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Running head: GENDER, SDO AND EMPATHY ON ANIMAL EXPLOITATION

**Why are women less likely to support animal exploitation than men?  
The mediating roles of social dominance orientation and empathy**

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Women are more concerned about nonhuman animal welfare than men

Women and men also differ in their social dominance and empathic orientations

These orientations mediated gender differences in animal exploitation attitudes

Human–animal relations share akin psychological mechanisms to human–human relations

**Word count: 2935**

### **Abstract**

Women tend to be more concerned about the welfare of (human/nonhuman) animals and the natural environment than men. A growing literature has shown that gender differences in environmental exploitation can be explained partially by the fact that women and men differ in their social dominance and emphatic orientations. We extend past studies by examining whether social dominance orientation (SDO; ‘Superior groups should dominate inferior groups’) and empathy (‘I feel others’ emotions’) also help explain gender differences in attitudes towards nonhuman animals. Our mediation model confirmed that SDO and empathy partially and independently mediate gender differences in both human supremacy beliefs (‘Animals are inferior to humans’) and speciesism (‘I think it is perfectly acceptable for cattle, chickens and pigs to be raised for human consumption’) among 1002 individuals (57% female;  $M_{\text{age}} = 26.44$ ) from the general population in Portugal. Our findings provide evidence that traits referring to human–human relations can help explain gender differences in environmentalism as well as our relations with other animals. The cumulative evidence suggests that exploitative tendencies towards the natural environment and (human/nonhuman) animals may be built upon shared psychological mechanisms.

Keywords: human–animal relations; gender differences; empathy; social dominance orientation; speciesism.

## Introduction

There is ample empirical evidence on gender differences in human–environment and human–(nonhuman)animal relations. Compared to men, women tend to show higher levels of environmental concern and pro-environmental engagement, as well as being more concerned about animal suffering, to hold more positive attitudes towards animals and to be more engaged in animal protection (for reviews, see Amiot & Bastian, 2015; Herzog, 2007; Sakellari & Skanavis, 2013; Zelezny, Chua, & Aldrich, 2000). Recent studies have tried to explain the psychological mechanisms underpinning gender differences on human–environment relations. For instance, individual differences in empathy and agreeableness have been found to mediate gender differences on pro-environmental behaviours (Arnocky & Stroink, 2011; Luchs & Mooradian, 2012). More recently, Milfont and Sibley (2016) used one-year longitudinal data to show that both social dominance orientation and empathy partially accounted for gender differences in environmental protection.

These findings indicate that individual differences in orientations towards human–human relations can help explain why men and women differ in their relations with the natural environment. However, and despite evidence of gender differences in key outcome variables in the field (see Amiot & Bastian, 2015; Herzog, 2007), the reason why men and women differ in human–(nonhuman)animal relations remains largely unexplained. To our knowledge, no empirical studies have yet directly addressed this question.

To address this gap, the present study draws on recent findings that women display greater levels of environmentalism partially because of their higher levels of empathy and lower levels of SDO compared to men (Milfont & Sibley, 2016). It is known that women tend to be more empathic than men (Reuckert & Naybar, 2008), to express lower desire and support for group-based dominance and inequality (Dambrun et al., 2004), and that SDO and empathy are intrinsically linked to each other (Sidanius et al., 2013). Moreover, SDO has

been consistently linked to human-based hierarchical views towards the natural environment (Milfont et al., 2013, in press; Milfont & Sibley, 2014), as well as support for the exploitation of animals in favour of human interests and human supremacy beliefs (e.g., Dhont et al., 2014, 2016).

