whether the effects of subject-complement statements are (1) moderated by explicit awareness of their influence on judgments, and (2) generalize to other politically charged comparisons. Our first study was a replication of one of C&M’s experiments, in which participants read summaries of actual scientific evidence showing no gender difference in math ability, but with either “boys” or “girls” framed as the reference point in subject-complement statements of equality. Participants then judged which gender is more naturally skilled at math. To assess whether the expected syntactic framing effect—attributing more ability to the gender in the complement position—is moderated by explicit awareness, we also asked participants to indicate which part of the summary was most influential in their judgment (cf. Thibodeau & Boroditsky, 2011, 2013).

In Experiment 2, we examined whether syntactic framing effects, assessed via judgments of *ability* in C&M’s experiments and in Experiment 1, extend to judgments of the *propensity to engage in certain kinds of behavior*—in this case, to commit terrorist acts. In our post-9/11 U.S. society, there are pervasive stereotypes about who is most likely to be a terrorist, with many believing (erroneously) that Muslims commit more terrorist acts than members of other religious groups (Sides & Gross, 2013). Participants in Experiment 2 read summaries of actual terrorism data that framed either Muslims or Christians as the reference point in subject-complement statements of equality regarding the two groups’ propensity to commit terrorist acts. Participants then judged which group is more likely to commit such acts and indicated which part of the summary was most influential in their judgment.

For the first two experiments, we preregistered our methods and analysis plans, but our analyses of the moderating effect of explicit awareness were exploratory. Experiment 3 was a high-powered replication of the first two experiments, with all participants judging both math ability and terrorist likelihood after reading subject-complement statements in the respective domain. For this final experiment, all methods and analyses (including those assessing the role of explicit awareness) were preregistered.<sup>1</sup>

---

<sup>1</sup> Our preregistrations for all three experiments (anonymized until this work is accepted for journal publication) can be found on AsPredicted: <http://aspredicted.org/blind.php?x=g8ni9z> (Experiment 1); <http://aspredicted.org/blind.php?x=ww9a7g> (Experiment 2); <http://aspredicted.org/blind.php?x=m8j285> (Experiment 3).

## Experiment 1: Math Ability

Following C&M, we predicted that after reading subject-complement statements of gender equality in math ability, participants would attribute more ability to the gender in the complement position. If so, statements with “boys” in the complement position should yield attributions similar to baseline beliefs (reflecting the common gender stereotype about math), but statements with “girls” in the complement position should reduce the tendency to attribute more ability to boys, relative to baseline. We also explored whether these effects differed in participants who cited the subject-complement statements as most influential in their judgments and those who did not.

In addition, we investigated whether the effects of subject-complement statements depend on the *genericness* of the statements. C&M’s statements included a mix of generic language (e.g., “girls are as good as boys at math”—a claim about boys and girls *in general*) and non-generic language (e.g., “[researchers] found that girls performed as well as boys in grades two through eleven”—a statement about a *specific* study finding). Previous research suggests that findings are perceived as more important when phrased generically than non-generically (DeJesus et al., 2019), so subject-complement statements may be more likely to elicit framing effects when they are generic. We found no reliable effects of genericness across our experiments, however, so due to space constraints we do not address these analyses in our results or discussions.

## Method

**Participants** A total of 338 English-speaking Amazon Mechanical Turk (MTurk) workers from the U.S. (age:  $M = 36$ ; range = 18-72; 186 men, 152 women) participated for \$0.30. This sample size gave us > 99% power to detect the smallest of C&M’s effects.

**Materials and Procedure** Participants were randomly assigned to one of five conditions: *Baseline* ( $n = 72$ ), *Boys=Girls Generic* ( $n = 67$ ), *Girls=Boys Generic* ( $n = 68$ ), *Boys=Girls Non-Generic* ( $n = 67$ ), or *Girls=Boys Non-Generic* ( $n = 64$ ). In the *Baseline* condition, participants simply judged which gender (girls or boys) they thought was more naturally skilled at math, and then rated how confident they were in their judgment using a sliding scale (0 = not at all confident; 100 = very confident).

