

The Influence of Generics on Inherent Reasoning and the Endorsement of Gender Stereotypes

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Abstract

The transition from descriptive regularities to prescriptive expectations is linked to the inherence heuristic (a cognitive shortcut attributing observed associations to inherent properties), reinforcing the perception of internal characteristics as defining features of social categories and contributing to gender stereotype endorsement. We investigated how inherent reasoning and moderating factors (i.e. generics and individual characteristics) influence the endorsement of gendered activities. Using a 3 (framing: generics vs. "most" vs. "some") × 2 (typicality: typical vs. countertypical gender associations) design, 241 French participants provided descriptive and prescriptive judgments about gendered associations, with justifications coded for inherence. Results showed that generic statements increased prescriptive judgments and reliance on inherent reasoning compared to "most" statements. Inherent justifications increased prescriptive judgments for typical and reduced them for countertypical gender associations. Inherent reasoning fully mediated the effect of generics on prescriptive judgments. These findings underscore the role of language and cognition in sustaining normative gender expectations.

Keywords: Inherence heuristic; Generics; Gender stereotypes; Social norms; Is-ought transition

Introduction

Gender stereotypes are deeply ingrained in society and significantly influence expectations about individual behaviors, affecting various aspects of life, including career choices and caring tasks (Master, 2021; Meeussen, Van Rossum, Van Laar, & Derks, 2022). For instance, competence alone does not ensure that a woman will advance to the same organizational level as an equivalently performing man (Heilman, 2001). Endorsing gender stereotypes can even be detrimental to health: men and women have been shown to have nutritional deficiencies due to differential meat and vegetable consumption (Feraco, et al., 2024; Rosenfeld & Tomiyama, 2021). Since protein consumption recommendations are not gender-based (European Commission, 2020; Nitsch, 2014), this discrepancy likely arises from social norms, particularly the association of meat with masculinity and vegetables with femininity (Stanley, Day & Brown, 2023; Nakagawa & Hart, 2019).

Gender stereotypes are normative, dictating what is appropriate, right, or ideal for each gender and discouraging behaviors that contradict assigned roles (Cosker-Rowland,

2024; Meeussen et al., 2022). The inference to transition from observations about reality (what is) to moral truths (what ought to be) was first identified by David Hume (1740/2000) as the is-ought transition. Empirical evidence supports this inclination (Eidelman et al., 2009). In multiple studies, college participants rated existing patterns (e.g., a certain set of graduation requirements) as "good," "right," and "the way things ought to be," even when presented with hypothetical alternatives that had potential benefits and negligible costs.

Recent research has explored the psychological mechanisms underpinning this inference, particularly the inherence heuristic (Hussak & Cimpian, 2015). This mental shortcut leads individuals to explain observed regularities based on inherent properties rather than external factors (Cimpian & Salomon, 2014). For example, since most mathematics prize winners are men (Castelvecchi, 2022), people might infer that men are naturally better at math (Cvencek, Meltzoff, & Greenwald, 2011), ignoring historical barriers that restricted women's access to the field (Heilman, 2001). This heuristic facilitates quick, intuitive justifications for societal patterns, reinforcing stereotypes by making them appear biologically driven and reducing motivation to challenge them (Cimpian & Salomon, 2014; Meyer & Gelman, 2016).

The disposition to rely on the inherence heuristic might be modulated by other factors, including language and particularly generics (Berio & Musholt, 2023). Generics express generalizations without specifying how many category members possess a given trait (Leslie, 2014). These statements are particularly influential in stereotype formation, as they encourage broad generalizations based on minimal evidence (Bosse, 2024; Gelman, 2021; Leslie, 2017). Because little evidence is needed to accept a generic statement, counterexamples fail to challenge them (e.g., "Girls have long hair" remains valid even if some girls have short hair; Cimpian, Brandone, & Gelman, 2010; Chambers et al., 2008). Such statements minimize within-category variability, promoting the perception that characteristics are intrinsic to the group (Noyes & Keil, 2019; Gelman & Roberts, 2017). Research also shows that generics carry normative force from childhood, with children reacting negatively to individuals who defy generically described

group norms (Gelman & Roberts, 2017; Haslanger, 2014). This normative dimension of generics has been widely discussed in recent philosophical literature, which argues that generics often blur the line between description and prescription by implying how group members ought to behave (Leslie, 2015; Hesni, 2021; Knobe, Prasada, & Newman, 2013; Lemeire, 2023). Thus, generic statements make stereotypes more resistant to counterexamples and contribute to their persistence across contexts and generations, making generics a good candidate to increase the reliance on the inherence heuristic.