Adding to a growing literature investigating how individual differences in orientations towards others are linked to non-human targets, we examined whether SDO and empathy may also explain why men and women differ in two constructs related to human–animal relations. *Human supremacy beliefs* express the view that humans are distinct from and superior to other animals (Dhont & Hodson, 2014). *Speciesism* refers to attitudes towards exploitation of animals in favour of human interests, where humans (the empowered group) use nonhuman animals for their own ends (Dhont et al., 2014). We expect that women will display lower levels of human supremacy beliefs and speciesism because they are lower in SDO and higher in empathy, whereas men will display higher levels of human supremacy beliefs and speciesism because they are higher in SDO and lower in empathy (see Milfont & Sibley, 2016). In other words, SDO and empathy will help explain why women and men differ in their attitudes towards nonhuman animals.

## **Method**

### **Participants**

We analysed online survey data hosted by Qualtrics. Participants from Portugal were recruited via ads in social media and rewarded with the choice to enter a draw to win a 7.9” 16GB tablet computer. The online survey was open for nearly four months (between July 3rd 2014 and November 5<sup>th</sup> 2014). A total of 1278 participants clicked on the survey link but only 1002 completed the whole survey (572 female;  $M_{\text{age}} = 26.44$ ,  $SD_{\text{age}} = 9.54$ , range: 18 - 64). Most had completed secondary (43.4%) or tertiary education (54.1%). Before starting the survey, participants were informed about the study and that participation was completely

anonymous. Participants provided their consent and were debriefed after completing the survey.

## Measures

The scale items are presented in full in the Supplementary Material in their original and Portuguese versions. Participants rated all scale items on a 5-point Likert-type scale anchored by 1 (*totally disagree*) and 5 (*totally agree*). The measures were presented to participants in the following order: *Social dominance orientation*, measured with Pratto et al.'s (1994) 16-item scale; *Empathy*, measured with a 10-item scale from the International Personality Item Pool (IPIP; Goldberg, 2002); and *human supremacy beliefs* and *speciesism*, each measured with six-item scales developed by Dhont and Hodson (2014) and Dhont and colleagues (2014), respectively.

## Data Analysis

The mediation structural equation model was construed in Mplus version 7.4 (Muthén & Muthén, 1998-2015) with robust maximum likelihood estimators and item parcels for each measure (see Supplementary Material). When testing the indirect effects, we used a bootstrapping mediation method with 10,000 re-samples and bias-corrected confidence intervals.

## Results

Table 1 reports the descriptive statistics and correlations among the measures and Figure 1 presents the model, which had acceptable fit to the data:  $SB\chi^2 (N = 1002, df = 81) = 398.04, p < .001$ ; RMSEA = .063 [90% CI = .056, .069]; CFI = .95; SRMR = .041. Compared to women, men scored significantly higher in SDO ( $\beta = 0.24, p < 0.001, 95\% \text{ CI } [0.18, 0.30]$ ), speciesism ( $\beta = 0.20, p < 0.001, 95\% \text{ CI } [0.12, 0.28]$ ) and human supremacy ( $\beta = 0.11, p < 0.001, 95\% \text{ CI } [0.05, 0.16]$ ), while scoring significantly lower in empathy ( $\beta = -0.37, p < 0.001, 95\% \text{ CI } [-0.43, -0.31]$ ).

The negative association between SDO and empathy ( $\beta = -0.38, p < 0.001, 95\% \text{ CI } [-0.46, -0.30]$ ) is reflected in their associations with the measures assessing human–animal relations, which were highly correlated ( $\beta = 0.82, p < 0.001, 95\% \text{ CI } [0.76, 0.88]$ ). Greater SDO was associated with *higher* levels of speciesism ( $\beta = 0.21, p < 0.001, 95\% \text{ CI } [0.11, 0.31]$ ) and human supremacy ( $\beta = 0.29, p < 0.001, 95\% \text{ CI } [0.22, 0.37]$ ). In contrast, greater empathy was associated with *lower* levels of speciesism ( $\beta = -0.14, p < 0.01, 95\% \text{ CI } [-0.24, -0.03]$ ), but empathy was not reliably related to human supremacy in the structural equation model ( $\beta = -0.06, p = 0.164, 95\% \text{ CI } [-0.15, 0.03]$ ; but see Table 1).

