# ¿Which Automatic Associations Prevail? Congruency and Reverse Priming Effects on Implicit Gender Stereotyping[1]

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## Abstract

**Objectives**. This study aimed to test whether gender stereotypes remain automatically activated following cues related to gender, despite years of promoting equality, and how it could correspond with explicit measures. **Method**. Seventy undergraduates performed a sequential priming task, in which the gender categories were presented subliminally. Culturally specific gender stereotypes were used as targets. In addition, other significant variables related to gender (self-assignment of stereotypes, identity and ideology) were assessed explicitly. **Results**. At first, the results showed a non-priming effect, indicating no implicit gender stereotyping. However, a more detailed observation of the data revealed that participants could be differentiated according to the effects that appeared: the congruency and the reverse priming effects. **Conclusion.** While gender stereotypes were automatically activated in Group 1 (positive socres), implicit stereotype inhibition seemed to take place in Group 2 (negative scores). Egalitarian goal activation is assumed to explain the reverse effect. The activation of different contents from the same primes emphatically suggests that more effort is needed to develop strong egalitarian commitments. Results also support the potential dynamic of gender stereotypes, even at an implicit level.

*Keywords.* Gender stereotypes, stereotype salience, implicit attitudes, gender equality, priming effects.

## ¿Qué asociaciones automáticas prevalecen? Efectos de priming de congruencia  e inverso en estereotipia de género implícita

### Resumen

**Objetivos**. Evaluar si los estereotipos de género continúan activándose automáticamente tras presentar claves relacionadas con el género, y cómo esta activación se correspondería con medidas explícitas. **Método**. Setenta estudiantes universitarios realizaron una tarea de *priming* secuencial en la que se presentaron subliminalmente los primes mujer y hombre (categorías de género). Los targets fueron estereotipos de género culturalmente

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significativos. Además, otras variables relacionadas con el género (autoasignación de estereotipos, identidad e ideología) se evaluaron explícitamente. **Resultados.** En un principio, los resultados no mostraron ningún efecto de priming, señalando la ausencia de estereotipia de género implícita. Sin embargo, una inspección más detallada de los datos reveló que los participantes podían diferenciarse según los diferentes efectos que habían aparecido: congruencia e inverso. **Conclusión.** Mientras que en el Grupo 1 (puntajes positivos) los estereotipos de género se activaron automáticamente, en el Grupo 2 (puntajes negativos) se produjo una inhibición implícita de estereotipos. La activación de una meta igualitaria podría explicar el efecto inverso. La activación de contenidos diferentes derivada de los mismos primes enfatiza la necesidad de realizar más esfuerzos para desarrollar compromisos igualitarios firmes. Los resultados también apoyan la potencial dinámica de los estereotipos de género, incluso a nivel implícito.

**Palabras clave.** Estereotipos de género, saliencia de los estereotipos, actitudes implícitas, igualdad de género, efectos de priming.

## Que associações automáticas prevalecem? Efeitos de priming de congruência e inverso em estereotipia de género implícita

### Resumo

**Escopo**. Avaliar se os estereótipos de género continuam se ativando automaticamente depois de presentar claves relacionadas com o género, e como esta ativação pode se corresponder com medidas explícitas. **Metodologia**. Setenta estudantes realizaram uma tarefa de *priming* sequencial na que se apresentaram subliminarmente os primes mulher e homem (categorias de género). Os objetivos foram estereótipos de gênero culturalmente significativos. Além, outras variáveis relacionadas com o género (auto-alocação de estereótipos, identidade e ideologia) foram avaliadas explicitamente. **Resultados**. Num principio, os resultados não mostraram efeito nenhum de priming, assinalando a ausência de estereotipia de gênero implícita. No entanto, uma inspeção mais detalhada dos dados revelou que os participantes podiam ser diferenciados segundo os efeitos diferentes que tinham aparecido: congruência e inverso. **Conclusão**. Enquanto que no grupo 1 (contagens positivas) os estereótipos de gênero foram ativados automaticamente, no Grupo 2 (contagens negativas) foi produzida uma inibição implícita de estereótipos. A ativação de uma meta igualitária pode explicar o efeito inverso. A ativação de conteúdos diferentes derivada dos mesmos primes enfatiza a necessidade de fazer mais esforços para desenvolver compromissos igualitários firmes. Os resultados também apoiam a potencial dinâmica dos estereótipos de gênero, mesmo no nível implícito.

**Palavras-chave.** Estereótipos de gênero, saliência dos estereótipos, atitudes implícitas, igualdade de gênero, efeitos de *priming*.

### Introduction

With the aim of eradicating the consequences of gender discrimination, gender equality is highly promoted and supported by most current societies (Cornwall & Edwards, 2015; Grown, Addison, & Tarp, 2016). As an example, the promotion of gender equality and the empowerment of women is one of the eight Millenium Development Goals adopted by the United Nations in 2000, and which was expected to have been met by 2015. Gender discrimination is defined as an unequal behaviour towards individuals based on their gender group. However, this topic is usually focused on discrimination against women given that this gender group is the target of a greater number of consequences and even of extreme events, such as death (Bongaarts & Guilmoto, 2015; Breiding et al., 2014). Phenomena like violence, the glass ceiling and the gender wage gap still damage women's

well-being. The occurrence at the same time of, on the one hand, institutional support for gender equality and an explicit rejection of any form of discrimination, and, on the other hand, of daily examples of discriminatory events, obliges us to consider some essential questions: If the majority agree with gender equality, why is discrimination against women still so pervasive? Do governmental and societal efforts to promote gender equality have any effect in changing people's observed behaviour? Moreover, do these behavioural changes involve an equivalent variation in internal, personal and interpersonal factors that underlie gender discrimination?