Individual differences may also influence reliance on the inherence heuristic. Salomon and Cimpian (2014) developed a scale to measure individuals' propensity to reason inherently about random processes (e.g., "Why is a coin round?"). Additionally, moral commitment to gender equality may reduce reliance on the inherence heuristic by encouraging awareness of societal influences on gender roles (Xiao, Marie & Strickland, 2024). Conversely, greater identification with traditional gender roles and perceiving gender as having a central role in one's identity may increase inherent justifications of gender norms. This effect has been observed in food consumption, with more masculine men consuming more meat and more feminine women consuming more vegetables than their non-conforming counterparts (Stanley, Day, & Brown, 2023; Rosenfeld & Tomiyama, 2021).

Despite substantial research on gender stereotypes, the interplay between linguistic structures like generics and cognitive tendencies like the inherence heuristic has received relatively little empirical attention. Our study aimed to explore how generics and inherent reasoning contribute to gender stereotype endorsement. Since both mechanisms attribute intrinsic characteristics to groups and carry normative force, they may jointly reinforce stereotypes (Berio & Musholt, 2023; Cimpian & Salomon, 2014). Understanding these processes is essential for developing strategies to challenge and ultimately reduce the influence of gender stereotypes.

Methods

Participants

Participants (N = 241; Median_{age} = 30-34 years; 133 women, 103 men, 5 other) were recruited through Crowdpanel. The sample size largely exceeded the minimum determined by power analyses based on effect sizes from related studies (Hussak & Cimpian, 2015; Bian & Markman, 2020). Around 17% of participants were currently students, and 16% lived with their parents. Participants (or their parents if they were dependent on them) had a median yearly income between 25.000 and 30.000 euros and received 5 euros for their participation.

Design and Ethics

We examined gender stereotypes in activities (e.g., sewing, reading romance novels) using a 3 (genericity: generics vs.

"most" vs. "some"; between-subject) x 2 (gender typicality: typical gender vs. countertypical gender; within-subject) design.

This study was conducted according to the guidelines of the Declaration of Helsinki and approved by the ethics committee of [University] (protocol code #2023_05, obtained 10/11/2023). Unless otherwise specified, the study's design and analyses have been preregistered and additional online materials are available at https://osf.io/at97z/?view_only=bf296a52713140c9922d1ac7d8b46c33. These supplemental materials include (1) the list of the materials used in the experiment and their respective masculinity/femininity ratings; (2) deidentified data; (3) analyses code in R; and (4) preliminary and supplemental analyses.

Materials

Typical vs countertypical gender associations. We selected activities classified as masculine or feminine based on the Occupation-Activities-Traits Attitude Measures (Liben, Bigler, Ruble, Martin, & Powlisha, 2002), a questionnaire that assesses gender associations with activities on a 7-point scale (1 = males only, 7 = females only). For typical associations, we chose the seven items with the lowest scores (most masculine) and the seven with the highest scores (most feminine). Countertypical associations (e.g., men-ironing, women-fishing) were created by inverting these typical pairings. The full list of associations and their masculinity/femininity ratings can be found in the Supplementary Materials.

Descriptive and prescriptive statements. Descriptive statements described behaviors typically associated with each gender (e.g., "Women read romance novels," "Men build with tools"), while prescriptive statements framed these behaviors in terms of normality (e.g., "It is normal that women read romance novels," "It is normal that men build with tools"). Given our interest in the is-ought distinction, we initially aimed to use a deontic verb construction (i.e. *should*) to directly express prescriptive statements. However, in French, the equivalent verb *devoir* proved problematic—a challenge noted in prior linguistic research (Salkie, 1996; Martikainen, 2018). *Devoir* can correspond to both *must* and *should* in English, and its interpretation depends heavily on context to disambiguate between deontic and epistemic readings. Because our stimuli offered minimal context, this ambiguity made *devoir* unsuitable for our purposes. We therefore opted for the phrasing *il est normal que*, which has been found to have both descriptive and prescriptive considerations (Bear & Knobe, 2017). Since we separately asked participants for a descriptive judgment and provided an example using *il est normal que* with a normative reading, we expected it would be interpreted as expressing normative expectations. This was confirmed during pilot testing, which primarily assessed intelligibility with 20 French speakers.

Individual scales. Participants completed four scales previously shown to influence stereotype endorsement

(Likert-scales from 1-7): (1) the Inherence Heuristic scale reasoning ($M = 4.21$, $SD = 0.87$), exploring the general tendency to inherent reasoning (Salomon & Cimpian, 2014), (2) the Traditional Masculinity and Femininity scale ($M = 5.29$, $SD = 0.98$), capturing participants' self-identification as masculine vs. feminine (Stanley, Day, & Brown, 2023), (3) the Centrality of Gender Identity scale ($M = 4.44$, $SD = 1.41$), measuring how important gender is for the construction of participants' identity (Rosenfeld & Tomiyama, 2021), and (4) the Moral Commitment to Gender Equality scale ($M = 5.25$, $SD = 1.45$), capturing the extent to which individuals deem equal treatment of men and women to be of unnegotiable importance and as central to their moral identity (Xiao, Marie, & Strickland, 2024).

