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Cognitive and personality variables as predictors of sexism against women in Spanish adolescents

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Abstract

Previous research on the antecedents of sexism against women have not considered simultaneously the effects of sex, personality, and cognitive variables (need for closure and critical thinking disposition) in relation to sexism. We evaluated whether in adolescence, these indicators could predict sexist attitudes towards women using structural models. The sample comprised 709 Spanish high-school students (mean age = 16.79). 51.5% were female. Sex (being male), need for closure and critical thinking were the most relevant predictors of sexism. The disposition to think critically is as relevant as the motivational dimension of cognition (need for closure) to predict sexism. Multi-group structural models by sex were estimated, and a moderator effect was found between openness to experience and sexism. We suggest future lines of research to disentangle the effects of personality and cognition on sexism and to guide intervention programs to reduce sexist attitudes among adolescents.

Keywords

Need for closure, critical thinking disposition, ambivalent sexism, personality, adolescents, sex differences

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Introduction

Sexism is a discriminatory attitude towards the opposite sex, or any reference to female inferiority or its corresponding cultural construction based on gender (Ayres et al., 2009). Glick and Fiske (1996) integrated positive and negative attitudes towards the construction of gender, conceptualized as the theory of Ambivalent Sexism. This theory is based on the representation of opposing affective connections as two dimensions: Hostile Sexism and Benevolent Sexism. Hostile Sexism shares a negative emotional charge with traditional sexism, represents women as inferior to men, and perpetuates stereotyped connotations. Historically, hostility towards women has disrupted the duality of gender and divided the patriarchal sexes into those of the 'strong' and 'weak', i.e. men and women (Ramiro-Sánchez et al., 2018). Thus, Benevolent Sexism consists of the false belief that men must provide 'protection and shelter' because women are weaker and must be cared for. Hence, the sexist position of men in this scenario nullifies processes of female empowerment and autonomy because women are subject both to the shelter and values of men. The latter casts women in the classical cultural roles of housewife, mother, caregiver, and wife. Moreover, Hammond and Overall (2013) report that labelling women based on positions of Benevolent Sexism perpetuates social views that clearly discriminate against them. In other words, when women justify the Hostile Sexism or Benevolent Sexism beliefs, according to Huang et al. (2016), they themselves collaborate in discrimination against women. Women's endorsement of BS can block the attainment of gender equality by encouraging them to invest in their romantic relationships instead of promoting their own achievements (Lachance-Grzela et al., 2021), which may be considered a potentially detrimental outcome for women. According to Shnabel et al. (2016), these overtones can reconstitute themselves as socially accepted beliefs played out in society as, for instance, women receiving less recognition for doing the same work as men, or that women are less competent in mathematics than boys, even though studies reveal this belief as a stereotype of men about women (Vuletich et al., 2020).

In terms of social psychology, sexism can be considered as a specific form of general prejudice motivated by desire for structure and avoidance of ambiguity (Allport, 1954). Since the 1950s, ample studies have investigated the role of person and situation-based factors on prejudice. Hodson and Dhont (2015) concluded from their review on this topic that, on one hand, individual differences (personality, ideological, cognitive and emotion constructs) matter to explain "generalized prejudice" (the finding that some people consistently score higher in prejudice towards multiple outgroups) and, on the other hand, that a better understanding of prejudice should consider the person, the situation, and their interaction. A study on a representative sample of 1500 Belgian adolescents reported that the generalized prejudice around the ideological construction is produced during the process of transition to adulthood, and in the dynamics of family socialization, through the exchange of opinions, reflection and openness to other positions, so that individual differences (cognitive, ideological and personality construction), constitute a phenomenon that explains the generalized prejudice at this stage of life (Meeusen & Dhont, 2015). The present study is framed in the first approximation, the study of individual differences in the explanation of a specific expression of prejudice, the sexism during adolescence.

Previous research on the antecedents of general sexism (negative attitudes towards women) and/or ambivalent sexism has focused on variables at the group level (social group membership, i.e., being part of the group "men" or "woman"), and at the personal level (including personality, social attitudes, and motivational cognitive styles). Subsequently we review the main research on this topic.

Sex and Personality traits

Sex has been found to have a strong effect on sexism (e.g. Akrami et al., 2011; Hellmer et al., 2018; Roets et al., 2012; Zhu & Chang, 2020). Some studies have found that men scored significantly higher than women for the Hostile Sexism component of Sexism, but that there were no sex differences for the Benevolent Sexism dimension, both in adult samples (e.g. Pek & Leong, 2003), and in Spanish samples of adolescents (Lameiras et al., 2001; Moyano-Pacheco et al., 2013). However, other works have found that men scored significantly higher than women in both, Hostile and Benevolent Sexism, both in samples of adults (Hellmer et al., 2018; Ibabe et al., 2016; Roets et al., 2012), and in a recent study with a sample of adolescents (12–17 years) from different European cities (Ayala et al., 2021).

Regarding the evolution of sexism in adolescence, a longitudinal study carried out in Spanish adolescents over three consecutive years, starting at an average of 12 years old, illustrated that boys scored higher than girls for Hostile Sexism (but not for BS) and that Hostile Sexism remained stable over time while Benevolent Sexism decreased with age (Ferragut et al., 2017). Sexism in adolescence is interwoven with many other problems. For example, self-control deficits in young male students predicted adherence to the prostitution myth (Menaker & Franklin, 2018). Prostitution myth refers to male domination over the prostitute in which deficits of self-control can exert an influence on the domineering behavior of both the client with the prostitute, and the procurer with the female figure whom he supposedly protects. Other studies connected pornography consumption with sexist hostility towards women (Peter & Valkenburg, 2016). In parallel, studies on prostitutes and young consumers of their services, report their low questioning of the role of women (Rizzo et al., 2021), coinciding with the results of Rousseau et al. (2019) that show low levels of critical thinking and the objectification of the female figure (Rousseau et al., 2019).

In summary, the sex variable also appears to predict ambivalent sexism, but with inconsistent results for Hostile Sexism and Benevolent Sexism. There is also interesting evidence that sex differences in terms of ambivalent sexism are formed at early ages, but may vary with experiences and over the years (Zhu & Chang, 2020), from adolescence to adulthood.

