Preregistration: Bayesian Analysis for the Gender, Status, and Emotions Project

Suzanne Hoogeveen & Julia Haaf

10/15/2020

Overview

We outline a Bayesian analysis for the gender-and-anger backlash effect of Study 1 in the Gender, Status, and Emotion project: We will construct various hierarchical models that reflect the predictions from the proposed theories. The evidence for each of these different theories will be quantified by Bayes factor model comparison, following the approach by Haaf & Rouder (2017) and Rouder, Haaf, Davis-Stober, & Hilgard (2019). In addition, we will adopt a multiverse approach in which we assess evidence for various a priori specified alternative analysis paths related to exclusion criteria (Steegen, Tuerlinckx, Gelman, & Vanpaemel, 2016).

The effect

This work involves a high-powered replication of the gender-and-anger backlash effect (Brescoll & Uhlmann, 2008): whereas angry men in a professional context are accorded higher status, angry women are accorded lower status, compared to sad men and sad women, respectively. In addition to attempting to replicate this key effect, various theory-based alternative perspectives are compared. To this end, several moderator variables are added to the design.

Dependent variable

1. status conferral (1-11 scale)

Main Independent Variables

1. target gender (male vs. female)
2. emotion (anger vs. sadness)
3. culture (West vs. East)

Theoretical Perspectives

1. The *Gender Stereotyping* perspective predicts female managers suffer backlash and decrements in status for expressing anger because they have violated implicit prescriptive norms (Brescoll & Uhlmann, 2008).
2. The *Status Signaling* perspective predicts that anger projects dominance and status for both men and women.
3. The *Cultural Change* perspective predicts that anger expressions lead to favorable evaluations of women relative to men, due to exposure to feminist messages and the #MeToo movement. (Effects are driven by internal motivations related to gender inequality.)
4. The *Study Savviness* perspective similarly predicts that angry women are favorably evaluated, but due to awareness of the study topic, external motivation not to appear prejudiced, and previous research experience. This should specifically apply to male participants, as they may be concerned about

appearing sexist. (Effects are driven by external motivations related to self-presentation of not being sexist.)
5. The *Cultural Differences* perspective predicts that anger may have positive effects in Western cultures but negative effects in harmony-oriented Eastern cultures.

These theoretical perspectives lead to the following predictions:

1. Anger increases status conferral to male targets across all cultures, and decreases status conferral to female targets across all cultures.
2. Anger increases status conferral to all targets across all cultures.
3. Anger increases status conferral to female targets only, across all cultures, and female targets are generally accorded more status.
4. Anger increases status conferral to female targets only, across all cultures, and female targets are generally accorded more status.
5. Anger increases status conferral to all targets, for all raters in Western societies, and decreases status conferral to all targets, for all raters in Eastern societies.

Follow-up Analyses

In addition to the main tests of the theoretical perspectives, we will look at the following factors in follow-up tests:

- main effect of target gender: are male or female targets generally accorded more status?
- gender of the rater: do male and female raters differentially display the main effects or interactions derived from the theoretical perspectives (e.g., do male or female raters particularly show gender stereotyping effects or reversed gender biases?)
- individual differences: what are the effects of workplace gender beliefs, sexist beliefs, #MeToo exposure, internal motivation to respond without sexism, external motivation to respond without sexism, study experience (number of research studies participated in, participanted in similar study (yes/no), psychology course taken(yes/no)), suspicion (hypothesis about gender (yes/no), influenced by gender, influenced by emotion).
- for the best-performing model, we will additionally investigate whether effects differ per lab (i.e., a random effects model).

These individual difference moderations will be used to distinguish between perspective 3 and 4, which predict the same overall pattern of responses, yet driven by different differences (see below). In addition, the moderator analyses will serve to further unpack what individual differences are related to the observed effects. These moderators are expected to be related to the target gender effect, as they should specifically affect status conferral to women (vs. men). Therefore, moderators will be included as an interaction with gender.