These and other issues suggest that, as in other types of discrimination, implicit factors are related to gender discrimination maintenance, which has been empirically supported (Blair & Banaji, 1996; Irmen, 2006). Consequently, it is necessary to use implicit measures to further investigate this phenomenon at a more profound level. In this study, we used a subliminal priming task with the aim of evaluating how gender discrimination operates implicitly nowadays. In addition, explicit measures of gender-related variables were used with the purpose of testing whether there is a correspondence between both aspects (implicit and explicit) of discrimination. Specifically, we analyzed whether gender stereotypes are automatically activated by the subliminal presentation of gender categories using a sequential priming task. We also evaluated self-assignment of gender stereotypes, gender identity and gender ideology at an explicit level and compared them with the implicit measure. Exploring this issue in a sample of young undergraduates also provided an opportunity to test the effects, if any, of a supposedly more egalitarian society on the implicit processes underlying gender discrimination in the current generation.

**Gender Stereotypes, Identity and Ideology**

Stereotypes are at the core of any discriminatory behaviour, and their analysis is one of the main means of investigating gender-related issues. Some authors claim that other variables, such as gender identity and gender ideology, also deserve attention in this field (Barberá, 1998; Moya & Puertas, 2003), since they are intrinsically involved in gender socialization. In this study, these three central

aspects of gender discrimination were considered, but with an emphasis on stereotypes.

In the last years, research has shown some changes in the stereotypes explicitly ascribed to each gender group across the time. The content of the feminine stereotypes has shown a higher dynamic than the content of the masculine (Castillo-Mayén & Montes-Berges, 2007, 2014; Diekman & Eagly, 2000; López-Sáez, Morales, & Lisbona, 2008). Additionally, the influence has been demonstrated of a number of sociocultural and sociodemographic variables in the attribution of traditional stereotypes to each gender group (Castillo-Mayén & Montes-Berges, 2007, 2014; Diekman & Eagly, 2000; Diekman, Eagly, Mladinic, & Ferreira, 2005; Wilde & Diekman, 2005). In summary, these studies report that, at least to some extent, gender stereotypes are susceptible to change and evolution. However, it is necessary to test whether these external changes have also occurred at the level of the implicit, automatic associations to each gender group, which is the core aim of this study.

Along with stereotypes, gender identity and gender ideology have an effect on how individuals interact with each gender group. Consistent with Spence's (1984, 1985) multifactorial theory, gender identity is conceptualized as a global psychological sense of masculinity or femininity associated with the biological sex. This basic sense not only involves personality traits, but also other facets such as interests, physical appearance, and roles. Some studies (Spence & Buckner, 1995, 2000) have revealed that an evaluation of gender identity according to this approach is more appropriate in predicting gender-related issues, such as sexist attitudes or gender-role behaviours. Gender ideology involves individuals' beliefs about the roles and behaviours that women and men should perform because of their biological sex, along with the relationships that both gender groups should hold between them (Moya, Expósito, & Padilla, 2006). This variable, also known as sexism, could convey any positive or negative attitude towards any gender group, and might exert an important influence on several aspects such as judgments, beliefs, attitudes, behaviours, or social relationships (Moya et al., 2006), so that it could facilitate gender discrimination.

## Priming and Discrimination Processes

Implicit measures of attitudes provide information about implicit or automatic processes that underlie behaviour (Banse & Greenwald, 2007). These techniques have provided an important and necessary breakthrough in research on implicit attitudes and discriminatory phenomena. Among the implicit measures, the priming task stands out because of its capacity to use subliminal stimuli. Commonly, using implicit measures means that the individual is unaware of the further activation of mental representations that occurs after the stimuli have been presented. Additionally, when a prime is presented subliminally, this also involves the individual being unaware of the presentation of this stimulus (Bargh & Chartrand, 2000).

Research on automaticity shows how higher mental processes can also be activated by the mere passive perception of external stimuli, and even more, by subliminal exposition to them (Bargh & Pietromonaco, 1982; Smith, Dijksterhuis, & Chaiken, 2008; Van den Bussche, & Reynvoet, 2007). In addition, this field of research reveals how automatic activation influences a wide range of results, such as social behaviour, without the individual being aware of this influence (Aarts & Dijksterhuis, 2003; Bargh, Chen, & Burrows, 1996; Chen & Bargh, 1997). Consequently, the application of implicit measures for the study of discrimination in an extensive variety of research has revealed that the stereotypes about different social groups can be automatically activated, and that the effect of this activation can be observed in subsequent behaviour (Dovidio, Kawakami, Johnson, Johnson, & Howard, 1997; Lepore & Brown, 1997). Thus, the automaticity of discriminatory processes becomes evident. The automatic activation of stereotypes has also been shown in gender-related research, using a variety of priming tasks (Banaji, Hardin, & Rothman, 1993; Blair & Banaji, 1996; Gawronski, Ehrenberg, Banse, Zukova, & Klauer, 2003), some of these using even subliminal stimuli (Irmen, 2006; Montes-Berges, 2009).

## Priming Effects

Basically, sequential priming techniques consist of the presentation of two different kinds of stimulus: primes and targets. A response to the target is required, and it is expected that this response should be influenced by the previous exposition to the prime. It is also expected that the relationship between prime and target (which can be evaluative or semantic, Wentura & Degner, 2010) facilitates the response to the target, leading to faster responses when prime and target are congruent, and slower responses when these stimuli are incongruent (i.e., when they do not have any relationship). This pattern of results is known as the congruency or facilitation effect, which has been found in many experiments (Bargh et al., 1996; Devine, 1989; Dovidio et al., 1997; Smith et al., 2008).