Research about the role of personality variables to explain general prejudice has mainly focused on the Big Five factors of personality (extraversion, neuroticism, openness to experience, agreeableness, and conscientiousness). One meta-analysis concluded that the best predictors of prejudice were agreeableness and openness to experience (Sibley & Duckitt, 2008). Specifically, Akrami et al. (2011) examined a combined personality model (agreeableness and openness to experience from the Big

Five, and right-wing authoritarianism and social-dominance orientation) as well as social psychology factors (gender and gender identification) to explain sexism in a sample of Swedish university students. They found that general sexism was correlated negatively in studies one and 2 with openness to experience (−.14 and −.19, respectively) and agreeableness (−.12 and −.22, respectively). Moreover, they concluded that sexism was best explained by considering the combined influence of personality and social-psychological variables, but there was absence of the moderating effect of sex. In the same line, the work by Hellmer et al. (2018), that includes the Big Five factors (study 2), also found negative correlations between sexism and openness, but agreeableness was negatively associated with sexism only among men, indicating a possible moderating effect of sex. Finally, Lameiras et al. (2001) found, in a sample of Spanish adolescents, that both men and women with higher openness to experience scores showed less sexism. Their results also point to a moderating effect of sex, given that conscientiousness and agreeableness correlated negatively with sexism in girls, while agreeableness and extraversion correlated positively with sexism in boys.

Impulsivity also plays a role in violent behavior and has been linked to violence (Krueger et al., 1996). A study on sexual dating among adolescents conducted in Spain found that boys tend to justify their Hostile Sexism, with violent and impulsive actions using smartphones (Linares et al., 2021). This study also established correlations between low impulsivity and low sexism. In this line of sexual dating consumption, another study with adolescents and young consumers of prostitution, reported the existence of a system of relationships whose central axis is represented by sexism, impulsivity and male dominance over girls (Velikova et al., 2021). Linares et al. (2021) have tentatively explained the process by which impulsivity can lead to an increase in sexism by relating impulsivity to the controlling behaviors that are so prevalent in sexist behaviors and attitudes.

Cognitive variables

Sexism can be considered a specific form of general prejudice motivated by desire for structure and avoidance of ambiguity (Allport, 1954). In this context, the Need For cognitive Closure (NFC) could help explain the prejudice (Hodson & Dhont, 2015) was developed as a theoretical framework for the cognitive–motivational aspects of decision making, and is defined as the desire for "an answer on a given topic, any answer […] compared to confusion and ambiguity" (Kruglanski, 1990, p. 337). This concept refers to a motivated cognitive style in which individuals with a higher need for closure prefer firm answers, order, predictability, and quick decision-making. People with low need for cognitive closure scores are more tolerant to uncertainty, ambiguity, and chaos. As such, the need for cognitive closure seems to capture Allport's (1954) concept of a "general way of thinking about the world", which he assumed could explain general prejudice (see Dhont et al., 2011).

Previous research has demonstrated the relationships between the need for cognitive closure, stereotypical attitudes (Dijksterhuis et al., 1996; Doherty, 1998), and racial prejudice (e.g. De Kerrsmaecker, Bostyn, Fontaine, Van Hiel, & Roets, 2018; Roets & Van Hiel, 2011b),

but only a few of these have focused on the role of need for cognitive closure in explaining sexism (Baldner et al., 2021; Calogero & Jost, 2011; Moyano-Pacheco et al., 2013; Pek & Leong, 2003; Roets et al., 2012). Pek and Leong (2003) found significant correlations between the need for cognitive closure and Hostile Sexism and Benevolent Sexism (.15 and .33, respectively), but found that the need for cognitive closure did not predict sexism in a hierarchical regression analysis which had included other personality and socio-cultural variables. In addition, Calogero and Jost (2011) provided experimental evidence for the relevance of this variable by showing that individual differences in the need for cognitive closure moderated the effects of exposure to sexist ideologies, such that a greater need to avoid cognitive closure protected women against BS and self-objectification. In congruence with this, Roets et al. (2012) also found a significant correlation between the need for cognitive closure and general Sexism (.32), Hostile Sexism (.30), and Benevolent Sexism (.23). Moreover, in this work they investigated the relative contribution and interactions between sex and need for cognitive closure in explaining ambivalent sexism toward women. They concluded that the need for cognitive closure was a strong and significant predictor of sexism which explained more variance than participant sex, and that these two factors did not significantly interact. They also found that the impact of the need for cognitive closure on sexism was thoroughly mediated by social attitudes (right-wing authoritarianism and social dominance, study 2). The most recent study by Baldner et al. (2021) shows that a high need for cognitive closure is associated with increased acceptance of general and specific stereotypes of women.

In the context of adolescence, Moyano-Pacheco et al. (2013) also reported strong correlations between the need for cognitive closure and Hostile Sexism and Benevolent Sexism (.51 and .73, respectively) in a sample of Spanish teenagers aged 13–17 years, and after controlling for sex and religion, found that the need for cognitive closure was a good predictor of Hostile Sexism and Benevolent Sexism in this group. In contrast, another recent research by Silva et al. (2021) with transgender young adults failed to establish connections between sexism and cognitive closure.

Another motivational aspect of cognition that could help explain sexism is Critical Thinking Disposition (CTD), defined as "the propensity and skills to engage in activity and 'mental activity' with reflective skepticism focused on deciding what to believe or do…" (Fasko, 2003, p. 8). Importantly, there is a consensus that a comprehensive view of critical thinking disposition must include, as in the aforementioned definition, both the cognitive (ability or skill) and dispositional (propensity or motivation) dimensions (e.g. Davies, 2015). Critical thinking skills involve a set of abilities including interpreting, predicting, analyzing, and evaluating, while dispositions refer to factors such as curiosity, inquisitiveness, open-mindedness, and prudence in decision-making (Fong et al., 2017; see Sosu, 2013, for a review of the taxonomies of important thinking dispositions). Both components define critical thinkers, as pointed out by Ku (2009, p. 71): "besides the ability to engage in cognitive skills, a critical thinker must also have a strong intention to recognize the importance of good thinking and have the initiative to seek better judgment".