In the *Girls=Boys Generic* condition, these questions were preceded by an adapted version of C&M’s summary of a large-scale math study. The summary contained three statements of gender equality phrased in generic language, each with “boys” in the complement position: “Girls Equal Boys at Math” (in the headline), “girls do just as well as boys at math,” and “girls perform as well as boys.” Following the forced-choice and confidence rating questions, participants were asked to indicate the part of the summary that was most influential in their judgment (by copying and pasting it into a text box) and any other information they relied on for their judgment.

The *Girls=Boys Non-Generic* condition was identical to its *Generic* counterpart, except that the subject-complement statements contained cues suggesting that the findings might not be generalizable, including past tense and the word “most” (cf. DeJesus et al., 2019). Thus, in the *Girls=Boys Non-Generic* condition, the three statements of equality were “Girls Equaled Boys at Math,” “most boys did just as well as most girls at math,” and “the boys performed as well as the girls.” The *Boys=Girls Generic* condition and the *Boys=Girls Non-Generic* condition were identical to their *Girls=Boys* counterparts, except that “girls” was in the complement position in the three statements of equality.

Participants were debriefed regarding the subtle biases in our linguistic stimuli at the end of all three experiments. Methods were approved by the Colorado College IRB.

## Results

Judgments in the *Baseline* condition reflected the common gender stereotype, with 67% of participants attributing more natural math ability to boys ( $SE = 6\%$ )—a value greater than chance (binomial sign test:  $p = .006$ ).

**Preregistered Analyses** Following C&M, we analyzed the binary responses using logistic regression models with condition as a categorical predictor. Below we report odds ratios (OR) for the Wald tests in the models, which indicate the relative likelihood of selecting “boys” in a given condition (e.g., an OR of 0.5 indicates that participants were half as likely to select “boys” in the condition of interest than in the reference condition).<sup>2</sup>

To test whether judgments varied by condition, we conducted a set of planned contrasts comparing each syntax condition to the *Baseline* condition. As shown in Figure 1, the results replicated C&M. Whereas participants in the *Girls=Boys* conditions chose “boys” at rates similar to baseline (58%,  $SE = 4\%$ ,  $OR = .70$  [95% CI: .38 to 1.28],  $p = .24$ ), those in the *Boys=Girls* conditions showed the reverse pattern, choosing “boys” significantly less often than baseline (37%,  $SE = 4\%$ ,  $OR = .30$  [.16 to .54],  $p < .001$ ).

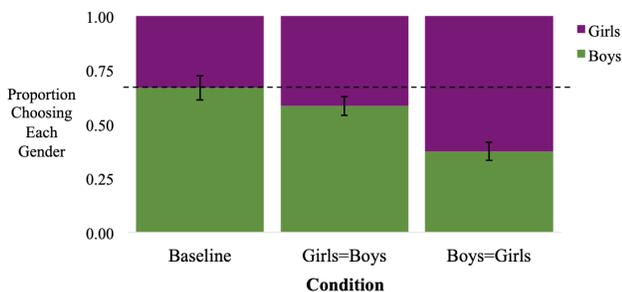


Figure 1. Overall responses in Experiment 1, reflecting the gender to whom participants attributed more natural math ability. Error bars in all figures represent  $\pm 1 SE$ .

<sup>2</sup> For all three experiments, we also computed weighted responses by multiplying the binary responses (boys/Muslims = 1, girls/Christians = -1) by the confidence ratings (0-100). Because the weighted responses showed the same patterns as the binary responses across all experiments, we report only the latter.

**Exploratory Analyses** To explore whether these effects were moderated by explicit awareness, we coded participants’ rationales for their judgments in the syntax conditions as “cited syntax” if they contained one or more of the subject-complement statements. Across conditions, the majority of participants (76%) cited the syntax. We used a logistic regression model with condition (*Girls=Boys* vs. *Boys=Girls*), cited syntax (yes vs. no), and the interaction of these factors as predictors of the binary responses. Notably, there was a significant interaction,  $OR = .36$  [.17 to .76],  $p = .008$ , indicating that the framing effect of the subject-complement statements depended on whether participants cited them in their rationale.