We then examined the extent to which SDO and empathy mediate the observed gender differences in speciesism and human supremacy. Although gender had a direct association with speciesism, gender also had a reliable total indirect effect on speciesism via the mediators ( $B = 0.08, p < 0.001, 95\% \text{ CI } [0.05, 0.12]$ ). We partitioned the variance of this total indirect effect into the two specific indirect effects. The results showed reliable mediational pathways of gender differences in speciesism via both SDO ( $B = 0.04, p < 0.05, 95\% \text{ CI } [0.01, 0.08]$ ) and empathy ( $B = 0.04, p < 0.01, 95\% \text{ CI } [0.02, 0.07]$ ). A statistical comparison confirmed that these indirect effects were similar in magnitude ( $B_{\text{Contrast}} = 0.0001, p = 0.987, 95\% \text{ CI } [-0.04, 0.05]$ ).

Similar results were observed for human supremacy. Gender had a direct association with human supremacy but also a reliable total indirect effect via the mediators ( $B = 0.15, p < 0.001, 95\% \text{ CI } [0.05, 0.12]$ ). Partitioning the variance of this total indirect effect showed that the indirect effect of gender on human supremacy via SDO was reliable ( $B = 0.11, p < 0.001, 95\% \text{ CI } [0.07, 0.16]$ ) but not the indirect effect via empathy ( $B = 0.04, p = 0.178, 95\% \text{ CI } [-0.01, 0.10]$ )—expected given that the association between empathy and human supremacy was not statistically significant in the model.



Additional analyses examined whether distinct mediation effects would emerge for the sub-dimensions of intergroup dominance (SDO-D) and intergroup anti-egalitarianism (SDO-E; see Stanley et al., 2017). Results for each of the SDO sub-dimensions mirror those reported above; the only distinction is that the direct effect of empathy on human supremacy beliefs becomes statistically significant when SDO-D or SDO-E are considered separately (see Supplementary Material).

### **Discussion**

The present study addresses the question of why men and women differ in their relations with animals. It adds to an increasing body of evidence investigating how traits referring to human relations are linked to non-human targets (e.g., Dhont et al., 2016; Milfont & Sibley, 2016; Milfont et al., 2013, in press). We expected that SDO and empathy would help explain gender differences in both human supremacy beliefs and speciesism. As anticipated, women showed lower levels of SDO, human supremacy beliefs and speciesism, and higher levels of empathy compared to men. These findings reinforce the role of gender both on human-(nonhuman)animal relations as well as on traits referring to human–human relations.

Importantly, both SDO and empathy partially and independently mediated the link between gender and speciesism. This suggests that women show decreased support for the exploitation of animals in favour of human interests partly because they tend to have lower levels of social dominance orientation and higher levels of empathy. Additionally, SDO partially mediated the link between gender and human supremacy beliefs, which suggests that women have decreased endorsement in humans as distinct from and superior to other animals partly because they tend to have lower levels of social dominance orientation. These results provide an extension of the Milfont and Sibley (2016) findings on the gender–

environmentalism link applied to human–animal relations, and fit with the Social Dominance Human-Animal Relations Model (SD-HARM) proposed by Dhont and colleagues (2016).

In light of these theoretical frameworks, the findings lend support to the notion that human prejudice and exploitation towards other humans, non-humans, and the natural environment may to some extent be built upon shared psychological mechanisms. While the current study draws on cross-sectional data, we highlight that a focus on the associations *per se* supports the idea of a shared underpinning, but longitudinal and causal relationships should be explored in future research. Moreover, our findings are based on online data from a predominantly younger and educated sample from Portugal, which limits generalization. Future research with more representative samples would strengthen confidence in our findings.