There is also empirical evidence that lower cognitive abilities (e.g., abstract–reasoning, verbal/nonverbal skills, and general intelligence) predict greater prejudice (e.g. Dhont & Hodson, 2014). Indeed, the meta-analysis by Onraet et al. (2015) showed that people with

lower cognitive abilities tended to show more ethnic prejudice. However, to the best of our knowledge, the relevance of the dispositional dimension of critical thinking to explain general prejudice or sexism remains unknown, even though critical thinking disposition is strongly correlated with the openness to experience personality characteristic (Facione et al., 1995). Similarly, a meta-analysis by Sibley and Duckitt (2008) showed that openness to experience was significantly associated with lower prejudice (mean $r = -.30$). Therefore, we hypothesized that critical thinking disposition would have a protective role in preventing the development of sexist attitudes.

A study in Chile with adolescents in seventh and eighth grade of elementary school showed that critical thinking favored a free coexistence, truncating gender stereotypes and sexist behaviors (Moreno et al., 2017). Recently, some studies have focused on critical thinking disposition and impulsivity, connecting it with sexism. According to Holt et al., 2012), young people with lower self-control consumed more internet pornography. Urben et al., (2015) reported that high impulsivity was associated with low critical thinking, relating this in practice to disturbing situations such as bullying, gender-based violence and sexual harassment of women (Sujung, 2021).

Therefore, all these dimensions that we have presented have implications in adolescence, as they shape personality (Abrahams et al., 2019), physical changes (Croy et al., 2019), have implications in socialization and impact on learning (Morillo et al., 2022), perception of life events and identity construction (Bogaerts, et al., 2021), friendship, affective relationships, sexuality (Mastari et al., 2022), and other characteristics that are part of the transition between adolescence and adulthood (Millar, 2008).

Objectives and Hypotheses

To the best of our knowledge, no previous studies have simultaneously considered the effects of sex and individual differences in cognitive and personality variables on the explanation of sexism in a unified way. Moreover, no previous academic literature has addressed the role of the disposition to think critically in sexist attitudes in adolescence, and only one work dealt with the relationships between need for cognition and sexism in adolescence. Thus, in this study we aimed to (1) clarify the relevance of the need for cognitive closure and critical thinking disposition cognitive variables in the explanation of sexist attitudes towards women; (2) assess the extent to which sex, personality, and cognitive variables contribute to the explanation of sexism by considering all these variables simultaneously; (3) assess the role that sex might play in moderating the possible effects of personality and cognitive variables on sexism. Sex seems central to any study on sexism, and there is abundant evidence on its predictive power. However, there is not enough evidence about its moderator effects, and therefore this last aim has been included for exploratory purposes. In order to do this, we took a structural equation modelling approach to test whether these variables could predict ambivalent sexism. We also used a multi-group procedure to examine the role sex plays in moderating how these variables affect sexism in adolescence.

Based on previous research (e.g. Akrami et al., 2011; Hellmer et al., 2018; Ibabe et al., 2016), we expected that sex would be a strong predictor of sexism scores, and may also to

moderate some effects of personality and cognitive variables on sexism. Moreover, based on the research on the effects of personality traits on general prejudice and sexism (Akrami et al., 2011; Krueger et al., 1996; Sibley & Duckitt, 2008), we predicted that openness to experience and agreeableness would negatively predict sexism, and impulsivity would be a positive predictor. Regarding the role of cognitive variables, we predicted, based on previous studies (e.g. Calogero & Jost, 2011; Moyano-Pacheco et al., 2013; Roets et al., 2012), that the need for cognitive closure would positively predict sexist attitudes. Finally, we expected that critical thinking disposition would negatively predict sexism scores based on: a) the relation found between critical thinking disposition and openness to experience (e.g. Facione et al., 1995), b) the fact that openness to experience is significantly associated with lower prejudice (Sibley & Duckitt, 2008), and c) on the negative association between cognitive abilities and prejudice (Onraet et al., 2015).

Methods

Sample and procedure

The design is correlational. There were eight educational centers in which the research was conducted. All of them were in Valencia (east of Spain). Five of them were in urban areas, while three were of rural location. About the ownership of the centers, five were public and the remaining three were private. The total sample consisted of 709 participants enrolled in the last 2 years of high school. 51.5% were girls and 48.5% were boys, and the mean age was 16.79 years (SD = 0.75, range = 15–20 years). The high-school location was urban for 37.2% of the sample, metropolitan for 35%, and rural for the remaining 27.8%. 74.7% of the adolescents perceived they were of medium economic status, medium-low income was perceived by 18.4%, and 4.8% perceived themselves as of high-income families. 77.5% of the adolescents use their mobile phones on daily bases. 31.5% of the interviewed informed that they have detected violent situations around them, while 20.4% reported they perceived they have suffered at least one situation of bullying in their educational context. 56.2% where in their first year at high school, and the rest in their second year. The mean age of their first sentimental relationships was 12.97 years (SD= 4.09) and a mode of 15 years. 29.6% were engaged in a sentimental relationship while 70.4% were not. Regarding their family's variables, educational level of the parents was as follows: no formal education or primary 23.3% (parents) and 18% (mothers); secondary or professional education 40.9% for parents and 36.3% for mothers; and university studies 35.8% (parents) and 45.6% (mothers). Regarding parent's employment situation, 91.1% of the fathers were working for a 75.9% in the case of the mothers. 78.7% of the adolescents lived in a nuclear family, 15.6% lived only with their mothers or mothers and siblings, and 5.7% were in other situations. Finally, with regard to the number of siblings, the range was 0–10, with a mean of 1.36 (SD= 1.02).

This study met all the pertinent internationally accepted and professional ethical guidelines and was approved by review boards in the autonomous government's Equity and Inclusive Policies area. The questionnaire administration was scheduled as part of the

Gender Equity plan of activities, although it was voluntary, and students do not receive any incentives for their participation. Students completed the questionnaires during the weekly tutoring schedule for these activities in the classroom facilities. The questionnaires were self-administered in one session of about 20–30 minutes following the instructions of a psychologist and a social worker, with the support of the students' coordinator. The process fully guaranteed the anonymity and confidentiality of the responses.