Moderators for individual differences

1. No moderators
2. No moderators
3. Internal motivations related to gender inequality. This construct is relevant to theory 3. The main idea is that raters who are aware of and hold strong beliefs about the presence of gender inequality apply reversed gender stereotyping (favorably evaluating women).
    a. Beliefs about gender inequality in the workplace (5 items) predict more status conferral to female targets
    b. Sexist beliefs (3 items) predict less status conferral to female targets
    c. Exposure to #MeToo movement (6 items) predicts more status conferral to female targets
    d. Internal motivation to respond without sexism (3 items) predicts more status conferral to female targets.
4. External motivation related to self-presentation. This construct is relevant to theory 4. The main idea is that raters who are concerned about coming off as sexist apply reversed gender stereotyping (favorably evaluating women).

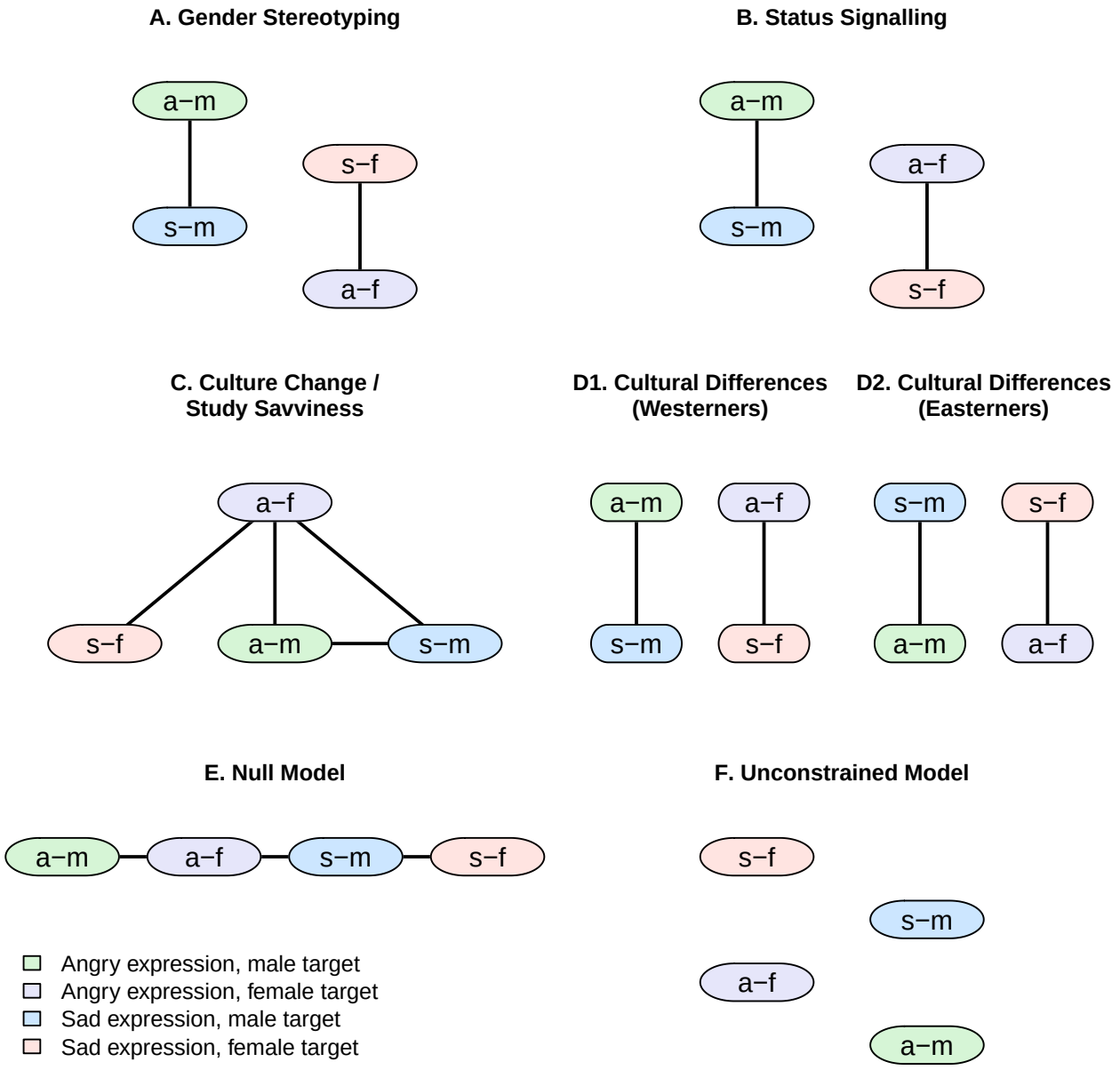

Figure 1: Theoretical positions are captured with order-constraints on cell means. Cells labeled 'a-m' correspond to the condition with an angry expression and a male target, cells labeled 's-m' correspond to the condition with a sad expression and a male target, cells labeled 'a-f' correspond to the condition with an angry expression and a female target, cells labeled 's-f' correspond to the condition with a sad expression and a female target. **A.** Gender Stereotyping model. **B.** Status Signalling model. **C.** Cultural Change / Study Savviness model. **D.** Cultural Differences model for Westerners (D1) and for Easterners (D2). **E.** Null model. **F.** None-of-the-above alternative model where all orderings of cell means are possible.

   a. External motivation to respond without sexism (3 items) predicts more status conferral to female targets
   b. Number of research studies participated in predict more status conferral to female targets
   c. Participation in similar study (yes/no) predicts more status conferral to female targets
   d. Psychology course taken (yes/no) predicts more status conferral to female targets
   e. Suspicion about hypothesis being about gender (yes/no) predicts more conferral to female targets
   f. Awareness of being influenced by target gender (1-9 scale) predicts more conferral to female targets
   g. Awareness of being influenced by target emotion (1-9 scale) predicts more conferral to female targets
5. No moderators

Multiverse Analysis

The multiverse approach allows us to assess the evidence across multiple potential sets of sample compositions, without a priori committing to any particular set of exclusion criteria or variable specifications (Steegen et al., 2016). Nevertheless, for the primary analysis, we propose to include everyone who completed the relevant measures. Although for individual variables there are often exclusion criteria that might be preferred by researchers in the field for theoretical reasons (e.g., excluding subjects with less