Notwithstanding the limitations of our study, the present findings are meaningful considering gender-socialization and gender-role theories. It has been noted that men tend to be socialized according to traditional masculine roles, which are typically more utilitarian, competitive and dominant, whereas women tend to be socialized according to traditional feminine roles, which are typically more caring, concerned with others and emotionally expressive (Eagly, 2009; Eccles et al., 1990). This may translate into stronger empathic concern and reduced dominance orientations among women, which may arguably generalise and spill over to encompass other animals and the natural environment (Amiot & Bastian, 2015; Herzog, 2007; Milfont & Sibley, 2016). Our findings lend support to this argument in showing that gender-relevant traits referring to human–human relations are linked to our relations with other animals, and partly mediate gender differences on this domain.

It is also noteworthy that in our sample SDO mediated both associations (gender-speciesism and gender-human supremacy), whereas empathy mediated only the gender-speciesism link. This measure of speciesism refers to a direct support for animal exploitation,

while the measure of human supremacy refers to a more ideological stance on human hierarchy over other animals. One possible interpretation is that a gender spillover effect of human-directed empathy to encompass also other animals may be triggered more in response to specific instances of animal suffering and abuse, and less with regard to abstract notions of the human–animal divide. In turn, for SDO, this distinction between practice and ideology did not appear to matter much in our model, perhaps because SDO is a more ideologically-charged trait than empathy. Future studies may explore how distinct personality traits may account for gender differences on specific types of animal use for human interests (e.g., meat eating, entertainment), and on more abstract framings/operationalisations of the human–animal divide.

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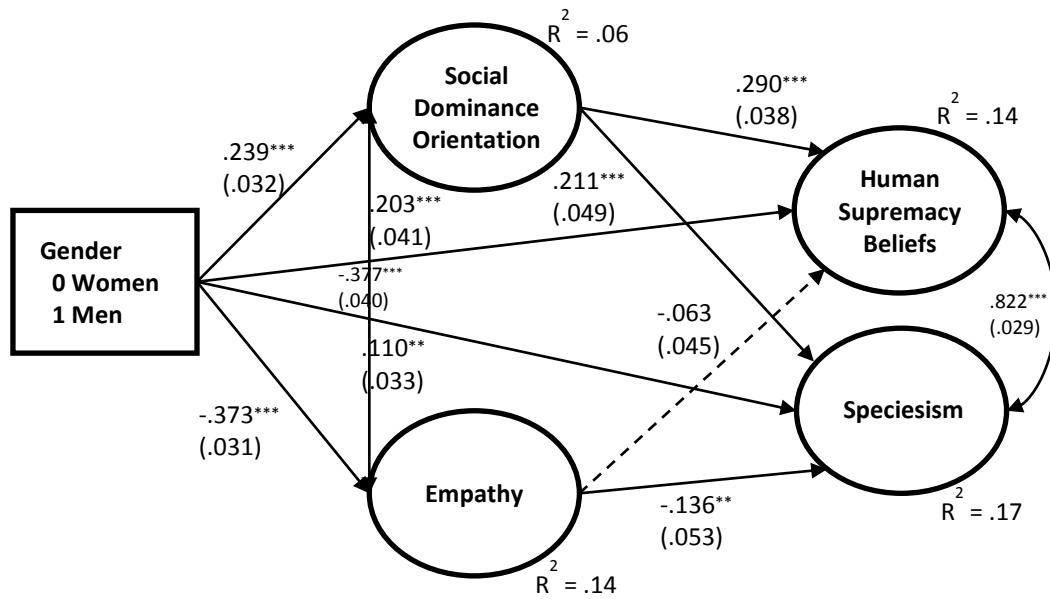
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**Table 1.** Descriptive statistics and correlations among measures.