Automatic priming effects on subsequent behaviour have been explained by Bargh and Morsella (2010), considering the previous activation of one of the unconscious behavioural guidance systems owing to stimuli effects. Briefly, they proposed: (a) the perceptual system, related to social perception and the automatic activation of social information (stereotypes); (b) the evaluative system, concerning the automatic activation of attitudes, which derives from the perception of the attitude object; (c) the motivational system, concerning the automatic activation of goals; and (d) the emotional system, which deals with the influence that emotional states can automatically exert. Specifically, this model takes into account two main stages. In the first, it is assumed that when a person is exposed to an environmental stimulus the automatic activation of the mediating system will start. Therefore, based on the evidence from social psychology research, this stage implies the automatic activation of one of the internal information processing systems mentioned above. In the second stage, the activation of the particular system would automatically cause the suitable behavioural response.

Apart from this pattern of results, a reverse priming effect has been also found in some studies (Abreu, Ramírez, Kim, & Haddy, 2003; Degner & Wentura, 2009; Glaser & Banaji, 1999; Laran, Dalton, & Andrade, 2011). This effect consists of faster responses in incongruent trials compared with congruent ones. Some authors suggest that this effect is derived from the application of an unconscious strategy to correct the prime's biased influence (Abreu et al., 2003; Glaser & Banaji, 1999). In addition, Laran et al. (2011) have proposed that this correction could derive from unconscious goal activation. This explanation approximates Moskowitz and colleagues' approach, which is based

on their observations of slowed-down responses to stereotypical associations (Moskowitz, Gollwitzer, Wasel, & Schaal, 1999; Moskowitz & Ignarri, 2009). They assert that the perception of stimulus cues could give rise to different consequences according to automatic goal activation. Therefore, the attitude object could implicitly activate, on the one hand, the goal to apply the stereotypes associated with the category (i.e., ethnic, gender), which implies the automatic activation of these stereotypes; but on the other hand, the same object could activate an egalitarian goal (to behave equally with people of other ethnicities), which implies the inhibition of the stereotype activation. Moreover, individuals can strongly develop the commitment to behave in an egalitarian way; in these cases, the egalitarian goal could become chronic (Moskowitz et al., 1999). However, contextual and motivational variables can influence egalitarian goals, so the egalitarian goal activation could be temporary and exert the same effect over implicit stereotype inhibition (Moskowitz & Ignarri, 2009; Moskowitz & Li, 2011; Moskowitz, Li, Ignarri, & Stone, 2011).

**The Present Study[4]**

Bearing in mind that gender equality is explicitly promoted by most people and government policies, but, at the same time, gender discrimination is still ubiquitous in most societies (United Nations Development Programme, 2013), the use of implicit measures is essential in this research area in order to assess what kind of automatic activation occurs with stimuli related to gender categories. This becomes even more relevant if we take into account the empirical evidence on the dynamics of gender stereotypes when using explicit measures. In order to provide a more comprehensive idea about how gender discrimination is evolving, these findings require an exploration of whether any change is also found at the implicit, automatic level.

To contribute to this issue, this study was designed to test whether gender stereotypes are automatically activated when gender categories are presented subliminally. To examine automatic processes, participants performed a sequential priming task in which gender categories were used as primes. Subsequently, a mask followed by a target

word appeared. The targets were a set of positive and negative gender stereotypes, culturally relevant to the sample, which were chosen because of their recently demonstrated association with gender categories (Castillo-Mayén & Montes-Berges, 2014). Participants were asked to judge the target's valence, being the reaction time (RT) the dependent variable. Although participants had to indicate whether the target word was positive or negative, the sequential priming task designed can in fact be classified within a semantic priming paradigm, given that the prime and target relationship was not based on its evaluative features, but on semantic aspects (Wentura & Degner, 2010). Therefore, our interest was focused on RT differences between congruent and incongruent trials, irrespective of the target's valence. Based on most of the research on priming and discrimination, our first hypothesis was that participants' responses would be faster in congruent trials than in incongruent ones because of the prime-target semantic relationship (i.e., participants would respond faster about "feeling" if this target was preceded by "woman" as prime than if it was preceded by "man" as prime). This pattern of results was expected when considering together both "woman" and "man" primes as well as when they were considered separately. Shorter RTs in congruent than in incongruent trials, called the congruency effect, would imply the automatic activation of gender (feminine and/or masculine) stereotypes derived from subliminal stimuli.

Acknowledging the possible influence of other factors related to gender in the maintenance of stereotyping, explicit measures assessed participants' self-assignment of gender stereotypes, gender identity and gender ideology. Therefore, we stated exploratory hypothesis so that the appearance of the congruency effect would be positively related to all these gender-related variables, indicating a correspondence between the implicit and the explicit levels of gender discrimination.

## Method

### Participants

Seventy undergraduates (50% women; $M_{age}$ = 19.51 years; $SD$ = 1.60) from a University in Spain participated in exchange for course credit. The sampling methods used for recruitment were

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[4]  This study is part of a broader piece of research and other variables related to general discrimination were also analyzed (social dominance orientation, egalitarianism, individualism, and perceived social status).

purposive and snowball. As inclusion criteria, participants had to be 18 years old or older, and students of this University. As exclusion criteria, psychology students were not recruited for participation in order to avoid any biased responses that could derive from their previous knowledge on the topic (priming tasks, discrimination). Students that had recently participated in the authors' other studies of similar topics (gender issues) were not recruited. All participants gave their consent to take part in the study.