Our work was carried out in accordance with the requirements set out in Organic Law 3/2018, of December 5 (LOPD + GDD), and as stipulated in EU regulation 2016/679 of the European Parliament and Council, of April 27, 2016 (GDPR).

Instruments

Critical thinking disposition. We used the *Critical Thinking Disposition Scale* (CTDS; Sosu, 2013) which includes 11 items that examine critical openness (items one–7) and reflective skepticism (items 8–11) recently validated in Spanish youth population (Bravo et al., 2020). The critical openness subscale reflects the tendency to be actively open to new ideas, critical in evaluating these ideas, and willing to modify thinking when presented with convincing evidence. The reflective skepticism subscale measures the tendency to learn from one's past experiences and to question evidence. The items are scored on a 5-point Likert-type scale ranging from 0 (strongly disagree) to 4 (strongly agree). An overall dispositional score for each individual was obtained by summing the scores for all items. Previous research has shown evidence for the validity, reliability, and stability of the factorial structure of the CTDS (Bravo et al., 2020; Sosu, 2013). In this sample, reliability as measured by alpha was .64 (95% CI .59–.67) for critical openness, and .67 (95% CI .63–.71) for reflective skepticism. For the full scale the alpha was .76 (95% CI .74–.79).

Need for cognitive closure

The need for cognitive closure was measured with the *brief Need for Closure scale* developed by Roets and Van Hiel (2011a), which is a reduced version of the *Need for Closure Scale* (NFC, Webster & Kruglanski, 1994). This short scale includes 15 items rated on a 6-point Likert scale (from 0 = strongly disagree; 5 = strongly agree). Two native speakers translated this scale into Spanish independently. In case of disagreements, a third native speaker was consulted. Given that the scale has not been previously validated in Spain, a Confirmatory Factor Analysis (CFA) was estimated in addition to the reliability information. The CFA fitted the data well to the original one factor structure: χ^2 (169)= 598.7, p< .001, RMSEA= .039 90% CI [.001, .093], CFI= .991, SRMR= .008. In this study, internal consistency estimated by alpha was .78 with 95% CI (.75–.80).

Personality

The Big Five personality traits were measured with the *Mini-IPIP Scales* (Donnellan et al., 2006). These scales have a total of 20 items, four per personality trait. The response

scale ranged from 0 (strongly disagree) to 4 (strongly agree). We used the validation into Spanish by Martínez-Molina and Arias (2018). In this work the alphas were .61 (95% CI: .56–.65) for neuroticism, .77 (95% CI: .74–.79) for extraversion, .73 (95% CI: .69–.76) for openness to experience, .77 (95% CI: .741–.796) for agreeableness, and .78 (95% CI: .75–.80) for conscientiousness.

Sexism

We used a version of the *Ambivalent Sexism Inventory* (Glick & Fiske, 1996), a 20-item tool comprising the two dimensions of ambivalent sexism namely Hostile Sexism and Benevolent Sexism, adapted to Spanish by De Lemus et al. (2008). The responses are recorded on a six-point Likert scale ranging from 0 (strongly disagree) to 5 (strongly agree). In this study, the alphas for Hostile and Benevolent Sexism were, respectively, .87 (95% CI .85–.88) and .79 (95% CI .76–.81).

Impulsivity

Self-perceived impulsivity was assessed by an ad hoc single indicator about whether the interviewee considered him/herself to be an impulsive person. The response scale was binary, with 0 = No and 1 = Yes.

Statistical analyses

First, we computed the correlation coefficients between the structural model variables using SPSS software (version 24, IBM Corp., Armonk, NY), basing the type of coefficient used on the nature of the variables (quantitative vs. binary). Following, to provide evidence on the structure of Spanish adaptation of the *brief Need for Closure scale* (Roets & Van Hiel, 2011a), a Confirmatory Factor Analysis was estimated with WLSMV (Weighted Least Squares Mean and Variance corrected), given the non-normal and ordinal nature of the data (Finney & DiStefano, 2013). Next, we implemented full structural equation models (SEMs) to predict the latent variable of sexism alongside several observed or latent background variables; the a priori (theoretical) model is shown in Figure 1. Predictors included in the model were cognitive variables (Critical Thinking Disposition and Need For cognitive Closure) and personality measures (impulsivity, extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience), with sex and age as control variables. This model places two latent variables, the constructs of critical thinking disposition and sexism that were composed of highly correlated dimensions. The rest of the variables were modeled as observed variables. SEM has several advantages compared to modeling only observed variables (for example, regression analyses), that can be grouped in four categories: (1) modelling of measurement errors and unexplained variances; (2) simultaneous testing of relationships; (3) ability to link micro- and macro-perspective; and (4) best-fitting model and theory development (Nunkoo & Ramkissoon, 2012). Specifically, the advantages in our particular case are the model fitting facilities and the modelling of randon measurement error. The

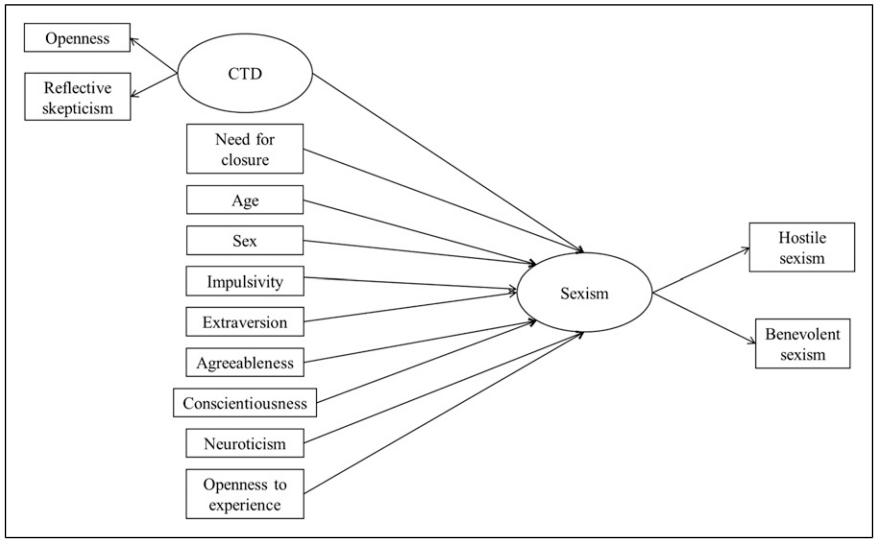

Figure 1. A priori or theoretical SEM to predict sexism. Note: CTD = critical thinking disposition. Sex is coded boys = 0, girls = 1.

data did not conform to parametric assumptions, so we estimated the SEMs with maximum likelihood with robust corrections (MLR) method (Finney & DiStefano, 2013) using Mplus 8.4 software (Muthén & Muthén, 1998-2017–2017). In addition, the reliability of the instruments was estimated using Cronbach's alpha with its 95% confidence interval. Alpha intervals were estimated in R (Rstudio RStudio Team, 2020).