Procedure

Participants were randomly assigned to one of three framing conditions: generic (e.g., "Men go fishing"), 'most' (e.g., "Most men go fishing"), and 'some' (e.g., "Some men go fishing"). These quantifiers reflect different implied prevalences (i.e., the percentage of Ks that are F that we infer from a sentence of the form Ks have Fs, e.g. "Women are caring") — 40% for 'some,' 80% for 'most,' and 90% for generics (Reuter, Neufeld, & Del Pinal, 2023). Associations were presented in random order following an example. For each, participants rated descriptive ("To what extent is it a fact that...?") and prescriptive agreement ("To what extent do you agree with this statement?") on a 7-point Likert scale. They then justified their prescriptive judgments, with responses coded for inherence. Inherent explanations referenced gender or item traits (e.g. from one of our participants, "Baking is feminine because it is sophisticated"), while external explanations cited historical or personal factors. Responses were coded as 1 (inherent), 0 (external), or 2 (no justification – these were excluded from analysis, though their inclusion did not affect results). Three research assistants, blind to hypotheses, coded responses with high interrater reliability ($\kappa = 0.89$ – 0.95 ; Cohen, 1960). Disagreements were resolved in discussion with the first author. Finally, participants completed demographic questions and the individual scales.

Analytic strategy

Data were analyzed using R. Mixed-effects models, including random intercepts for items and participants, were run with the lme4 package (Bates, 2007). Logistic regressions used glmmTMB (Brooks et al., 2023), and mediation analyses were conducted with the mediate package (Tingley et al., 2013). Post-hoc tests used the Tukey method (1949), and model predictors followed best practices (Meteyard & Davies, 2020; details in Supplementary Materials).

Results and Discussion

In this study, we tested four pre-registered hypotheses. First, participants would have higher descriptive and prescriptive

judgment scores for typical gender associations than countertypical. Second, prescriptive judgment scores would be higher for people who use inherent features to justify their endorsement of those judgements, notably for typical gender associations. Third, participants who were exposed to generic sentences would have higher prescriptive judgment scores than those who saw sentences with a quantifier (i.e. most or some). Lastly, exposure to generic sentences would predict more inherent justifications.

Descriptive judgment

To test our first prediction, a paired t-test was conducted to compare descriptive judgment scores for activities performed by the typical vs countertypical gender. The results revealed that the associations between activities and their typical gender ($M = 4.84$, $SD = 1.64$) were judged as more of a fact than those between activities and the opposite gender ($M = 3.33$, $SD = 1.68$), $t(2891) = 43.76$, $p < .001$, 95% CI [1.44, 1.58]. This indicates that people consistently identified activities that are performed by the typical gender to be more factual compared to the opposite gender. Moreover, two one-sample t-test were conducted to determine whether typical and countertypical descriptive judgments differed significantly from the scale neutral value of 4. The analysis revealed that the mean judgment score for typical associations ($M = 4.84$, $SD = 1.64$) was significantly higher than 4, $t(2891) = 27.58$, $p < .001$, 95% CI [4.78, 4.90], while the mean judgment score for countertypical associations ($M = 3.33$, $SD = 1.68$) was significantly lower than 4, $t(2891) = -21.41$, $p < .001$, 95% CI [3.27, 3.39]. This shows that typical gender associations tended to be considered more factual, while it was the opposite for countertypical gender stereotypes, which were considered less of a fact.

These results suggest that gender stereotypes, at least those concerning these activities, seem to still be prevalent in France. This was an important first step in our analysis, since we are interested in exploring whether generics and the inherence heuristic play a role in the transition from what currently is (i.e. descriptive judgments) to what it should be (i.e. prescriptive judgments).

Prescriptive judgment

To test our first three predictions, we performed a mixed-effects linear regression on participant's judgment score about each activity, with typicality of the association (typical vs. countertypical gender), inherence (inherent vs. extrinsic justifications), and framing (generics vs most vs some) plus the interaction between typicality and inherence as fixed effects. The fixed effects explained 19.8% of the variance in participants' judgment scores ($R^2_m = 0.198$), while the combined fixed and random effects explained 49.6% of the variance ($R^2_c = 0.496$).

Consistent with our first prediction, the results revealed a significant effect of typicality on prescriptive judgments of commonly gendered activities. Specifically, participants had lower prescriptive judgment scores when activities were

associated with the countertypical gender ($M = 4.42$, $SD = 1.94$) than with typical gender ($M = 5.15$, $SD = 1.70$), $b = -0.55$, $SE = 0.04$, $t = -13.28$, $p < .001$. This shows that associations are thought to be more normal when the activities are combined with the gender that stereotypically performs them, compared to the opposite gender, reinforcing the notion that gender norms continue to be perceived as prescriptive.