	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7
1. Gender (0=women,1=men)	—	—	—						
2. SDO	2.15	.60	.23*** [.17, .29]	(.86)					
3. SDO-Dominance	2.21	.71	.24*** [.18, .30]	.86 [.83, .88]	(.81)				
4. SDO-Equality	2.09	.70	-.15*** [-.21, -.09]	-.85 [-.87, -.83]	-.45 [-.52, -.38]	(.83)			
5. Empathy	3.67	.65	-.37*** [-.42, -.31]	-.36*** [-.42, -.30]	-.30*** [-.36, -.25]	.32*** [.25, .38]	(.87)		
6. Human supremacy	2.67	.82	.20*** [.14, .25]	.30*** [.24, .36]	.27*** [.21, .32]	-.25*** [-.31, -.19]	-.20*** [-.27, -.14]	(.87)	
7. Speciesism	2.78	.68	.25*** [.19, .30]	.25*** [.19, .31]	.22*** [.16, .29]	-.21*** [-.26, -.15]	-.21*** [-.28, -.15]	.61*** [.56, .65]	(.67)

*Note.* Numbers in brackets are 95% confidence intervals based on bias-corrected accelerated bootstrapping with 10,000 re-samples in SPSS. Values in diagonal are Cronbach's alphas. \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .



**Figure 1.** Structural equation model assessing the indirect effects of gender on speciesism and human supremacy via SDO and empathy.

*Note.*  $N = 1002$ . Indicators for the latent variables are item parcels excluded from the figure owing to space constraints.  $**p < .01$ .  $***p < .001$ .

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## Supplementary Material

### **Indirect Effect Results When Considering SDO-E and SDO-D**

We examined the extent to which the subdimensions of SDO would both mediate the observed gender differences in speciesism and human supremacy. We employed item-level data for these analyses using the 8-item scales of SDO-E and SDO-D.

#### SDO-E

The model with SDO-E and empathy as mediators showed good fit to the data:  $SB\chi^2$  ( $df = 143$ ) = 562.04,  $p < .001$ ; RMSEA = .054 [90% CI = .049, .059]; CFI = .93; SRMR = .043. The results are similar to those reported in Figure 1 in the main document; however, the effect of empathy on human supremacy is statistically significant ( $\beta = -0.09$ ,  $p = 0.032$ , 95% CI [-0.18, -0.01]) when only the SDO-E items are considered in the analysis.

Gender had a reliable total indirect effect on speciesism via the mediators when considering SDO-E ( $B = 0.07$ ,  $p < 0.001$ , 95% CI [0.04, 0.11]). When partitioning the variance of this total indirect effect into the two specific indirect effects, the results showed reliable mediational pathways of gender differences in speciesism via both SDO-E ( $B = 0.02$ ,  $p = .019$ , 95% CI [0.01, 0.04]) and empathy ( $B = 0.05$ ,  $p = .003$ , 95% CI [0.02, 0.09]). A statistical comparison confirmed these two specific indirect effects were similar in magnitude ( $B_{\text{Contrast}} = -0.03$ ,  $p = 0.142$ , 95% CI [-0.07, 0.01]). Gender also had a reliable total indirect effect on human supremacy via the mediators when considering SDO-E ( $B = 0.12$ ,  $p < 0.001$ , 95% CI [0.07, 0.18]). The specific indirect effect of gender on human supremacy via SDO-E was reliable ( $B = 0.07$ ,  $p < 0.001$ , 95% CI [0.04, 0.11]) as was the indirect effect via empathy ( $B = 0.06$ ,  $p = 0.041$ , 95% CI [0.01, 0.11]).

#### SDO-D

The model with SDO-D and empathy as mediators showed good fit to the data:  $SB\chi^2$  ( $df = 143$ ) = 662.81,  $p < .001$ ; RMSEA = .060 [90% CI = .056, .065]; CFI = .92; SRMR = .044. Again, the effect of empathy on human supremacy is statistically significant ( $\beta = -0.09$ ,  $p = 0.035$ , 95% CI [-0.18, -0.01]) when only the SDO-D items are considered in the analysis.