To unpack this interaction, we ran separate logistic regression models (with condition as the sole predictor) on the responses of participants who cited and did not cite the syntax. For those who did not cite the syntax, there was a significant syntactic framing effect: participants in the *Girls=Boys* conditions (92%,  $SE = 5\%$ ,  $n = 37$ ) were far more likely than those in the *Boys=Girls* conditions (48%,  $SE = 10\%$ ,  $n = 27$ ) to attribute more natural math ability to boys,  $OR = 12.21$  [3.01 to 49.55],  $p < .001$ . In contrast, for participants who cited the syntax, there was no framing effect: participants in the *Girls=Boys* conditions (45%,  $SE = 5\%$ ,  $n = 95$ ) and *Boys=Girls* conditions (35%,  $SE = 5\%$ ,  $n = 107$ ) responded similarly,  $OR = 1.56$  [.89 to 2.76],  $p = .12$  (see Figure 2). Thus, the framing effect observed across the full sample was driven by the relatively small subset of participants (24%) who did not indicate that the subject-complement statements were influential in their judgments.

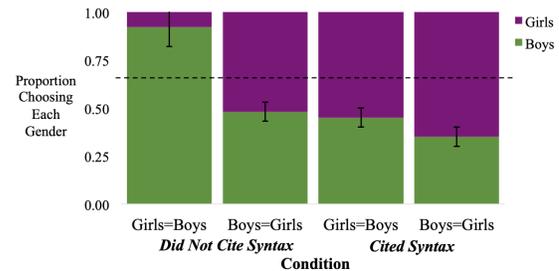


Figure 2. Responses in Experiment 1, separated by condition and whether or not participants cited the syntax. Dotted line = baseline.

## Discussion

Overall, the results of Experiment 1 replicated C&M. After reading subject-complement statements of equality, participants attributed more natural math ability to the gender in the complement position—thus reinforcing the common gender stereotype (when *Girls=Boys*) or refuting it (when *Boys=Girls*).

However, our exploratory analyses add another wrinkle to these effects. In their rationales, more than three-quarters of participants cited the subject-complement statements as most influential in their judgments, yet these participants were no more likely to judge boys as the more skilled gender when “boys” was in the complement position than in the subject position. This finding suggests that those who

cited the subject-complement statements as influential may have interpreted them at face value, as expressions of gender equality. Another possibility—suggested by these participants’ tendency to attribute more math ability to *girls* regardless of syntactic frame (see Figure 2)—is that they recognized the bias against girls implicit in the *Girls=Boys* frame and consciously resisted it in their judgments. We consider these possibilities further in our discussion of the remaining experiments.

The expected syntactic framing effect was observed only in the roughly one-quarter of participants who did not cite the subject-complement statements as influential, implying that they drove the pattern seen across the full sample. Thus, it appears that the implications of subject-complement statements must be relatively covert for such statements to affect people’s judgments. Explicit recognition of the influence of such statements seems to eliminate their effects.

## Experiment 2: Terrorism

In Experiment 2, we investigated whether syntactic framing effects extend to more incendiary judgments of the propensity to commit terrorist acts. Here the subject-complement statements ostensibly expressed that Muslims and Christians are equally likely to be terrorists, but following the results of Experiment 1, we expected that participants would judge the group in the complement position as *more* likely. Of interest as well was whether this effect would again be moderated by explicit awareness.

### Method

**Participants** A total of 340 English-speaking U.S. MTurk workers (age:  $M = 37$ ; range = 19-75; 179 men, 160 women, 1 non-binary) participated for \$0.30.