This main effect was qualified by an interaction between gender typicality and inherence, as hypothesized by our second prediction, $b = -1.10$, $SE = 0.10$, $t = -11.31$, $p < .001$ (see Figure 1). In particular, compared to people who applied extrinsic reasons to justify their endorsement of a particular gender for activities, people who provided an inherent explanation believe that it is more normal for the typical gender to perform a particular activity ($M_{inherent} = 5.67$, $SD_{inherent} = 1.26$; $M_{extrinsic} = 5.01$, $SD_{extrinsic} = 1.79$, $p < .001$), and less normal for the countertypical gender ($M_{inherent} = 3.92$, $SD_{inherent} = 2.02$; $M_{extrinsic} = 4.48$, $SD_{extrinsic} = 1.94$, $p < .001$). This demonstrates that inherent reasoning influences endorsement of stereotypes. Specifically, justifying gender associations in terms of internal characteristics has a double effect: on the one hand, it reinforces the belief that it is normal for the typical gender to perform certain common activities; on the other hand, it also increases reluctance to endorse the countertypical gender as normal performers of the same activities. For instance, a participant justifying the belief that it is normal for women to bake because “the kitchen is made for women” or “baking is a feminine hobby because it is refined” is also inclined to believe that men should not engage in such activities, since it was not ‘made for them’.

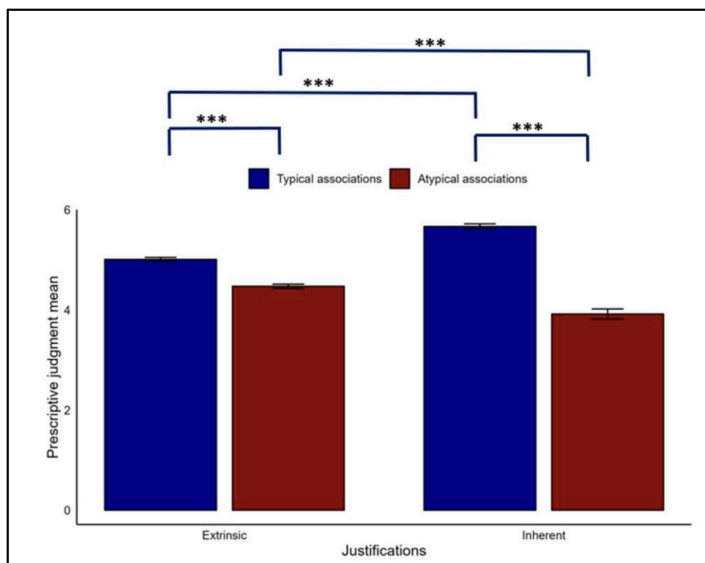


Figure 1: Prescriptive judgments’ interaction (y-axis) between justification type (x-axis: inherent vs extrinsic) and typicality of the association (fill: typical vs countertypical). Brackets indicate pairwise comparisons. $p < .001$ ***

Generic framing

Concerning framing, our third prediction was partially confirmed: while participants exposed to generic sentences reported higher prescriptive judgment scores ($M = 4.97$, $SD = 1.66$) than those presented with “most” quantifier statements ($M = 3.75$, $SD = 1.89$), $b = -1.17$, $SE = 0.16$, $t = -7.38$, $p < .001$, they reported lower prescriptive scores than those who read sentences framed with the quantifier “some” ($M = 5.49$, $SD = 1.62$), $b = 0.49$, $SE = 0.16$, $t = 3.10$, $p = .002$. Thus, the hypothesis that generic statements would yield higher prescriptive judgments than quantifier-based statements was only partially supported: generics elicited stronger normative judgments than “most” statements, but not more than “some” statements. Consistent with previous literature (Gelman & Roberts, 2017; Haslanger, 2014), these findings show that generic statements increase the normative force of said statement, compared to those sentences that specify that most of individuals in a group that have a specific characteristic. Importantly, this includes associations between activities and both the typical and the countertypical gender, meaning that generics increase normative force of any association. This result supports the notion that generic language may lead individuals to consider gendered behaviors as more prescriptive and less flexible, reinforcing traditional stereotypes about what is deemed appropriate for each gender. Concerning the increased endorsement of associations when sentences included the quantifier ‘some’ compared to generics, it can be explained because of some’s introduction conditions (i.e., the minimum percentage of Ks that need to be F in order for the statement Ks are F to be true, e.g. “Women are caring”). Indeed, some’s introduction condition is around 20%, while generic statements’ is around 90% (Reuter, Neufeld, and Del Pinal, 2023).