The model in Figure 1 estimated the whole sample; we then estimated a multi-group model to compare boys and girls and test for the moderator (interaction) effects of sex on sexism. The overall goodness-of-fit of all models (CFA and SEM) was assessed as recommended elsewhere (e.g., Kline, 2016) using the chi-square statistic, comparative fit index (CFI), root mean squared error of approximation (RMSEA) and its 90% confidence interval (CI), and standardized root mean square residual (SRMR). Models with a CFI exceeding .90 and a RMSEA and SRMR of .08 or less were considered to have an adequate fit; an excellent fit was defined by a CFI exceeding .95 and a RMSEA and SRMR lower than .05.

Analyzing fit in multi-group or multi-sample SEMs required the use of a series of increasingly restricted models to test for the equality of relevant parameter estimates. This series started by estimating the baseline theoretical model in both groups (boys and girls) by freely estimating all the parameters. If the baseline model fit well, we tested a second model in which all the relevant parameter estimates were constrained to be equal in both groups. If this model fit the data as well as the baseline model, the parameter (in this case sex) did not interact in it—i.e., it did not moderate the model outcome. However, a poorer fit in the second model iteration compared to baseline indicated the presence of one or

more moderator effects. Thus, some (or all) of the constraints could then be relaxed (freely estimated in both groups) in order to identify the moderating effects.

Therefore, a multi-group SEM must compare the relative fit of several models and statistical differences between them can be tested either with statistical or practical fit-comparison approaches (Cheung & Rensvold, 2002). The statistical approach uses corrected χ^2 differences ($\Delta\ \chi^2$) to compare constrained to unconstrained models, with non-significant values indicating the correct application of constrains. However, this statistical rationale has been strongly criticized for its excessive power to detect differences, and therefore a more practical approach has been advocated (Cheung & Rensvold, 2002) which uses the differences in fit indices to compare constrained and less-constrained models to determine which one to retain. Specifically, CFI differences (ΔCFIs) are used for model comparisons, where a ΔCFI of .01 or less usually indicates that the constrained (more parsimonious) model should be retained (Cheung & Rensvold, 2002).

Results

Table 1 shows the correlation coefficients for all the variables included in the structural model presented in Figure 1. In general, the correlation matrix shows many statistically significant correlations among the variables. The relationship of Hostile Sexism with Sex was −.42 ($p< .01$), and the one of Benevolent Sexism with Sex was −.27 ($p< .01$). These two correlations were statistically different ($t\,(706)= -5.07$, $p< .001$). Therefore, boys had more sexist attitudes than girls had, and more so in Hostile Sexism. Moreover, Hostile Sexism was significantly correlated with the cognitive variables (negatively with Critical thinking disposition, r = −.22, $p< .01$, and positively with Need for closure, r = .17, $p< .01$). In the same vein, Benevolent Sexism was significantly correlated with the cognitive variables (negatively with Critical thinking disposition, r = −.11, $p< .01$, and positively with Need for closure, r = .23, $p< .01$). Regarding personality variables, both Hostile Sexism and Benevolent Sexism were negatively correlated with openness to experience and agreeableness. It is worth noting that the correlations of critical thinking disposition with openness and reflective skepticism were very large (.92 and .84, respectively), which is no surprise as they are indicators of critical thinking disposition, and this is the way they are modeled in the SEM model, as indicators of the latent variable critical thinking. This is also the case of the correlation between hostile and benevolent sexism (.63) which allowed us to model sexism as a single latent factor with these two indicators.

Whole-sample structural model

A SEM model was estimated to predict a latent variable for ambivalent sexism (see Figure 1). In terms of overall fit, the model fitted the data very well: $\chi^2\ [38] = 74.81$, $p < .001$, RMSEA = .037, 90% CI [.024, −.049], CFI = .961, and SRMR = .028.

Standardized parameter estimates are shown in Figure 2, but for the sake of clarity, we have not shown correlations among exogenous (predictor) variables. There were several statistically significant effects, the largest of which was sex, followed by the cognitive

Table 1. Correlations among all variables included in this study.

Type	Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Socio-demographic	(1) Age	1	—												
	(2) Sex	−.03	1	—											
Cognitive	(3) CTD	.08*	.08*	1	—										
	(4) Need for closure	.00	.00	.03	1	—									
	(5) Openness	.05	.06	.92**	−.01	1	—								
	(6) RS	.09*	.08*	.84**	.08*	.56**	1	—							
Personality	(7) Impulsivity	.01	.08*	−.20**	.04	−.15**	−.22**	1	—						
	(8) Extraversion	.02	.05	−.09*	−.01	−.07	−.10**	.24**	1	—					
	(9) Agreeableness	−.02	.22**	.23**	−.06	.21**	.19**	−.02	.18**	1	—				
	(10) Conscientiousness	.02	.06	.17**	.19**	.11**	.21**	−.17**	−.04	.11**	1	—			
	(11) Neuroticism	−.02	.27**	−.05	.18**	−.03	−.07	.27**	.02	−.02	.05	1	—		
	(12) OTE	.03	.00	.32**	−.14**	.35**	.19**	−.05	.03	.20**	.02	−.08*	1	—	
Sexism	(13) Hostile sexism	.08*	−.42**	−.22**	.17**	−.21**	−.17**	.11**	.05	−.21**	.00	−.11**	−.14**	1	—
	(14) Benevolent sexism	.04	−.27**	−.11**	.23**	−.12**	−.06	.05	.04	−.12**	.06	−.04	−.11**	.63**	1

Notes. CTD = Critical Thinking Disposition; RS = Reflective skepticism OTE = Openness To Experience; Sex is coded boys = 0, girls =1. *$p < .05$; **$p < .01$.