### Instruments

#### Self-assignment of Gender Stereotypes Scale (Castillo-Mayén, 2011).

This scale consists of 20 gender stereotypes (10 feminine and 10 masculine). For each gender group, half have a positive valence and half a negative valence. Examples of the stereotypes are: 'warm' (feminine positive, FP), 'devious' (feminine negative, FN), 'bold' (masculine positive, MP), and 'authoritarian' (masculine negative, MN). Participants were asked to indicate the extent to which each stereotype was characteristic of him/her. Responses were made on a 5-point Likert-type scale, from *Not at all characteristic of me* (1) to *Completely characteristic of me* (5). A higher score indicated a higher assignment of each group of gender stereotypes. Cronbach's alpha for each group of gender stereotypes were as follows: $\alpha_{FP} = 0.71$, $\alpha_{FN} = 0.65$, $\alpha_{MP} = 0.67$, and $\alpha_{MN} = 0.55$.

#### Multifactorial Gender Identity Scale (López-Zafra & López-Sáez, 2001).

This measurement was built upon Spence's (1984, 1985) multifactorial model of gender identity. A brief version of the scale was used to assess some facets of gender identity: global gender identity (GGI, 2 items), traditional gender personality traits (PT, 18 items; 9 feminine and 9 masculine) and physical appearance (PA, 10 items). Responses were made on a 7-point scale. In relation to GGI, it evaluates a global sense of masculinity and femininity, which indicates the congruency between gender identity and the biological sex. Participants indicated to what extent they considered themselves globally feminine and masculine ("Overall, I consider myself feminine/masculine"), in a range from *Not*

*at all* (1) to *Completely* (7). To calculate GGI, items are subtracted according to the biological sex, so that a positive result indicates that gender identity corresponds with sex. Concerning PT, participants indicated the extent to which they self-assign each trait (i.e., "tender" [feminine trait], "athletic" [masculine trait]), in a range from *Not at all* (1) to *Completely* (7). Reliability of the feminine traits was $\alpha = 0.65$ and $\alpha = 0.71$ for the masculine. Regarding PA, participants indicated the frequency with which they consider to hold certain characteristics ("My physical appearance is harmonious") in a range from *Never* (1) to *Always* (7). A higher score indicated a higher body satisfaction. Cronbach's alpha for PA was 0.87.

#### Gender Ideology Scale (Moya et al., 2006).

This 12-items measure assesses traditional sexism considering beliefs about roles and specific behaviours ascribed to women and men. It presented a 5-point Likert-type scale, ranging from *Strongly disagree* (0) to *Strongly agree* (4). A higher score indicates a more traditional gender ideology (i.e., "Extramarital affairs are more blamable in the case of women"). Reliability values in previous studies have ranged from 0.71 to 0.90 (Moya et al., 2006). In this study, Cronbach's alpha was 0.88.

### Procedure

According to Montero and León (2007), this empirical study can be classified as a within-subject experiment, in which the independent variable (the combination of the gender category [women, men] and the target [feminine, masculine]) was presented randomly by blocks.

Concerning the study procedure, the first author approached students in their classroom and invited them to participate in the study. They were also asked to extend the invitation to a friend who satisfied the inclusion and exclusion criteria for participation. Several dates were agreed with participants to organize data collection. The explicit measures related to gender were administered one week before the priming task. Both parts of the experiment were performed in groups, with fewer participants for the priming task. The priming task was programmed and administered using Inquisit 3.0.3.2 (Millisecond Software, 2010). Two laptop computers were used to apply the task. Their screens

were set at resolution 1024 x 768 pixels and at 60 Hz refreshing rate. Primes and mask duration were adjusted to this refreshing rate. All stimuli were uppercase and appeared centred on the screen.

The sequential priming task (Figure 1) consisted of the subliminal presentation of a gender category (primes: man /woman) during 33.4 ms. The prime was followed by the mask presentation

("XQFBZRMQWGBX") used in previous studies (Chartrand & Bargh, 1996; Montes-Berges, 2009; Zemack-Rugar, Bettman, & Fitzsimons, 2007) and recommended to avoid conscious prime identification (Bargh & Chartrand, 2000). Mask duration was 50.1 ms (Stimulus Onset Asynchrony [SOA] = 83.5 ms) and was followed by the target which remained until the participant's response[5].
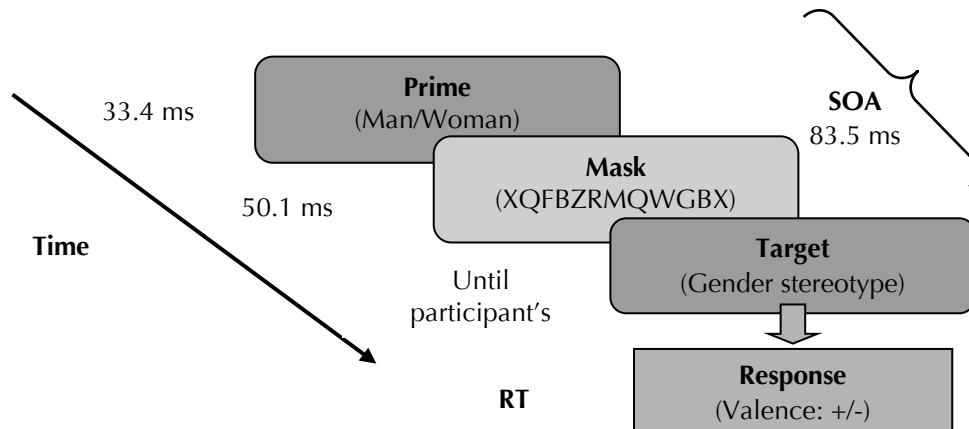


*Figure 1.* Procedure scheme of the subliminal sequential priming task.
Source: Compiled by authors

The targets consisted of 10 positive and 10 negative gender stereotypes, half of these feminine and half masculine. These stereotypes were selected from a recent study which has shown the current characteristics that are assigned differentially to men and women in our country (Castillo-Mayén & Montes-Berges, 2014). The target list used is shown in Table 1. Participants were asked to indicate, as quickly and as accurately as possible, the target's valence by pressing "a" (positive) or "5" (negative) on the keyboard. These keys were selected taking into account the distance between the participants' hands and their comfort. The instructions for the task were given verbally and also on screen before each block of trials. The dependent variable was the RT from the target presentation until the participant's response.