To test our fourth prediction that exposure to generic sentences would predict more inherent responses, we conducted a logistic regression analysis using an ordinal beta regression model (Harrell & Harrell, 2015). We calculated the proportion of inherent justifications provided by each participant ($M = 0.21$, $SD = 0.19$) and included it as the dependent variable, with framing as the fixed effect. Consistent with our hypothesis, generic framings resulted in more inherent justifications ($M = 0.24$, $SD = 0.43$) than sentences starting with most ($M = 0.15$, $SD = 0.36$), $b = -0.42$, $SE = 0.03$, $z = -14.92$, $p < .001$, as well as some ($M = 0.18$, $SD = 0.39$), $b = -0.26$, $SE = 0.03$, $z = -9.29$, $p < .001$. This result is consistent with the idea that generics prompt the described characteristics to be perceived as intrinsic to the group, since high prevalence is implied (Reuter, Neufeld, and Del Pinal, 2023), which leads to a higher likelihood of justifying the associations inherently.

Inherent reasoning as a mediator for generics’ influence on prescriptive judgments

We conducted a mediation analysis between generics and inherent reasoning on the difference between typical and

countertypical associations. We had two main reasons to pursue this analysis. First, both generics and inherent reasoning contribute to attributing intrinsic characteristics to the group, carrying normative force and thus limiting motivation to out contrary to the stereotype (Berio & Musholt, 2023; Cimpian, 2015). Second, our results empirically hint at a relationship between generics and inherence when it comes to stereotype endorsement, being so that generics influence the proportion of inherent justifications and both variables influence prescriptive judgments.

We thus examined if the effect of generic framing on people's prescriptive judgments about typical vs countertypical gender was mediated by their inherent reasoning. Since we did not pre-register this analysis, we had no previous hypothesis. Following the process described at Bian and Markman (2020), we used standardized composite scores on the judgment (i.e. the difference between all the typical-gender items and the countertypical gender items for each participant) and inherent measures (i.e. proportion of inherent justifications). We first fitted two linear regression models: one to predict the proportion of inherent responses for each participant by condition (generics vs. most), and the other one to predict composite judgment scores by inherence proportions and condition (generics vs. most). A mediation analyses was performed with a bootstrap method with 10,000 iterations.

Results showed that there was an indirect effect of framing (most vs generics) on the difference between prescriptive judgments of the typical vs countertypical gender via inherent reasoning (mean indirect effect = 0.19, $p < .001$, 95% CI of bootstrapped samples = [0.07, 0.35]). The effect of the direct path in the mediation model was not significant (although trending; mean direct effect = -0.30, 95% CI of bootstrapped samples = [-0.61, 0.02], $p = .054$, see Figure 2a), showing that inherent reasoning fully mediated the effect of generics on prescriptive judgments. The same patterns of results were found when comparing some vs generics (mean indirect effect = 0.12, $p = .04$, 95% CI of bootstrapped samples = [0.00, 0.25]; mean direct effect = -0.15, 95% CI of bootstrapped samples = [-0.45, 0.14], $p = .31$, see Figure 2b).

This suggests that generic sentences increase people's tendency to reason inherently, which has a downstream effect on their prescriptive judgments, with people who reason inherently showing a greater difference between activities performed by the typical vs the countertypical gender. This goes back to the interaction effect that we observed between typicality of the association and inherence, where inherent reasoning increased the normative force of typical associations but also increased resistance to accept countertypical ones.

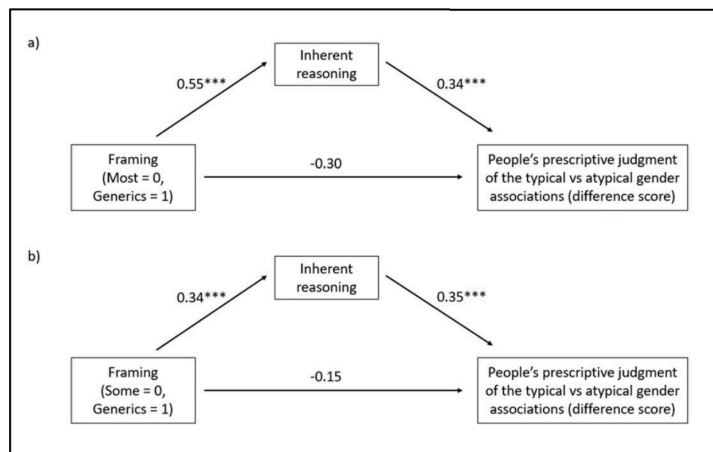


Figure 2: Mediation of inherent reasoning between the effects of framing (a: most vs. generics; b: some vs. generics) on the difference in people's prescriptive judgments toward typical vs. countertypical gender associations

Individual characteristics

Since framing is a between-subject variable, we checked whether generics influenced the proportion of inherent justifications due to individual differences in inherent reasoning. A logistic regression analysis (ordinal beta; Harrell & Harrell, 2015) with proportion of inherent explanations as the dependent variable and framing and the Inherence Heuristic Scale (Salomon & Cimpian, 2014) as fixed factors confirmed that framing remained significant compared to both the most ($p < .001$) and the some ($p < .001$) conditions. Additionally, participants scoring higher on the Inherence Heuristic Scale provided more inherent justifications ($b = 0.21$, $SE = 0.01$, $z = 14.16$, $p < .001$), aligning with expectations that a general proneness to the heuristic predicts more inherent justifications.