English experience or who fail to correctly recall the target gender), in practice, when many simultaneous exclusions are made the sample size can drop dramatically. In this case, effect size estimates may be inaccurate, it may not be possible to make any inference because of low sensitivity, and concerns are raised about differential attrition across conditions potentially confounding the results. Thus there is a principled case to be made on behalf of an intent-to-treat approach, in which few to no observations or participants are excluded (Gupta, 2011; McCoy, 2017). We consider the intent-to-treat principle a conservative but valuable approach that can be one key part of a multiverse analysis.

Variables to include in the multiverse

Exclusion criteria

- English fluency.

1. Include everyone regardless of years of English experience (or other language in which the survey is administered)
2. Exclude participants with less than 5 years of English experience (or other language in which the survey is administered)

- Manipulation check.

1. Exclude no one based on the manipulation check.
2. Exclude participants who did not correctly recall the target gender

- Straigthlining.

1. Exclude no one based on pattern of responding
2. Exclude participants who always selected the same option on all items within each of the 5 scales

In total, there will be $2 \times 2 \times 2 = 8$ conditions for the multiverse analysis.

To assess whether we want to do an exclusion or no exclusion at all we suggest to only analyze the level if there is less than 95% overlap with other levels. We assume that otherwise the exclusions will not have a meaningful effect on the results.

For the scales: items will be dropped when alpha $< .40$ until alpha $> .40$.

Moderator scales

1. News exposure scale (1-7 Likert scale)

- How frequently do you read news articles?
- To what extent are you familiar with the #MeToo movement?
- How often have you come across news articles about gender discrimination in the workplace?
- How much exposure have you had to online commentary (e.g., Twitter, Facebook, etc) alleging biases against women in professional settings?
- How much exposure have you had to mainstream news coverage (e.g., newspapers, television news programs) alleging biases against women in professional settings?
- To what extent have you been actively following the #MeToo movement?

2. Internal motivation to respond without sexism (1-7 Likert scale)

- I am personally motivated by my beliefs to be nonsexist toward women.
- Being nonsexist toward women is important to my self-concept.
- Because of my personal values, I believe that using stereotypes about women is wrong.

3. External motivation to respond without sexism (1-7 Likert scale)

- Because of today's PC (politically correct) standards I try to appear nonsexist toward women.
- I try to hide any negative thoughts about women in order to avoid negative reactions from others.
- I attempt to appear nonsexist toward women in order to avoid disapproval from others.