Gender had a reliable total indirect effect on speciesism via the mediators when considering SDO-D ( $B = 0.09$ ,  $p < 0.001$ , 95% CI [0.05, 0.13]). The results showed reliable mediational pathways of gender differences in speciesism via both SDO-D ( $B = 0.04$ ,  $p = .001$ , 95% CI [0.02, 0.07]) and empathy ( $B = 0.05$ ,  $p = .007$ , 95% CI [0.02, 0.08]), and these two specific indirect effects were similar in magnitude ( $B_{\text{Contrast}} = -0.01$ ,  $p = 0.751$ , 95% CI [-0.05, 0.04]).

Gender also had a reliable total indirect effect on human supremacy via the mediators when considering SDO-D ( $B = 0.16$ ,  $p < 0.001$ , 95% CI [0.10, 0.22]). The results showed reliable mediational pathways of gender differences in speciesism via both SDO-D ( $B = 0.10$ ,  $p < 0.001$ , 95% CI [0.07, 0.15]) and empathy ( $B = 0.05$ ,  $p = .046$ , 95% CI [0.01, 0.11]), and the two indirect effects did not differ statistically ( $B_{\text{Contrast}} = 0.05$ ,  $p = 0.231$ , 95% CI [-0.03, 0.13]). Gender also had a reliable total indirect effect on human supremacy via the mediators when considering SDO-E ( $B = 0.12$ ,  $p < 0.001$ , 95% CI [0.07, 0.18]). The specific indirect effect of gender on human supremacy via SDO-E was reliable ( $B = 0.07$ ,  $p < 0.001$ , 95% CI [0.04, 0.11]) as was the indirect effect via empathy ( $B = 0.06$ ,  $p = 0.041$ , 95% CI [0.01, 0.11]).

## Measures

All items were subjected to two independent translations and compared against each other before reaching a final translation to Portuguese, which was then translated back into English by a professional translator (native speaker) for quality control.

As detailed in the article, we used Pratto et al.'s (1994) social dominance orientation (SDO) scale, empathy items from the International Personality Item Pool (IPIP; Goldberg, 2002), Dhont and Hodson's (2014) human supremacy beliefs scale, and Dhont et al.' (2014) speciesism scale. Table S1 presents the items used. Due to a lapse in the translation process, the original speciesism scale had eight items but only the first six were translated and presented in the survey (cf. Dhont et al., 2014). The present study was part of a PhD research project which included additional measures focused on eating habits that were of less relevance to the present purposes. Nevertheless, translations of these measures are also available upon request.

**Table S1.** Detail of measures and their translations used in the research

Measure	Original version	Portuguese version
SDO	1. Some groups of people are just more worthy than others.	1. Alguns grupos de pessoas são mais dignos do que outros.
	2. It would be good if all groups could be equal.	2. Seria bom se todos os grupos pudessem ser iguais.
	3. In getting what your group wants, it is sometimes necessary to use force against other groups.	3. Para atingir o que o seu grupo quer, por vezes é necessário utilizar a força contra outros grupos.
	4. Group equality should be our ideal.	4. A igualdade entre grupos deveria ser o nosso ideal.
	5. All groups should be given an equal chance in life.	5. Deveriam ser dadas oportunidades iguais na vida a todos os grupos
	6. Superior groups should dominate inferior groups.	6. Os grupos superiores devem dominar os grupos inferiores.
	7. We should do what we can to equalize conditions for different groups.	7. Devemos fazer o que estiver ao nosso alcance de modo a que as condições para os diferentes grupos sejam iguais.
	8. To get ahead in life, it is sometimes necessary to step on other groups.	8. Para avançar na vida, por vezes é necessário passar por cima de outros grupos.
	9. If certain groups of people stayed in their place, we would have fewer problems.	9. Se certos grupos de pessoas ficassem no seu lugar, teríamos menos problemas.
	10. Increased social equality would be a good thing.	10. O aumento da igualdade social seria uma coisa positiva.
	11. It's probably a good thing that certain groups are at the top and other groups are at the bottom.	11. Provavelmente é positivo que certos grupos estejam no topo e outros grupos estejam no fundo.
	12. We would have fewer problems if we treated different groups more equally.	12. Teríamos menos problemas se tratássemos os diferentes grupos de forma mais igualitária.
	13. Inferior groups should stay in their place.	13. Os grupos inferiores deveriam ficar no seu lugar.
	14. We should strive to make incomes more equal.	14. Deveríamos lutar por tornar os rendimentos mais igualitários.
	15. No one group should dominate in society.	15. Não deve haver um grupo a dominar na sociedade.
	16. Sometimes other groups must be kept in their place.	16. Por vezes outros grupos devem ser mantidos no seu lugar.