**Materials and Procedure** Participants were randomly assigned to one of five conditions mirroring those of Experiment 1: *Baseline* ( $n = 72$ ), *Muslims=Christians Generic* ( $n = 66$ ), *Christians=Muslims Generic* ( $n = 67$ ), *Muslims=Christians Non-Generic* ( $n = 67$ ), or *Christians=Muslims Non-Generic* ( $n = 68$ ). The procedure was analogous to that of Experiment 1. Participants in the syntax conditions read a summary of a fictional large-scale terrorism study derived from actual data on terrorism (PIRUS, 2019). The summary in the *Muslims=Christians Generic* condition was as follows (the three statements of equality are underlined here):

**Recent Study: Muslims Equal Christians in Terrorist Acts**

*A recent study has shown that Muslims are just as likely as Christians to commit terrorist acts. At the non-partisan Nation Institute, a team of researchers analyzed religiously motivated acts of violence and intimidation committed by hundreds of people in the United States from 1965 to 2015. Overall, they found that Muslims cause as many terror-related civilian deaths as Christians in major U.S. cities. A troubling finding from the study, however, is that there is no universal agreement on the definition of terrorism. The researchers worry that some government agencies, as a result, may fail to develop effective counterterrorism policies.*

The *Muslims=Christians Non-Generic* condition was identical to its *Generic* counterpart, except that the subject-complement statements were “Muslims Equaled Christians in Terrorist Acts,” “some Muslims were just as likely as some Christians to commit terrorist acts,” and “the Muslims caused as many terror-related civilian deaths as the Christians.” The *Christians=Muslims Generic* condition and the *Christians=Muslims Non-Generic* condition were identical to their *Muslims=Christians* counterparts, except that “Muslims” was in the complement position in the three statements of equality.

After reading the summary, participants judged which religious group (Muslims or Christians) is more likely to be terrorists (“Based on these findings, who do you think are more likely to be terrorists?”), rated their confidence in their answer, and provided a rationale for their judgment as in Experiment 1. The *Baseline* group answered only the terrorist likelihood and confidence questions.

### Results

In the *Baseline* condition, 76% of participants judged Muslims as more likely to be terrorists ( $SE = 5\%$ ), which was greater than chance (binomial sign test:  $p < .001$ ). These results align with the common U.S. stereotype.

**Preregistered Analyses** We analyzed the binary responses as in Experiment 1. Planned contrasts showed that participants chose “Muslims” less often in the syntax conditions than baseline, which was expected for the *Muslims=Christians* conditions (56%,  $SE = 4\%$ ,  $OR = .40$  [.21 to .76],  $p = .005$ ), but not for the *Christians=Muslims* conditions (49%,  $SE = 4\%$ ,  $OR = .30$  [.16 to .56],  $p < .001$ ). As shown in Figure 3, participants chose “Muslims” descriptively less often when Muslims were in the complement position than in the subject position, providing no evidence for a syntactic framing effect overall.

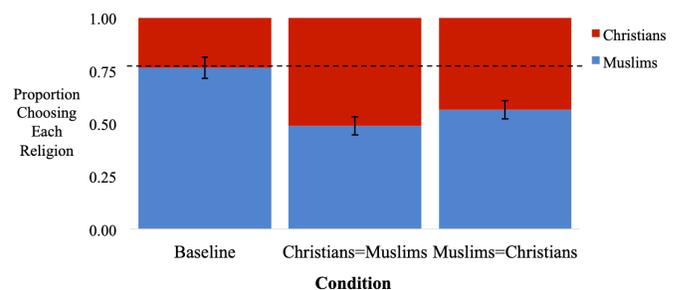


Figure 3. Overall responses in Experiment 2, reflecting the religious group participants judged as more likely to be terrorists.

**Exploratory Analyses** In the syntax conditions, the majority of participants (68%) cited one or more subject-complement statements in their rationales. A logistic regression model with condition (*Christians=Muslims* vs. *Muslims=Christians*), cited syntax, and the interaction of these factors as predictors yielded a significant interaction,  $OR = .22$  [.12 to .39],  $p < .001$ , indicating that the effect of syntactic frame, though not observed overall, was

moderated by whether or not participants cited the syntax in their rationales.