Overall, the experiment consisted of 240 trials divided into 6 blocks. Half the trials primed the concept of "woman" and the other half primed the concept of "man". The first block was used as

participants' training and was not analyzed. The software allowed us to randomize prime and target presentation and to guarantee that each prime was presented together with each gender stereotype only once in a block of trials. Consequently, as suggested by Wentura and Degner (2010), in each block the prime "woman" was presented once before each feminine stereotype, and the prime "man" was also presented once before each masculine stereotype (congruent trials). The reverse prime-target combination pattern led to the incongruent trials ("woman" + masculine stereotypes and "man" + feminine stereotypes). Therefore, each stereotype appeared twice in each block of trials: once in a congruent trial and once in an incongruent trial.

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5  As indicated by Wittenbrink (2007) and Wentura and Degner (2010), in order to test that the selected parameters prevented the conscious visibility of the prime, a pilot study was carried out. 80 undergraduates performed the priming task and none of them informed us about prime visibility.

Table 1
*Gender stereotypes used as targets in the subliminal priming task, according to gender group and valence (original targets in Spanish)*

|  | Positive | Negative |
|---|---|---|
| Feminine Stereotypes | Affection (*afecto*) | Whim (*capricho*) |
|  | Feeling (s*entimiento*) | Submissiveness (*sumisión*) |
|  | Kindness (*amabilidad*) | Pessimism (*pesimismo*) |
|  | Sweetness (*dulzura*) | Vulnerability (*vulnerabilidad*) |
|  | Loyalty (*lealtad*) | Insecurity (*inseguridad*) |
| Masculine Stereotypes | Bravery (*valentía*) | Selfishness (*egoísmo*) |
|  | Undertake (*emprender*) | Laziness (*pereza*) |
|  | Naturalness (*naturalidad*) | Conflict (*conflicto*) |
|  | Strength (*fuerza*) | Insensitivity (*insensibilidad*) |
|  | Firmness (*firmeza*) | Rebelliousness (*rebeldía*) |

Source: Compiled by authors

As a check control, in order to guarantee that the prime was presented subliminally, once the priming task had finished, participants were asked to write all the words that they could remember. None of the participants wrote any gender category. In addition, the debriefing procedure indicated no suspicion regarding the purpose of the priming task.

## Results

Prior to testing the first hypothesis, according to which a congruency priming effect was expected, the dataset was prepared as follows. Firstly, to analyze response latency data, RT means per target were calculated. As trimming procedure, RTs more than three standard deviation units above the overall mean were identified as outliers (Banaji & Hardin, 1996; Blair & Banaji, 1996; Montes-Berges, 2009) and replaced with the average value of this target (Montes-Berges, 2009). These outliers only amounted to 2.29% of the total data. Anticipatory responses (RTs below more than three standard deviations) were not found.

It is important to point out that in this study incorrect responses to the target were not of interest, since we focused on the prime-target semantic relationship (faster or slower RT when prime and target belonged to the same gender group or to a different gender group, respectively), and not on

the evaluative relationship (to consider a particular gender stereotype as positive or negative). However, following the same procedure as in previous studies (Montes-Berges, 2009), the exclusion criterion of making more than 37.5% mistakes (75 errors) was considered, forcing the exclusion of one participant.

Subsequently, RT means were calculated for congruent and incongruent trials for each participant. In order to compare if response facilitation occurred only for feminine stereotypes, masculine stereotypes or in both cases, RT means were calculated as follows: (a) RT means of all congruent trials: trials where feminine stereotypes were preceded by "woman" prime and trials where masculine stereotypes were preceded by "man" prime; (b) RT means of all incongruent trials: trials where masculine stereotypes were preceded by "woman" and trials where feminine stereotypes were preceded by "man"; (c) RT means of congruent trials related to women: only trials where feminine stereotypes were preceded by "woman"; (d) RT means of incongruent trials related to women: only trials where masculine stereotypes were preceded by "woman"; (e) RT means of congruent trials related to men: only trials where masculine stereotypes were preceded by "man"; (f) RT means of incongruent trials related to men: only trials where feminine stereotypes were preceded by "man".

As Wentura and Degner (2010) recommended regarding sequential priming analyses, priming

effects were calculated by subtracting the RT means in congruent trials from RT means in incongruent trials. This analysis was repeated for the three possible combinations of congruent-incongruent trials explained above considering: (a) trials in which both "woman" and "man" primes appeared; (b) trials in which only "woman" prime appeared; and (c) trials in which only "man" prime appeared. The expected congruency priming effect would be indicated by a positive result in these subtractions significantly different from zero. However, after running the corresponding one sample *t*-tests, these expected facilitation effects were not found in any of the three combinations of trials, all *ts* < 1, *ns*. Therefore, our first hypothesis had to be rejected.