Further analysis incorporating additional individual differences found that, beyond generics (most: $b = -0.415$, $SE = 0.032$, $z = -12.98$, $p < .001$; some: $b = -0.425$, $SE = 0.033$, $z = -13.03$, $p < .001$) and inherent reasoning tendency ($b = 0.244$, $SE = 0.016$, $z = 15.36$, $p < .001$), moral commitment to gender equality and conformity to gender roles also significantly predicted inherent justifications, while gender centrality to one's identity did not. Higher moral commitment to gender equality was associated with fewer inherent justifications ($b = -0.079$, $SE = 0.010$, $z = -8.33$, $p < .001$), likely reflecting a conscious effort to recognize social influences on gender roles. Conversely, stronger conformity to gender roles predicted greater inherent justification ($b = 0.053$, $SE = 0.015$, $z = 3.58$, $p < .001$), suggesting that those adhering to traditional roles may view their activities as intrinsically justified, reinforcing resistance to deviation.

Conclusion

Our results highlight the interplay of cognitive, linguistic, and individual factors influencing stereotype endorsement.

Inherent reasoning reinforces prescriptive judgments in two ways: it normalizes typical gendered activities while making countertypical gender participation seem less appropriate. For example, if (as one of our participants did) one believes “baking is a feminine activity because it is refined,” this not only justifies women baking but also implicitly discourages men from doing so. This cognitive mechanism underscores the rigidity of gender norms and the difficulty of challenging them.

Moreover, inherent reasoning fully mediated the effect of generics on prescriptive judgments. That is, exposure to generic statements increases the likelihood of justifying gendered activities in terms of intrinsic properties, which in turn strengthens stereotype endorsement while discouraging countertypical gender participation. This is consistent with our observations that generic statements positively influenced both the degree of stereotype endorsement and the proportion of inherent reasoning. Generic statements amplified stereotype endorsement more than quantified (“most”) ones, reinforcing their prescriptive nature and traditional ideas about what is deemed appropriate for each gender. They also elicited more inherent reasoning, likely because generics imply high prevalence (e.g., “Men build with tools” suggests most men do). This highlights the role of linguistic framing in internalizing and maintaining social norms.

Individual differences also influenced inherent reasoning. Unsurprisingly, a general tendency toward inherent reasoning also led to gender-based inherent justifications, as well as conformity to gender roles, increased reliance on this heuristic, suggesting that those adhering to traditional roles may view their activities as intrinsically justified, reinforcing resistance to deviation. Conversely, a strong commitment to gender equality reduced it, suggesting a conscious effort to avoid essentialist claims and acknowledge societal influences on gender roles.

Our study has several limitations. First, while mediation analyses provide insight into potential mechanisms, its correlational nature prevents us from making strong causal claims. Second, while we selected individual characteristics based on prior research (Rosenfeld & Tomiyama, 2021; Salomon & Cimpian, 2014), other factors—such as cognitive ability, control, inclination for complex reasoning or system-justifying tendencies—may also play a role in people’s ability and motivation to overcome the tendency to adopt inference-based explanations (Salomon & Cimpian, 2014). Evidence from Eidelman and Crandall (2009) supports this, since a high cognitive load increased favorability towards the existing stage or the is to ought transition. Third, our sample consisted primarily of university students, which may limit the generalizability of our findings to broader populations differing in age or education level. Fourth, the activities and genders associated in our materials may reflect culturally-specific stereotypes,

limiting the cross-cultural validity of our conclusions. Fifth, as shown by Bear and Knobe (2017), the concept of *normality* is inherently dual: it simultaneously conveys descriptive information about what typically happens and prescriptive judgments about what ought to happen. This dual nature may have softened the normative force of prescriptive statements by introducing an element of statistical typicality, meaning that our results may represent conservative estimates of participants’ prescriptive judgments. Future research could benefit from testing more explicitly normative wording (e.g., “should”) to more clearly isolate the prescriptive dimension. Lastly, while our study focused on inherent reasoning as a cognitive mechanism reinforcing prescriptive gender judgments, it did not explicitly disentangle it from psychological essentialism—the belief that social categories reflect deep, immutable essences (Newman & Knobe, 2019; Gelman, 2004). Future research could explore how essentialist beliefs about gender interact with the use of generic language and inherent reasoning. For instance, individuals with stronger essentialist beliefs may be more prone to interpreting generics as reflecting fixed traits rather than contextual regularities (Rhodes, Leslie, & Tworek, 2012), thus further entrenching prescriptive norms. Investigating the boundary conditions between inherent reasoning and essentialist thinking would help clarify the cognitive architecture sustaining gender stereotypes.