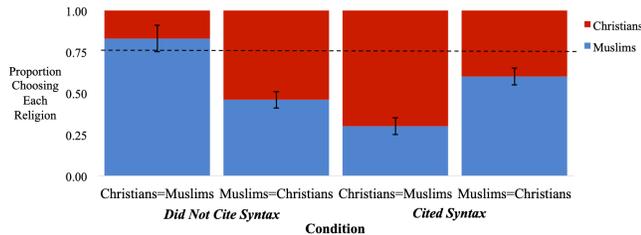


Figure 4. Responses in Experiment 2, separated by condition and whether or not participants cited the syntax. Dotted line = baseline.

For participants who did not cite the syntax, there was a syntactic framing effect in the expected direction: those in the *Christians=Muslims* conditions (83%,  $SE = 5\%$ ,  $n = 48$ ) were far more likely than those in the *Muslims=Christians* conditions (46%,  $SE = 8\%$ ,  $n = 37$ ) to choose “Muslims,”  $OR = 5.88 [2.17 \text{ to } 15.94]$ ,  $p < .001$ . In contrast, for participants who cited the syntax, there was a syntactic framing effect in the *opposite* direction: those in the *Muslims=Christians* conditions (60%,  $SE = 5\%$ ,  $n = 96$ ) were more likely than those in the *Christians=Muslims* conditions (30%,  $SE = 5\%$ ,  $n = 87$ ) to choose “Muslims,”  $OR = .28 [.15 \text{ to } .52]$ ,  $p < .001$  (see Figure 4). Thus, only the relatively small subset of participants (32%) who did not indicate that the subject-complement statements were influential judged the group in the complement position as more likely to be terrorists. Those who did indicate that the statements were influential judged the group in the *subject* position as more likely to be terrorists, contrary to the expected effect of syntactic frame.

## Discussion

Unlike Experiment 1, there was no overall syntactic framing effect in Experiment 2: participants judged Muslims and Christians as about equally likely to commit terrorist acts regardless of syntactic frame, contrary to the baseline belief that Muslims are more likely to commit such acts. However, our exploratory analyses showed a similar pattern to Experiment 1. The expected syntactic framing effect—judging the group in the complement position as more likely to be terrorists—was found only in the roughly one-third of participants who did *not* cite the subject-complement statements as influential in their judgments. These results provide further evidence for the covertness of such effects.

The other two-thirds of participants, in contrast, not only *failed* to show the expected syntactic framing effect, but actually showed a significant effect in the *opposite* direction. This reverse effect suggests that consciously attending to the subject-complement statements may lead people to appreciate the bias against (in this case) the group in the complement position (i.e., the group implied to be more typical of terrorists) and to consciously resist it by selecting the other group as the more likely wrongdoers.

Regardless of the explanation for this opposite framing effect, the results of Experiment 2 show that the expected effects of subject-complement statements generalize to judgments of behavioral propensity, but as in Experiment 1, only in people who fail to recognize this influence.

## Experiment 3: Confirmatory Replication

In our first two experiments, the moderating effect of explicit awareness was found in exploratory analyses. In Experiment 3, we preregistered analyses to confirm this effect, assessed effects in both domains (math and terrorism) via a repeated-measures design, and more than doubled our sample size to ensure a high-powered replication. Given the results of the first two experiments, we did not have strong predictions about the *overall* effect of syntactic framing, but we predicted an interaction between *frame* (condition) and *cited syntax* in each domain (i.e., we predicted the expected framing effect in those who did not cite the syntax, and no effect or a reverse effect in those who cited the syntax).

## Method

**Participants** A total of 752 English-speaking U.S. MTurk workers (age:  $M = 38$ ; range = 18-82; 406 men, 341 women, 5 non-binary) participated for \$0.50.

**Materials and Procedure** One-third of participants ( $n = 260$ ) were assigned to the *Baseline* condition for both domains (math and terrorism), and the other two-thirds ( $n = 492$ ) were assigned to one of the two syntax conditions for each domain. Participants received all stimuli and answered all questions for one domain before the other, with order counterbalanced. All of the subject-complement statements used generic language. The procedure was otherwise identical to that of the previous experiments.