4. Beliefs about gender in the workplace (1-7 Likert scale)

- Women are more likely to be passed over for assignments in the workplace than men are
- Women experience more instances of bias in the workplace than men do
- Men tend to get more opportunities than women do in the workplace
- Do you believe there is more bias against women or against men in professional settings, limiting their chances for advancement?
- Female managers face systematic gender discrimination in today's workplaces.

5. Sexist beliefs (1-7 Likert scale)

- It's a fact that men are better suited for some jobs than are women.
- Sometimes it's the objective thing to do to hire a man rather than a woman.
- It's a fact that men are better suited than women for the type of work the candidate

Model Specification and Predictions

Prior settings

We think small effects in the predicted direction may still be meaningful. We therefore propose to use a scale of 0.25 for the effect of interest. A scale of 0.25 assumes an size effect that is 25% of the sampling noise (standard deviation), which is generally considered a small effect. For the variation between countries/labs we use a setting of 60% of the overall size of the effect, which means a scale of 0.15.

General Model Structure

We will use Bayesian hierarchical modeling with participants nested in countries/labs. We will first construct an unconstrained model that includes all main parameters from the separate theories, which are free to vary in size and direction. In the primary analysis, we will used different ordinal constraints to capture the different theoretical predictions (see below). Bayes factor model comparison will be used to compare the models and determine what theory best predicts the empirical data. This method is based on the work by Haaf, Klaassen, & Rouder (2018).

Theoretical Predictions:

1. Null Model: angry men, sad men, angry women and sad women are all accorded equal status.

Let Y_{ijk} be the status rating of the ith lab, the jth participant in the kth target gender condition and the lth target emotion condition. Then

$$Y_{ijk} \sim N(\alpha_i, \sigma^2),$$

2. Gender Stereotyping: while angry men are accorded higher status than sad men, angry women are accorded lower status than sad women.

$$Y_{ijk} \sim N(\alpha_i + x_1\beta + x_2\gamma + x_3\theta, \sigma^2),$$

where α_i is the baseline status conferral rating for ith lab. Parameter β is the effect of the target gender, parameter γ is the effect of the target emotion, and parameter θ is the gender-by-emotion interaction effect. The indicator variables are x_1 (-1/2 for female targets and 1/2 for male targets), x_2 (-1/2 for sadness and 1/2 for anger), and x_3 (-1/2 for angry women and sad men, 1/2 for sad women and angry men).

The theoretical perspective does not put ordinal constraints on the main effects of gender and emotion, only on the interaction effect. Specifically, the cell mean of the angry men condition needs to be higher than the sad men condition and the cell mean of the sad women condition needs to be higher than the cell mean of the angry women condition. To meet this condition, the inequality constraints $\theta > 0$ and $\theta > \gamma$ and $\theta > -\gamma$ have to hold. (???? I think I'm too stupid for this...)

3. Status Signaling: angry men are accorded higher status than sad men and angry women are accorded higher status than sad women.

$$Y_{ijk} \sim N(\alpha_i + x_1\beta + x_2\gamma + x_3\theta, \sigma^2),$$

where α_i is the baseline status conferral rating for ith lab. Parameter β is the effect of the target gender, parameter γ is the effect of the target emotion, and parameter θ is the gender-by-emotion interaction effect. The indicator variables are x_1 (-1/2 for female targets and 1/2 for male targets), x_2 (-1/2 for sadness and 1/2 for anger), and x_3 (-1/2 for angry women and sad men, 1/2 for sad women and angry men).

The theoretical perspective requires that both angry men are accorded more status than sad men and that angry women are accorded more status than sad women. It does not put constraints on the main effect of gender and allows for an interaction effect. Specifically, the cell mean of the angry men condition needs to be higher than the sad men condition and the cell mean of the angry women condition needs to be higher than the cell mean of the sad women condition. To meet this condition, the inequality constraints $\gamma > 0$ and $\gamma > \theta$ and $\gamma > -\theta$ have to hold.

4. Culture Change/ Study Savviness: angry women are accorded more status than sad women, angry men and sad men. There is no effect of emotion for men.

$$Y_{ijk} \sim N(\alpha_i + x_1\beta + x_2\gamma, \sigma^2),$$

where α_i is the baseline status conferral rating for ith lab. Parameter β is the effect of emotion for female targets, parameter γ is the effect of angry women versus men (both sad and angry). The indicator variables are x_1 (-1/2 for sad female targets and 1/2 for angry female targets, and 0 for men) and x_2 (-1/3 for men, 2/3 for angry women and 0 for sad women).