Overall, our findings highlight how language and cognition sustain normative expectations, positioning the inherent heuristic as a key psychological mechanism underlying the is-ought transition and identifying linguistic and individual factors that shape its influence.

Acknowledgments

We are grateful to Claire Chambrier and Aprifel for the support to this project. We also want to thank the rest of the team at the Institut Lyfe Research Center for the invaluable feedback.

References

- Bates, D. (2007). Linear mixed model implementation in lme4. *Manuscript, University of Wisconsin*, 15, 5-2.
- Bear, A., & Knobe, J. (2017). Normality: Part descriptive, part prescriptive. *Cognition*, 167, 25-37.
- Berio, L., & Musholt, K. (2023). How language shapes our minds: On the relationship between generics, stereotypes and social norms. *Mind & Language*, 38(4), 944-961.
- Bian, L., & Markman, E. M. (2020). Why do we eat cereal but not lamb chops at breakfast? Investigating Americans’ beliefs about breakfast foods. *Appetite*, 144, 104458.
- Bosse, A. (2024). Stereotyping and generics. *Inquiry*, 67(10), 3876-3892.
- Brooks, M., Bolker, B., Kristensen, K., Maechler, M., Magnusson, A., McGillicuddy, M., ... & Jagan, M. (2023). Package ‘glmmTMB’. *R Packag Vers*, 1(1), 7.
- Castelvecchi, D. (2022). Mathematics prizes have a gender problem—can it be fixed?. *Nature*, 606(7913), 240-241.

- Chalnick, A., & Billman, D. (1988). Unsupervised learning of correlational structure. *Proceedings of the tenth annual conference of the cognitive science society* (pp. 510-516). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Chambers, C. G., Graham, S. A., & Turner, J. N. (2008). When hearsay trumps evidence: How generic language guides preschoolers' inferences about unfamiliar things. *Language and Cognitive Processes*, 23(5), 749-766.
- Cimpian, A., Brandone, A. C., & Gelman, S. A. (2010). Generic statements require little evidence for acceptance but have powerful implications. *Cognitive science*, 34(8), 1452-1482.
- Cimpian, A., & Salomon, E. (2014). The inference heuristic: An intuitive means of making sense of the world, and a potential precursor to psychological essentialism. *Behavioral and Brain Sciences*, 37(5), 461-480.
- Cohen, J. (1960). A coefficient of agreement for nominal scales. *Educational and psychological measurement*, 20(1), 37-46.
- Cosker-Rowland, R. (2024). The normativity of gender. *Noûs*, 58(1), 244-270.
- Cvencek, D., Meltzoff, A. N., & Greenwald, A. G. (2011). Math-gender stereotypes in elementary school children. *Child development*, 82(3), 766-779.
- Eidelman, S., & Crandall, C. S. (2009). A psychological advantage for the status quo. *Social and psychological bases of ideology and system justification*, 85-106.
- European Commission (2020, updated 2021). Dietary recommendations for protein intake for adults and older adults. Available at https://knowledge4policy.ec.europa.eu/health-promotion-knowledge-gateway/dietary-protein-intake-adults-3_en#:~:text=The%20recommended%20intake%20in%20adults,t he%20recommendation%20does%20not%20differ.
- Feraco, A., Gorini, S., Camajani, E., Filardi, T., Karav, S., Cava, E., Strollo, R., Padua, E., Caprio, M., Armani, A., & Lombardo, M. (2024). Gender differences in dietary patterns and physical activity: An insight with principal component analysis (PCA). *Journal of Translational Medicine*, 22(1), 1112.
- Gelman, S. A. (2021). Generics in society. *Language in Society*, 50(4), 517-532.
- Gelman, S. A. (2004). Psychological essentialism in children. *Trends in cognitive sciences*, 8(9), 404-409.
- Gelman, S. A., & Roberts, S. O. (2017). How language shapes the cultural inheritance of categories. *Proceedings of the National Academy of Sciences*, 114(30), 7900-7907.
- Gelman, S. A., Ware, E. A., & Kleinberg, F. (2010). Effects of generic language on category content and structure. *Cognitive psychology*, 61(3), 273-301.
- Harrell, Jr, F. E., & Harrell, F. E. (2015). Ordinal logistic regression. *Regression modeling strategies: with applications to linear models, logistic and ordinal regression, and survival analysis*, 311-325.
- Haslanger, S. (2014). The normal, the natural and the good: Generics and ideology. *Politica & Società*, 3(3), 365-392.
- Heilman, M. E. (2001). Description and prescription: How gender stereotypes prevent women's ascent up the organizational ladder. *Journal of social issues*, 57(4), 657-674.
- Hesni, S. (2024). Normative generics and social kind terms. *Inquiry*, 67(9), 3216-3239.
- Hume, D. (1740/2000) A treatise of human nature, ed. D. F. Norton & M. J. Norton. Oxford University Press. (Original work published 1740.)
- Hussak, L. J., & Cimpian, A. (2015). An early-emerging explanatory heuristic promotes support for the status quo. *Journal of Personality and Social Psychology*, 109(5), 739.
- Knobe, J., Prasada, S., & Newman, G. E. (2013). Dual character concepts and the normative dimension of conceptual representation. *Cognition*, 127(2), 242-257.
- Lemeire, O. (2023). "Philosophers care about the truth": Descriptive/normative generics. *Mind & Language*, 38(3), 772-786.
- Leslie, S. J. (2017). The original sin of cognition. *The Journal of Philosophy*, 114(8), 395-421.
- Leslie, S.-J. (2015). Hillary Clinton is the only man in the Obama administration: Character concepts, generics, and gender. *Analytic Philosophy*, 56(2), 111-141.
- Leslie, S. J. (2014). Carving up the social world with generics. In J. Knobe, T. Lombrozo, and S. Nichols (Eds.), *Oxford studies in experimental philosophy*, 1 (pp. 208-232). Oxford: Oxford University Press.
- Liben, L. S., Bigler, R. S., Ruble, D. N., Martin, C. L., & Powlishta, K. K. (2002). The developmental course of gender differentiation: Conceptualizing, measuring, and evaluating constructs and pathways. *Monographs of the society for research in child development*, i-183.
- Martikainen, H. (2018). Modal Markers as Potential Sources of Distortion in Translated Medical Abstracts. *Educational Sciences: Theory and Practice*, 18(4), 917-934.
- Master, A. (2021). Gender stereotypes influence children's STEM motivation. *Child Development Perspectives*, 15(3), 203-210.
- Meeussen, L., Van Rossum, A., Van Laar, C., & Derks, B. (2022). Gender stereotypes: What are they and how do they relate to social inequality?. In *Solidarity and Social Justice in Contemporary Societies: An Interdisciplinary Approach to Understanding Inequalities* (pp. 79-86). Cham: Springer International Publishing.
- Meyer, M., & Gelman, S. A. (2016). Gender essentialism in children and parents: Implications for the development of gender stereotyping and gender-typed preferences. *Sex Roles*, 75, 409-421.
- Nakagawa, S., & Hart, C. (2019). Where's the beef? How masculinity exacerbates gender disparities in health behaviors. *Socius*, 5, 2378023119831801.
- Newman, G. E., & Knobe, J. (2019). The essence of essentialism. *Mind & Language*, 34(5), 585-605.