Since subliminal primes make finding priming effects more difficult, this pattern of results might be expected. However, following Degner and Wentura's (2010) procedure, a more detailed observation of RT data was carried out. Bearing in mind the different kinds of result that can derive from a priming task (congruency effect, reverse effect and no effect), the score after subtracting RT means of congruent trials from RT means of incongruent trials, including both "woman" and "man" primes, was explored in each participant. Subsequently, the entire sample was divided into two groups, according to whether they had a positive or negative score. This procedure led to identify one group consisted of 33 participants (15 men) with a positive score (Group 1) and other group of 36 participants (19 men) with a negative score (Group 2). The priming effect was tested again in each group. When considering both primes, results showed a *congruency priming effect* in Group 1 ($t(32) = 7.72$, $p < 0.001$, $d = 0.29$), implying faster responses in congruent trials than in incongruent ones. Moreover, the results for Group 2 showed a *reverse priming effect* ($t(35) = -6.19$, $p < .001$, $d = 0.29$), which indicated faster responses in incongruent trials than in congruent (see Figure 2).
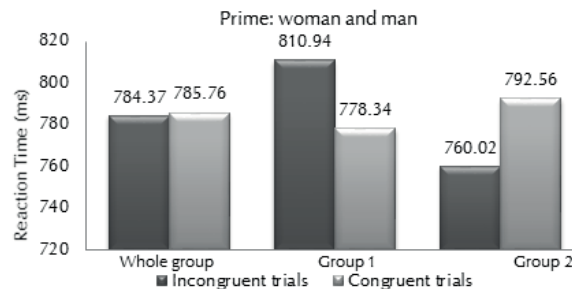


*Figure 2*. RT means (ms) in each group in the entire priming task.
Source: Compiled by authors

Analyses were repeated for each prime separately, which led to finding the same pattern of results. When considering the prime woman only, results showed again a *congruency priming effect* in Group 1, ($t(32) = 3.91$, $p < 0.001$, $d = 0.34$), whereas in Group 2 showed a *reverse priming effect*, ($t(35) = -3.30$, $p = 0.002$, $d = 0.24$) (see Figure 3).
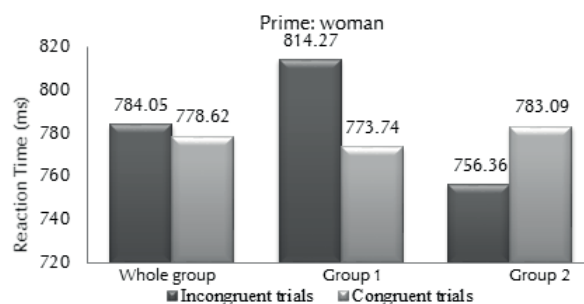


*Figure 3*. RT means (ms) in each group when the prime was "woman".
Source: Compiled by authors

Likewise, when only the prime "man" was considered, results replicated the same pattern, showing again a *congruency priming effect* in

Group 1, ($t$(32) = 2.92, $p$ = 0.006, $d$ = 0.21), and a *reverse priming effect* in Group 2, ($t$(35) = -3.95, $p$ < 0.001, $d$ = 0.31) (see Figure 4).
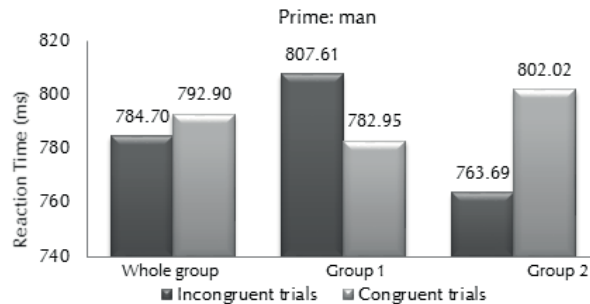


*Figure 4.* RT means (ms) in each group when the prime was "man".

Source: Compiled by authors

To further explore the results, three mixed two-way ANOVA were carried out, in which *group* (Group 1 vs. Group 2) was a between-subject factor, and trials (incongruent, congruent) were a within-subject factor. The first mixed ANOVA included all the trials (both primes). The results showed that there was a non-significant main effect of *group*, ($F$(1, 67) = 0.46, $p$ = 0.499). There was also a non-significant main effect of trials, ($F$(1, 67) = 0.00, $p$ = 0.993). However, there was a significant interaction between the *group* and the *trials*, ($F$(1, 67) = 91.35, $p$ < 0.001, $h_p^2$ = 0.58), observed power = 1.00, indicating that participants from each group differed in the speed with which they responded to each type of trial. Specifically, participants from Group 1 were faster in congruent trials than participants from Group 2, while participants from Group 2 were faster in incongruent trials than those from Group 1 (see Figure 2 for mean values). When only the prime "woman" was considered for the factor trials, results showed that there were non-significant main effects of the factors *group*, $F$(1, 67) = 0.83, $p$ = 0.366, or trials, $F$(1, 67) = 1.12, $p$ = 0.294. However, the interaction effect of both factors was significant, $F$(1, 67) = 26.62, $p$ < 0.001, $h_p^2$ = 0.28, observed power = 1.00, indicating different RT's in each group of participants according to the trials in a similar way as in the previous analysis (see Figure 3 for mean values). Similarly, when only the prime "man" was considered for the factor trials, results showed non-significant main effects of the factors group, $F$(1, 67) = 0.19, $p$ = 0.666, or trials, $F$(1, 67) = 1.11,

$p$ = 0.295. However, the interaction effect of both factors was again significant, $F$(1, 67) = 23.63, $p$ < 0.001, $h_p^2$ = .26, observed power = 1.00, indicating that participants from each group differed in the RT's with which they responded to each type of trial following the same pattern of results as before (see Figure 4 for mean values).

To test our second hypothesis[6], firstly, descriptive analyses were carried out for all the scales and their components (see Table 2). The results showed: (a) a preference for a self-assignment of positive feminine and positive masculine stereotypes to negative gender stereotypes, (b) a preference for feminine rather than for masculine traits, (c) GGI scores indicated a correspondence between the gender identity and the biological sex, (d) participants were moderately satisfied with their bodies, and (e) a non-traditional gender ideology in the sample. Secondly, to test the correspondence between the implicit and explicit levels of discrimination, we carried out Pearson's correlation analysis, considering each scale and its components, and the six types of trials described above. However, the results showed a lack of relationship between the implicit and the explicit measures, such that all $rs$ ≤ (-) 0.176, $p$ ≥ 0.165.