**Table S1 (continued).** Detail of measures and their Portuguese translations used in the research.

Measure	Original version	Portuguese version
EMP	1. I feel others' emotions.	1. Eu sinto as emoções dos outros
	2. I suffer from others' sorrows.	2. Sofro com as mágoas dos outros
	3. I am deeply moved by others' misfortunes.	3. Comovo-me profundamente com as desgraças dos outros
	4. I am easily moved to tears.	4. Sou facilmente levado(a) às lágrimas
	5. I cry easily.	5. Choro facilmente
	6. I experience my emotions intensely.	6. Sinto as minhas emoções intensamente
	7. I feel spiritually connected to other people.	7. Sinto-me emocionalmente ligado às outras pessoas
	8. I don't understand people who get emotional.	8. Não compreendo as pessoas que ficam emocionadas.
	9. I am not interested in other people's problems.	9. Não estou interessado(a) nos problemas das outras pessoas
	10. I seldom get emotional.	10. Raramente fico emocionado(a).
HUMAN SUP.	1. The life of an animal is just not of equal value as the life of a human being.	1. A vida de um animal simplesmente não tem o mesmo valor que a vida de um ser humano.
	2. Animals are inferior to humans.	2. Os animais são inferiores aos humanos.
	3. There is nothing unusual at all in the fact that humans dominate other animal species.	3. Não há absolutamente nada de estranho no facto de os humanos dominarem as outras espécies de animais.
	4. We should strive to more equality between humans and animals.	4. Devemos esforçar-nos para ter mais igualdade entre humanos e animais.
	5. In an ideal world, humans and animals would be treated on an equal basis.	5. Num mundo ideal, humanos e animais seriam tratados numa base de igualdade.
	6. It is important that we treat other animal species more equally.	6. É importante que tratemos as outras espécies de animais de forma mais igualitária.
SPEC*	1. Animal research cannot be justified and should be stopped.	1. A experimentação animal não pode ser justificada e deve ser terminada.
	2. The production of inexpensive meat, eggs, and dairy products justifies maintaining animals under crowded conditions.	2. A produção de carne, ovos, e lacticínios a baixo custo justifica manter animais em condições de sobrelotação.
	3. The use of animals in rodeos and circuses is cruel.	3. A utilização de animais em rodeos e circos é cruel.
	4. I get upset when I see wild animals in cages at zoos.	4. Fico transtornado quando vejo animais selvagens em jaulas nos jardins zoológicos.
	5. I think it is perfectly acceptable for cattle, chickens and pigs to be raised for human consumption.	5. Acho que é perfeitamente aceitável que gado, galinhas e porcos sejam criados para consumo humano.
	6. I have seriously considered becoming a vegetarian in an effort to save animal lives.	6. Já considerei seriamente tornar-me vegetariano para tentar salvar vidas animais.

(\*) Please note that the original *Speciesism* scale developed by Dhont et al. (2014) has eight items. The full scale was translated but the last two items were omitted from the online survey by mistake. These items are: 'I think that human economic gain is more important than setting aside land for wildlife' ['Acho que o ganho económico para os seres humanos é mais importante do reservar terra para animais selvagens'], and 'There is nothing wrong with killing animals for their fur to make clothes (fur coats)' ['Não há nada de errado em matar animais para usar suas peles para fazer roupas (casacos de peles)'].