## Results

The *Baseline* condition replicated the previous experiments: 67% of participants attributed more natural math ability to boys ( $SE = 3\%$ ), and 73% judged Muslims as more likely to be terrorists ( $SE = 3\%$ ). Both values were greater than chance (binomial sign tests:  $ps < .001$ ).

**Preregistered Analyses** As in the first two experiments, the majority of participants in the syntax conditions cited one or more subject-complement statements in their rationales for both domains (math: 70%; terrorism: 71%).

We analyzed the binary responses in the syntax conditions separately for each domain, using logistic regression models with condition, cited syntax, and the interaction of these factors as predictors. For both domains, the interaction was significant (math:  $OR = .09 [.03 \text{ to } .23]$ ,  $p < .001$ ; terrorism:  $OR = .18 [.07 \text{ to } .43]$ ,  $p < .001$ ), indicating that the syntactic framing effect for each domain was moderated by whether or not participants cited the subject-complement statements in their rationales. Below we unpack each interaction by separately analyzing the responses of participants who cited and did not cite the syntax, as in the previous experiments.

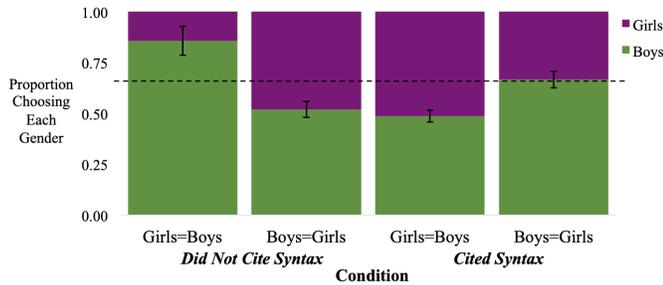


Figure 5. Responses in Experiment 3 for the math domain, separated by condition and whether or not participants cited the syntax. Dotted line = baseline.

**Math** Participants who did not cite the syntax showed the expected syntactic framing effect, replicating Experiment 1: those in the *Girls=Boys* condition (86%,  $SE = 4\%$ ,  $n = 69$ ) were far more likely to choose “boys” than those in the *Boys=Girls* condition (52%,  $SE = 7\%$ ,  $n = 54$ ),  $OR = 5.48$  [2.32 to 12.91],  $p < .001$ . In contrast, participants who cited the syntax showed a framing effect in the opposite direction: those in the *Boys=Girls* condition (66%,  $SE = 3\%$ ,  $n = 194$ ) were more likely to choose “boys” than those in the *Girls=Boys* condition (49%,  $SE = 4\%$ ,  $n = 175$ ),  $OR = .48$  [.31 to .73],  $p = .001$  (see Figure 5).

**Terrorism** For participants who did not cite the syntax, the framing effect trended in the expected direction, as in Experiment 2: those in the *Christians=Muslims* condition (80%,  $SE = 5\%$ ,  $n = 75$ ) were descriptively more likely to choose “Muslims” than those in the *Muslims=Christians* condition (67%,  $SE = 6\%$ ,  $n = 67$ ),  $OR = 1.96$  [.91 to 4.19],  $p = .08$ . In contrast, participants who cited the syntax showed a framing effect in the opposite direction, replicating Experiment 2: participants in the *Muslims=Christians* condition (61%,  $SE = 4\%$ ,  $n = 177$ ) were more likely to choose “Muslims” than those in the *Christians=Muslims* condition (35%,  $SE = 4\%$ ,  $n = 173$ ),  $OR = .35$  [.23 to .54],  $p < .001$  (see Figure 6).

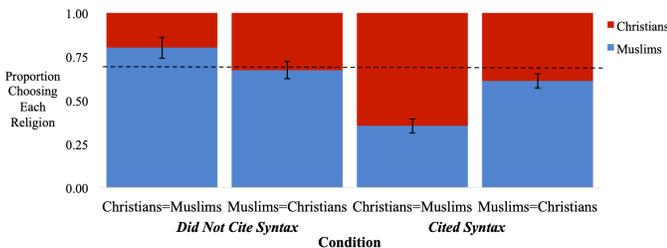


Figure 6. Responses in Experiment 3 for the terrorism domain, separated by condition and whether or not participants cited the syntax. Dotted line = baseline.