- Nitsch, D. (2014). Is there a difference in metabolic burden between men and women?. *Nephrology Dialysis Transplantation*, 29(6), 1110-1112.
- Noyes, A., & Keil, F. C. (2019). Generics designate kinds but not always essences. *Proceedings of the National Academy of Sciences*, 116(41), 20354-20359.
- Reuter, K., Neufeld, E., & Del Pinal, G. (2023). Asymmetry effects in generic and quantified generalizations. In *Proceedings of the Annual Meeting of the Cognitive Science Society* (Vol. 45, No. 45).
- Rhodes, M., Leslie, S. J., & Tworek, C. M. (2012). Cultural transmission of social essentialism. *Proceedings of the National Academy of Sciences*, 109(34), 13526-13531.
- Rosenfeld, D. L., & Tomiyama, A. J. (2021). Gender differences in meat consumption and openness to vegetarianism. *Appetite*, 166, 105475.
- Salkie, R. (1996). Modality in English and French: A corpus-based approach. *Language Sciences*, 18(1-2), 381-392.
- Salomon, E., & Cimpian, A. (2014). The inherence heuristic as a source of essentialist thought. *Personality and Social Psychology Bulletin*, 40(10), 1297-1315.
- Stanley, S. K., Day, C., & Brown, P. M. (2023). Masculinity matters for meat consumption: An examination of self-rated gender typicality, meat consumption, and vegetarianism in Australian men and women. *Sex Roles*, 88(3), 187-198.
- Tingley, D., Yamamoto, T., Hirose, K., Keele, L., & Imai, K. (2014). Mediation: R package for causal mediation analysis.
- Tukey, J. W. (1949). Comparing individual means in the analysis of variance. *Biometrics*, 99-114.
- Xiao, H., Marie, A., & Strickland, B. (2024). Moral commitment to gender equality increases (mis) perceptions of gender bias in hiring. *European Journal of Social Psychology*.
- WHO, J., & Consultation, F. E. (2003). Diet, nutrition and the prevention of chronic diseases. *World Health Organ Tech Rep Ser*, 916(i-viii), 1-149.