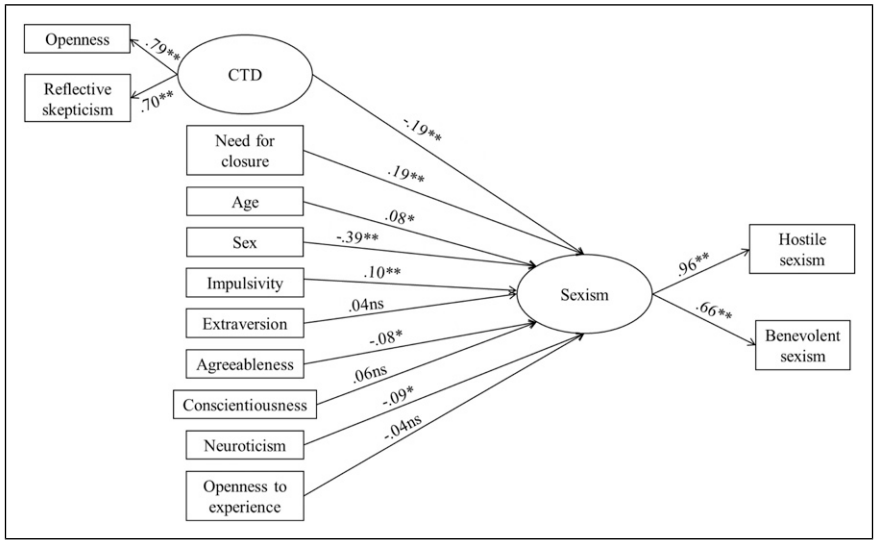

Figure 2. Standardized parameter estimates for the SEM model in the overall sample. Note: CTD = critical thinking disposition, *$p < .05$; **$p < .01$.; ns = not significant. Sex is coded boys = 0, girls = 1.

variables (critical thinking disposition and need for cognitive closure). Boys in this study were more sexist than girls, and a lower critical thinking disposition and higher need for cognitive closure were associated with more sexist attitudes. In terms of personality variables, there were small but significant effects for impulsivity, agreeableness, and neuroticism, while the effects of extraversion, conscientiousness, and openness to experience were not significant. Overall, 32.2% of the sexism variance was explained by the predictors.

Multi-group structural model by sex

The multi-group sequence of 11 models was calculated as follows. First, the baseline model (model 1; Figure 3) was simultaneously tested in boys and girls with no parameter constraints. This model was used as a baseline for further comparisons. Model two constrained only the factor loadings in both samples, leaving all the other parameter estimates free. This model is required because, unless the factor loadings are equal across the samples, the comparison of the equality of effects is meaningless (van de Schoot et al., 2012). Models 3 to 11 were systematic trials in which one additional structural coefficient (C1 to C9 in Figure 3) was constrained and tested against the baseline model. This strategy allowed us to systematically test for all the potential moderating effects that sex could have on the effects of all the sexism predictors.

Table 2 shows goodness-of-fit indices for the 11 models in the multi-group sequence, as well as the chi-square and CFI differences for models 2 to 11 compared with model 1

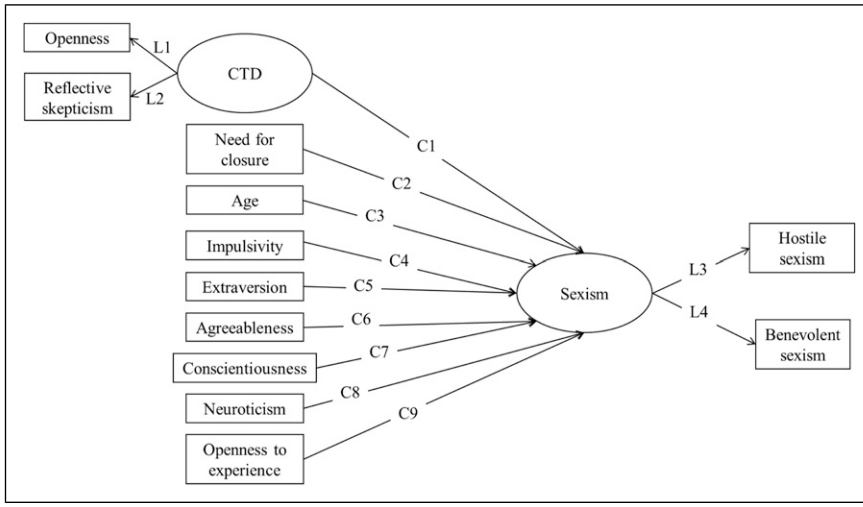

Figure 3. Graphic representation of the sequence of models tested in the multi-group routine: The first model maintained free estimations for all the parameters; the second model constrained the factor loading equalities (L1–L4); subsequent models individually constrained structural coefficients C1 to C9. A total of 11 models were tested in the multi-group routine. Note: CTD = critical thinking disposition. Sex is coded boys = 0, girls = 1.

(baseline). In every step of the sequence, one effect (C1 to C9, or models 3–11) is further constrained. All the models, from model 3 to 10, fit the data as well as models 1 and 2, which indicates that constrains C1 to C8 in Figure 3 where correctly imposed and therefore there is no moderation effect in this relationship of sex. However, model 11 showed a worse fit than model 1 (the chi-square difference was significant, and the CFI difference exceeded .01). This means that constrain C9 is not correct and therefore there is a moderation effect of sex in the association between openness to experience and sexism. In other words, model 10 was considered the best fitting model in terms of parsimony with constrains C1 to C8 but not C9. This means that all the factor loadings, as well as all the structural coefficients in this model, were equal in both samples, except for the effect of openness to experience. Standardized parameter estimates are presented in Figure 4; the variance of sexism explained for boys and girls were very similar at 17.3% and 16% respectively. Sex played a role in moderating the effect of openness to experience on sexism, and so while the openness to experience factor had a significant negative impact on sexism (it protected against sexism, $\beta = -.162$, $p = .018$) in boys, this was not true for girls ($\beta = .044$, $p = .441$).