Given that opposite results were found in Groups 1 and 2, we explored whether other gender-related factors could account for these.

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6    We acknowledge the importance of analyzing these variables according to participants' sex. However, since this is not the main objective of this study, these results are not reported here due to space limits.

Consequently, a series of independent samples *t*-test was carried out to compare both groups in each of the explicit measures (see Table 2). No significant differences were found[7] in *self-assignment of gender* *stereotypes*, *gender identity* or *gender ideology* between participants from either group, all *ts* ≤ 1.61, *ns*.

Table 2
*Mean and standard deviation of the gender-related variables in the whole sample and in each group.*

| Scales | Components | Total sample | | Group 1 (n = 33) | | Group 2 (n = 36) | | t | df | p |
|---|---|---|---|---|---|---|---|---|---|---|
| | | M | SD | M | SD | M | SD | | | |
| Self-assignment of gender stereotypes | PFGS | 3.82 | 0.44 | 3.83 | 0.53 | 3.81 | 0.37 | 0.17 | 62 | 0.869 |
| | NFGS | 2.58 | 0.77 | 2.52 | 0.75 | 2.63 | 0.79 | -0.58 | 62 | 0.566 |
| | PMGS | 3.10 | 0.59 | 3.04 | 0.50 | 3.14 | 0.65 | -0.71 | 62 | 0.481 |
| | NMGS | 2.20 | 0.61 | 2.20 | 0.64 | 2.20 | 0.59 | -0.03 | 62 | 0.976 |

| Scales | Components | Total sample | | Group 1 (n = 33) | | Group 2 (n = 36) | | t | df | p |
|---|---|---|---|---|---|---|---|---|---|---|
| | | M | SD | M | SD | M | SD | | | |
| Multifactorial Gender identity | GGI | 4.03 | 1.64 | 4.06 | 1.39 | 4.00 | 1.85 | 0.15 | 67 | 0.879 |
| | FPT | 4.87 | 0.64 | 4.79 | 0.72 | 4.93 | 0.57 | -0.93 | 67 | 0.357 |
| | MPT | 3.61 | 0.86 | 3.78 | 0.81 | 3.45 | 0.88 | 1.61 | 67 | 0.111 |
| | PA | 4.52 | 0.94 | 4.63 | 0.76 | 4.43 | 1.08 | 0.89 | 67 | 0.378 |
| Gender ideology | GIS | 0.74 | 0.64 | 0.71 | 0.63 | 0.77 | 0.66 | -0.37 | 67 | 0.712 |

*Note.* PFGS = positive feminine gender stereotypes; NFGS = negative feminine gender stereotypes; PMGS = positive masculine gender stereotypes; NMGS = negative masculine gender stereotypes; GGI = global gender identity; FPT = feminine personality traits; MPT = masculine personality traits; PA = physical appearance; GIS = gender ideology scale.
Source: Compiled by authors

## Discussion

The primary aim of this study was to test whether subliminal presentation of gender categories could activate automatically gender stereotypes in a sample of young undergraduates. The importance of such analysis, which would replicate the facilitation effect widely reported in priming literature, is based

mainly on (a) the necessity to estimate whether current egalitarian policies and public rejection to discrimination have had any effect at the implicit level, and (b) previous research that, using explicit measures, indicate the potential dynamic of gender stereotyping. Firstly, results of the sequential priming task revealed a non-priming effect, implying the absence of automatic activation of any knowledge structure. However, a more detailed examination of results identified two groups of participants

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[7] No differences were found between both groups neither in the other variables related to discrimination (see Note 1).

that could be differentiated according to the effects caused by the same primes. Specifically, a congruency priming effect was observed in Group 1 when primes were considered either together or separately, whereas a reverse priming effect was showed in Group 2 in the same conditions. This implied that Group 1 participants were faster in stereotypical trials (woman-kindness, man-strength) than in counter-stereotypical ones, while Group 2 participants were faster in counter-stereotypical trials (i.e., woman-strength, man-kindness) than in stereotypical. These results were reinforced with a significant interaction effect between the type of trials and the group. To our knowledge, this is the first time that both opposite effects are found in gender stereotyping literature when using the same primes and without any particular manipulation (beyond the priming task) that could influence participants' (counter) stereotypical responses. Moreover, no differences were found between the groups with regard to explicit, gender-related variables (gender ideology, identity and self-assignment of stereotypes). These results provide relevant inputs in relation to what type of information might be automatically activated after cues related to gender, even when these cues are presented subliminally. However, the unexpectedness of these findings means that some explanations remain speculative.

Empirical evidence from recent decades has largely demonstrated the congruency priming effect (Bargh & Morsella, 2010; Devine, 1989; Dovidio et al., 1997; Lepore & Brown, 1997). Specifically, in our study this effect entailed the automatic activation of gender stereotypes, as reported in previous research (Banaji et al., 1993; Blair & Banaji, 1996; Gawronski et al., 2003; Irmen, 2006; Montes-Berges, 2009). However, the reverse priming effect has been less observed and reported, and therefore, there are not many clear explanations about it. Some authors have suggested the implication of an unconscious corrective strategy in this effect (Abreu et al., 2003; Glaser & Banaji, 1999), but the brief presentation of the masked primes in the present study hardly allows participants to develop such a correction. Following Moskowitz and colleagues' approach, we suggest that the reverse priming effect could have involved the implicit inhibition of stereotypes' automatic activation. According to Moskowitz and Ignarri (2009), the goals of being an egalitarian person do not correct stereotype activation, but provoke implicit operations that prevent such activation.