The theoretical perspective entails that the cell mean of the angry women condition needs to be higher than the sad women condition and higher than the cell means of the angry men and the sad men conditions. To meet this condition, the inequality constraints $\beta > 0$ and $\gamma > 0$ have to hold.

5. Cultural Differences: in Western cultures, angry men and women are accorded more status than sad men and women, while in Eastern cultures, sad men and women are accorded more status than angry men and women.

$$Y_{ijk} \sim N(\alpha_i + x_1\beta + x_2\gamma + x_3\theta + x_4\delta + x_5\eta + x_6\zeta + x_7\omega, \sigma^2),$$

where α_i is the baseline status conferral rating for ith lab. Parameter β is the effect of the target gender, parameter γ is the effect of the target emotion, and parameter θ is the gender-by-emotion interaction effect. The indicator variables are x_1 (-1/2 for female targets and 1/2 for male targets), x_2 (-1/2 for sadness and 1/2 for anger), and x_3 (-1/2 for angry women and sad men, 1/2 for sad women and angry men). In addition, parameter δ is the effect of culture, parameter η is the culture-by-emotion interaction effect, parameter ζ is the culture-by-gender interaction effect, and parameter ω is the culture-by-gender-by-emotion threeway interaction. .....

The theoretical perspective entails that the cell mean of the angry women condition needs to be higher than the sad women condition and higher than the cell means of the angry men and the sad men conditions. To meet this condition, ...

5. Unconstrained model: all effects are included, without any ordinal constraints.

$$Y_{ijk} \sim N(\alpha_i + x_1\beta + x_2\gamma + x_3\theta + x_4\delta + x_5\eta + x_6\zeta + x_7\omega, \sigma^2),$$

   where α_i is the baseline status conferral rating for ith lab. Parameter β is the effect of the target gender, parameter γ is the effect of the target emotion, and parameter θ is the gender-by-emotion interaction effect. In addition, parameter δ is the effect of culture, parameter η is the culture-by-emotion interaction effect, parameter ζ is the culture-by-gender interaction effect, and parameter ω is the culture-by-gender-by-emotion three-way interaction.

(do we include culture effects here?) *Suus*

Questions:

1. I'm not sure at all how to specify the ordinal constraints for the cultural differences model...
2. I now just mentioned the moderator analyses, and the fact that they will be included as interactions with gender. Do we also have to write them out?

References

Brescoll, V. L., & Uhlmann, E. L. (2008). Can an Angry Woman Get Ahead?: Status Conferral, Gender, and Expression of Emotion in the Workplace. *Psychological Science*, *19*, 268–275. doi:10.1111/j.1467-9280.2008.02079.x

Gupta, S. K. (2011). Intention-to-treat concept: A review. *Perspectives in Clinical Research*, *2*, 109–112. doi:10.4103/2229-3485.83221

Haaf, J. M., Klaassen, F., & Rouder, J. N. (2018). Capturing Ordinal Theoretical Constraint in Psychological Science. *PsyArXiv*. doi:10.31234/osf.io/a4xu9

Haaf, J. M., & Rouder, J. N. (2017). Developing constraint in Bayesian mixed models. *Psychological Methods*, *22*, 779–798. doi:10.31234/osf.io/ktjnq

McCoy, C. E. (2017). Understanding the Intention-to-treat Principle in Randomized Controlled Trials. *Western Journal of Emergency Medicine*, *18*, 1075–1078. doi:10.5811/westjem.2017.8.35985

Rouder, J. N., Haaf, J. M., Davis-Stober, C. P., & Hilgard, J. (2019). Beyond overall effects: A Bayesian approach to finding constraints in meta-analysis. *Psychological Methods*, *24*, 606–621. doi:10.1037/met0000216

Steegen, S., Tuerlinckx, F., Gelman, A., & Vanpaemel, W. (2016). Increasing Transparency Through a Multiverse Analysis. *Perspectives on Psychological Science*, *11*, 702–712. doi:10.1177/1745691616658637