Discussion

This study aimed to evaluate the predictive role of sex, cognitive and personality variables on sexist attitudes towards women in adolescence. The model explained a relevant and very similar percentage of variance in sexism in boys and girls. The sex factor had the

Table 2. Model fit for the multi-group routine.

Models	χ^2	df	*p*	$\Delta\chi^2$	Δdf	*p*	RMSEA	90% CI	CFI	ΔCFI	SRMR
Model 1. Baseline	122.75	69	<.001	—	—	—	.047	.033, −.060	.932	—	.043
Model 2. Factor loadings constrained	126.96	71	<.001	4.23	2	.120	.047	.034, −.061	.929	.003	.044
Model 3. Factor loadings and C1 constrained	128.48	72	<.001	5.70	3	.127	.047	.034, −.060	.929	.003	.043
Model 4. Factor loadings and C1–C2 constrained	133.18	73	<.001	10.26	4	.036	.048	.035, −.061	.924	.008	.044
Model 5. Factor loadings and C1–C3 constrained	133.06	74	<.001	10.06	5	.073	.048	.034, −.061	.926	.006	.044
Model 6. Factor loadings and C1–C4 constrained	134.74	75	<.001	11.89	6	.064	.048	.034, −.060	.925	.007	.044
Model 7. Factor loadings and C1–C5 constrained	134.48	76	<.001	11.79	7	.108	.047	.034, −.060	.926	.006	.044
Model 8. Factor loadings and C1–C6 constrained	133.98	77	<.001	11.55	8	.172	.046	.033, −.059	.928	.004	.044
Model 9. Factor loadings and C1–C7 constrained	135.58	78	<.001	13.17	9	.155	.046	.033, −.059	.927	.005	.044
Model 10. Factor loadings and C1–C8 constrained	138.63	79	<.001	16.07	10	.097	.046	.033, −.059	.925	.007	.045
Model 11. Factor loadings and all effects equal	145.36	80	<.001	22.28	11	.022	.048	.036, −.061	.918	.014	.047

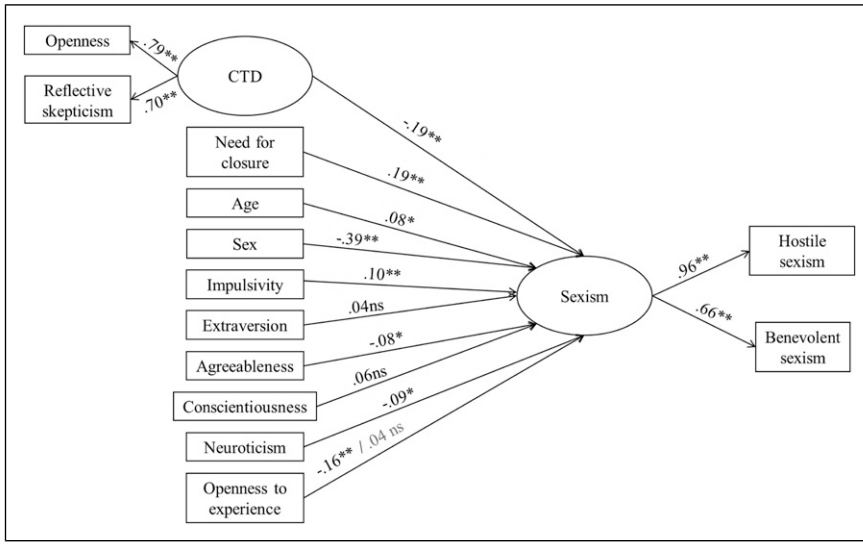

Figure 4. Standardized parameter estimates for the best fitting model in the multi-group routine. Note: CTD = critical thinking disposition, *p < .05; **p < .01.; ns = not significant. Sex is coded boys = 0, girls = 1; in grey the standardized coefficient for girls that it is statistically different between sexes.

strongest impact on the prediction of sexism, followed by the cognitive variables: self-reported critical thinking disposition and need for cognitive closure, both with the same effect magnitude. To the best of our knowledge, this is the first paper that has jointly evaluated the role of sex and cognitive and personality variables in the explanation of ambivalent sexism, and that includes and shows the relevance of the cognitive dimension – the critical thinking disposition – in explaining sexist attitudes toward women. Moreover, sex moderates the effect of openness to experience on ambivalent sexism.

Our results concurred with those published by Roets et al. (2012) and Ibabe et al. (2016) in that men presented higher scores than women for sexism, mainly in Hostile Sexism. As other studies have already pointed out (Calogero & Jost, 2011; Moyano-Pacheco et al., 2013; Pek & Leong, 2003) a higher need for cognitive closure tends to indicate more sexist attitudes towards women—an effect we also observed, albeit with a moderate effect; it remains unclear whether this relationship was attenuated by other cognitive factors such as critical thinking disposition. However, in direct contrast to the results published by Roets et al. (2012), we found that sex was a stronger predictor of sexism than need for cognitive closure. This difference might be because Roets et al. (2012) studied a sample of adults while our work examined adolescents. Indeed, the finding that sex strongly predicted sexism in our work may indicate that gender identification is more important to adolescents compared to adults (Priess et al., 2009). In addition, we found that critical thinking disposition was a protective factor against sexist beliefs, in other words, adolescents who were more disposed to think critically displayed

fewer sexist attitudes. These results align with the study by Rousseau et al. (2019) on young consumers of prostitution, reporting low levels of critical thinking and a dehumanization of the female figure, perceiving her as an object to generate pleasure. Another later research on the same subject by Rizzo et al. (2021), defined the female figure as a generator of pleasure without greater depth or questioning.