Moreover, Moskowitz and Ignarri (2009) assume that stereotype activation is an implicit cognitive function that also depends on a goal: the goal of applying stereotypes. This might explain why the same primes can lead to different priming effects, as we found in our study. Therefore, in accordance with the dominant association that prevailed in the person, gender categories, even presented subliminally, seemed to involve the automatic activation of opposite goals in each group of participants, namely, the goal to behave in an egalitarian way and the goal to behave stereotypically. Consequently, at an implicit level, stereotypical associations regarding gender categories seem to have been overridden in some individuals (Group 2) but persist in others (Group 1). A strong, or lack of, commitment to an egalitarian behaviour might be the reason why participants would have developed, or not, egalitarian goals (Moskowitz & Ignarri, 2009). Future studies should examine the reasons why some people form this strong commitment, as well as the factors that promote, and prevent, its development. In particular, it would be important to identify how this commitment becomes relevant for the individual so that it can, eventually, develop into a goal that is automatically activated. From a societal and institutional level, this research could inform policy making and the design of effective strategies to reduce gender discrimination by promoting the acquisition of such strong commitment.

The occurrence of different types of priming effects derived from the same primes can also contribute to identifying which unconscious behavioural guidance system is automatically activated when gender categories are presented subliminally. It can also provide some input in one of the second generation questions about priming effects that Bargh (2006) points out, that is, how the same prime can lead to different qualitative effects. According to Bargh and Morsella's (2010) model, it could be assumed that both congruency and reverse priming effects are consequences of the automatically activated motivational system, since both effects involve automatic goal activation. However, these authors also assume that priming effects may follow the activation of the perceptual system because of an automatic activation of social information (stereotypes). In addition, they establish a link between these two systems, the perceptual and the motivational. Therefore, in line

with this model, there are some possible reasons for the occurrence of both priming effects with the same primes in our study. On the one hand, these primes could have activated diverse contents in the motivational system (different goals). That is, the motivational system could be the one involved in both priming effects, but it would have operated differently in both groups of participants, activating two different (and opposite) goals in each group. On the other hand, the same primes could have activated a different internal system (perceptual or motivational) in each group of participants: the perceptual system in those participants in which a congruency effect occurred and the motivational in those who showed a reverse effect. Moreover, these last two systems might have operated jointly in the congruency effect. Thus, "man" and "woman" categories could have activated the stereotypical content (derived or not from a goal) in participants from Group 1, leading to a stereotypical response in the priming task (faster responses in congruent trials than in incongruent), while these primes would have activated an egalitarian goal in participants from Group 2, leading to a counter-stereotypical response (faster responses in incongruent trials than in congruent). A fact worth mentioning is that the assumed egalitarian goal activation could have caused a non-priming effect (no RT differences between congruent and incongruent trials) instead of a reverse effect. Such effect implies strong counter-stereotypical associations in these participants, which supports the assumption about the role of this goal.

In summary, according to empirical and theoretical support, we assume that when a congruency effect occurred (Group 1) it was because automatic activation of gender stereotypes took place, whereas the reverse effect (Group 2) occurred because of implicit gender stereotype inhibition, derived from the automatic activation of an egalitarian goal. Taking into account that no differences were found between both groups with regard to the explicit measures (gender ideology, identity and self-assignment of stereotypes), which is a typical way to assess gender-related issues, and, importantly, the low score in the gender ideology scale, these results also demonstrate empirically that although gender discrimination might be explicitly rejected, it might persist implicitly. This lack of differences in the explicit aspect of discrimination could be partly due to the individuals' conscious

effort to become more egalitarian, possibly leading to an external level similar to internally more egalitarian individuals. Overall, these results also support previous research about the dynamic of gender stereotypes. Interestingly, our study provides evidence that these changes can also appear at an implicit level.

This study presents some limitations. Firstly, we are not able to confirm that the automatic activation of an egalitarian goal occurred in Group 2 participants. Also, if activated, we cannot state whether this goal was chronic or temporary. Nevertheless, given that the reverse priming effect found in this study indicated a counter-stereotypical response, it seems likely that implicit gender stereotype inhibition occurred, which in turn presumably involved some kind of egalitarian process. Since a reverse priming effect was not expected, the potential involvement of these goals was not assessed; therefore, a replication of the study including goal assessment would be convenient. Thus, for future research we suggest assessing the previous existence of a chronic goal to behave in an egalitarian way using subliminal and sequential priming tasks. Likewise, some manipulations on the activation of temporary egalitarian goals would assist on providing more solid explanations about the reverse priming effects. Another limitation is related to the characteristic of the sample. Although our aim was to test gender stereotypes activation in a young sample, undergraduates might be more informed about and concerned with gender equality issues than other cohorts, which could have facilitated the occurrence of the reverse priming effect. Therefore, replication of the study with other groups of young people (specially, with a lower level of education) would be desirable to explore the representability of the results. Finally, further validation of some of the explicit measures would be convenient prior replication, and thus, some results based on them should be interpreted with caution.

As a final conclusion, this study showed that implicit gender stereotyping, at least in some participants, still persists in young people despite institutional efforts to promote equality. However, it has been observed that implicit gender stereotype inhibition can also occur. The opposite results found lead to different conclusions. Firstly, the idea that automatic activation of stereotypes can be avoidable (Blair, 2002; Kunda & Spencer, 2003), even without manipulating participants' response

intentions, is reinforced. Secondly, people who hold egalitarian goals and people who merely maintain egalitarian beliefs seem to only differ in the strong commitment to achieve these goals (Moskowitz et al., 1999). From a practical perspective, this means that unless egalitarian policies and societies are able to encourage such commitment in the population, egalitarian values could hardly be truly incorporated. In many instances, these values seem to be only externally accepted, leading to the maintenance of discrimination, and particularly to gender inequality.

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