## Discussion

The results of Experiment 3 largely replicated the pattern of findings we observed in Experiments 1 and 2. For both the math and terrorism domains, we only observed the expected syntactic framing effect for the roughly 30% of participants who did not cite the syntax as influencing their judgments. For those who did cite the syntax, we observed the reverse

framing effect, with participants perceiving the group in the subject position as superior at math or more likely to commit terrorist acts. This supports the possibility that these participants may be sensitive to the bias implicit in these statements, and to consciously resist it in their judgments.

## General Discussion

Although statements like “Girls are as good at math as boys” appear to express gender equality, C&M showed that people infer a gender difference from such statements; namely, the group in the complement position (in this case, “boys”) is judged to be superior. Across three experiments, we replicated and extended this work, identifying a key moderator: whether or not people explicitly indicate that this subject-complement syntax was influential in their decision-making. On the one hand, that we observed such similar patterns of syntactic framing in two vastly different domains (math ability versus propensity to commit terrorist acts) speaks to the generalizability of these effects. On the other hand, the reliable moderating role of (not) explicitly citing the syntax as influential places some limits on C&M’s conclusions, suggesting that these effects are not as pervasive as previously assumed.

Interestingly, we consistently observed that those who *did* cite the syntax as influential in our studies tended to show, if anything, a *reverse* framing effect. This may suggest they are sensitive to the bias implicit in subject-complement statements and consciously acting to resist it, or they may simply be interpreting the statements at face value as expressions of equality (oblivious to the bias). In future work, we will disentangle these possibilities by asking participants to explicitly judge whether the statements are biased against one group (as in C&M’s follow-up study). Although C&M found that participants believed the statements to be relatively unbiased overall, those who cite the syntax as influential might be more likely to detect bias in the statements than those who do not. Such participants might also be more likely to hold prior beliefs that run counter to the bias, as indexed by demographic variables that predict endorsement of the relevant stereotypes (e.g., religious or political affiliation).

While C&M concluded that subject-complement statements intended to express equality can backfire by implying that boys are naturally more talented than girls at math (or in our case, that Muslims are more likely than Christians to be terrorists), our findings suggest that these statements will only backfire when people do not stop and consider their implications. When people think carefully about what these statements mean, they may be less susceptible to perpetuating the stereotypes subtly transmitted by them.

## References

- Chestnut, E. K., & Markman, E. M. (2018). “Girls are as good as boys at math” implies that boys are probably better: A study of expressions of gender equality. *Cognitive Science*, 42, 2229-2249.

- DeJesus, J. M., Callanan, M. A., Solis, G., & Gelman, S. A. (2019). Generic language in scientific communication. *Proceedings of the National Academy of Sciences, 116*, 18370-18377.
- Kersey, A. J., Csumitta, K. D., & Cantlon, J. F. (2019). Gender similarities in the brain during mathematics development. *npj Science of Learning, 4*, 19.
- PIRUS (*Profiles of Individual Radicalization in the United States*). National Consortium for the Study of Terrorism and Responses to Terrorism. Retrieved from <https://start.umd.edu/data-tools/profiles-individual-radicalization-united-states-pirus>
- Rahhal, N. (2019). Girls are just as good at math as boys, finds brain imaging study. *DailyMail.com*. Retrieved from <https://www.dailymail.co.uk/health/article-7662639/Girls-just-good-math-boys-finds-brain-imaging-study.html>
- Sides, J., & Gross, K. (2013). Stereotypes of Muslims and support for the War on Terror. *The Journal of Politics, 75*, 583-598.
- Thibodeau, P. H., & Boroditsky, L. (2011). Metaphors we think with: The role of metaphor in reasoning. *PLOS ONE, 6*, e16782.
- Thibodeau, P. H., & Boroditsky, L. (2013). Natural language metaphors covertly influence reasoning. *PLOS ONE, 8*, e52961.
- Tversky, A. (1977). Features of similarity. *Psychological Review, 84*, 327-352.