Regarding the role of personality variables, higher levels of impulsivity and lower levels of agreeableness and neuroticism also predicted more sexist attitudes. However, the impact of impulsivity on sexism was intermediate-low, and for agreeableness and neuroticism was relatively low. Akrami et al. (2011) and Hellmer et al. (2018) also provided evidence for the negative relationship between agreeableness and sexism. Regarding moderation, there was only one relationship moderated by sex: Openness to experience was a significant negative predictor of sexism in boys but was not in girls. That is, boys with fewer sexist attitudes had higher openness to experience scores, while this factor did not affect sexist attitudes in girls. This qualifies the results from Akrami et al. (2011) and Hellmer et al. (2018) who also identified a negative relationship between openness to experience and sexism but found no evidence that sex was a moderating factor. Our results also contrast with the suggestion by Hellmer et al. (2018) of a possible interaction between sex and agreeableness. Finally, the significant effect of impulsivity on sexism is also documented in the literature (Krueger et al., 1996; Linares et al., 2021; Velikova et al., 2021).

Additionally, in agreement with Roets et al. (2012), who did not find any interaction effect between sex and need for cognitive closure in explaining sexism, our predictive model showed that cognitive variables significantly affected sexist attitudes in both sexes and these effects were not moderated by sex. In both sexes, an increased need for cognitive closure was predictive of more sexist attitudes, with the opposite being true of individuals who were more disposed to think critically.

It is worth noting that although the correlation of Hostile and Benevolent Sexism is high, for some variables, the pattern of correlations with Hostile and Benevolent Sexism is different. For instance, the correlations of sex with Hostile Sexism is significantly higher than with Benevolent Sexism. The correlations of Need for closure with Hostile and Benevolent Sexism are very similar but Critical thinking disposition is most strongly linked to Hostile Sexism. Further research is needed to clarify the differential role of cognitive variables in the prediction of these two components of sexism.

This work also showed that critical thinking disposition and need for cognitive closure both had the same magnitude effect on sexist attitudes, although the first effect is negative and the second is positive. Our predictive model of sexism simultaneously considered personality variables, general motivated cognition, critical thinking disposition, and sex, allowing us to control for their potentially confounding effects. Another strength of this research was that, unlike the bivariate techniques (i.e. regression/correlational techniques) used in similar studies (Akrami et al., 2011; Hellmer et al., 2018; Roets et al., 2012), focusing in adolescence we used a multivariate approach (i.e., multi-group structural equation modelling) to simultaneously examine the moderating effect of sex for all the variables.

The most novel contribution of this work, is to show that the disposition to think critically is as relevant as the motivational dimension of cognition (Need for closure) to

predict sexism. Critical thinking has been linked to an analytical or rational style of thinking from the framework of the dual process theories of reasoning (Evans & Stanovich, 2013). These theories set out two opposing types of thinking: "System one" thinking that corresponds to an automatic, preconscious, holistic, non-verbal and associative style of thinking (a.k.a., intuitive or experiential thinking), compared to "System two" corresponding to thinking that is rational, slow, and logical (a.k.a., analytical or rational thinking). Several authors equate critical thinking to System two thinking (e.g. Halpern, 2014) or conceptualize critical thinking as a subtype of rational thinking (Stanovich, 2016). In line with these results, the link between cognitive styles (system one and system two types of thinking) and sexism is a promising line of research.

Conclusions and Implications

Our results show the relevance of the cognitive variables over the personality variables in explaining sexist attitudes. They are consistent with the literature in showing the relevance of sex and the need for cognitive closure, extending it by including the critical thinking disposition. In conclusion, being male and having a high need for cognitive closure and a low critical thinking disposition are predictive of more sexist attitudes. Regarding personality variables, agreeableness and impulsivity predicted sexism, but openness to experience was a significant negative predictor of sexism in adolescent boys, though not in girls. Therefore, an outstanding result of this work is to point out the relevance of the disposition to think critically in the prediction of sexist attitudes.

These findings have implications for those seeking to minimize the sexist attitudes of adolescents toward women. For an example, the results of Dosil et al. (2020) showed that sexism, both benevolent and hostile, is clearly associated with teenage dating violence and victimization. Possible intervention programs should include strategies for fostering the critical thinking disposition or reducing the need for cognitive closure by training in the ability to cope with cognitive uncertainty. Indeed, enhancing the dispositional and skill dimensions of critical thinking in students has been flagged as an essential education goal (Abrami et al., 2015; Dyer & Hall, 2019; Taghinezhad et al., 2019; Tiruneh et al., 2014), a position this study supports by highlighting the relationship between critical thinking and sexism in adolescents.

This work also had some limitations, mostly related to the nature of our cross-sectional sample. This meant we were unable to make causal claims. Second, the measure of impulsivity is too coarse, and the use of a more detailed (questionnaire-type) measure of impulsivity should be considered in future research. For example, the Barrat's BIS-11-A scale of impulsivity has already been validated in Spanish and could be a good election (Martinez-Loredo et al., 2015). Third, the research was made with young people, and we tried not to use overly long protocols. Given that the internal consistency of scales such as the mini IPIP can be affected by such data loss (Cupani et al., 2019), further research should aim to replicate our findings by employing better approaches to measure personality traits, especially impulsivity. Fourth, critical thinking is a motivational and ability construct, but it was measured as a self-report, which may cast some doubts on the ability adolescents have to self-assess this construct (see, for example, the Dunning-Kruger

effect). A final limitation is that some descriptive data of the adolescents were not recorded, such as race/ethnicity, gender identity, sexual orientation, etc. Future research in this field should aim to test whether cognitive variables such as critical thinking and need for cognitive closure contribute differently to the prediction of the Benevolent Sexism and Hostile Sexism components of sexism. Future studies should also try to replicate these findings longitudinally and in different populations. Finally, the results suggest that considerable variance in ambivalent sexism toward women remains unaccounted for. Future research should examine the role of social-ideological attitudes in any explanation of ambivalent sexism, for instance the variables associated with cognitively rigid thinking such as religious fundamentalism, right-wing authoritarianism and social dominance orientation (Hannover et al., 2018; van Assche et al., 2019), as well as the role of cultural factors such as religious affiliation and conservatism in cross-cultural research (Prina, & Schatz-Stevens, 2020).

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Open research statement

As part of IARR's encouragement of open research practices, the author(s) have provided the following information: This research was not pre-registered. The data and the materials used in the research can be obtained by emailing: oliver@uv.es

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