### **Item Parcels and Results using Item-Level Data**

Considering the advantages of using item parcels in structural equation modeling over item-level data (e.g., Little, Cunningham, Shahar & Widaman, 2002), the model presented in the main manuscript used item parcels for each measure to fit a more parsimonious model. Due to the number of items in each measure, we created four parcels for the SDO and empathy measures, and three for the speciesism and human supremacy measures. The specific items for each parcel are detailed below.

Figure S1 provides the results using item-level data instead of item parcels. Apart from comparatively poor fit, the model results using item-level data are virtually identical to those using the parcels, as a comparison between Figure 1 and Figure S1 clearly shows.

#### SDO

SDOp1 = MEAN (SDO\_1 SDO\_2R SDO\_3 SDO\_4R);  
 SDOp2 = MEAN (SDO\_5R SDO\_6 SDO\_7R SDO\_8);  
 SDOp3 = MEAN (SDO\_9 SDO\_10R SDO\_11 SDO\_12R);  
 SDOp4 = MEAN (SDO\_13 SDO\_14R SDO\_15R SDO\_16);

#### Empathy

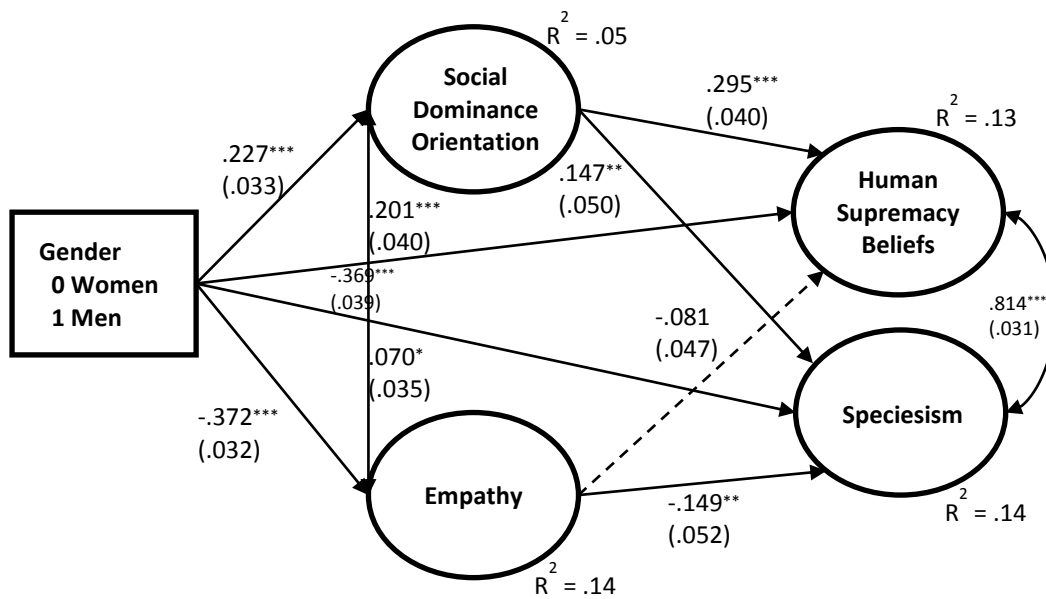
EMp1 = MEAN (EM\_1 EM\_8R);  
 EMp2 = MEAN (EM\_2 EM\_9R);  
 EMp3 = MEAN (EM\_3 EM\_10R);  
 EMp4 = MEAN (EM\_4 EM\_5 EM\_6 EM\_7);

#### Human Supremacy

HSUPp1 = MEAN (HSUP\_1 HSUP\_4R);  
 HSUPp2 = MEAN (HSUP\_2 HSUP\_5R);  
 HSUPp3 = MEAN (HSUP\_3 HSUP\_6R);

#### Speciesism

SPECp1 = MEAN (SPEC\_1R SPEC\_2);  
 SPECp2 = MEAN (SPEC\_3R SPEC\_4R);  
 SPECp3 = MEAN (SPEC\_5 SPEC\_6R);

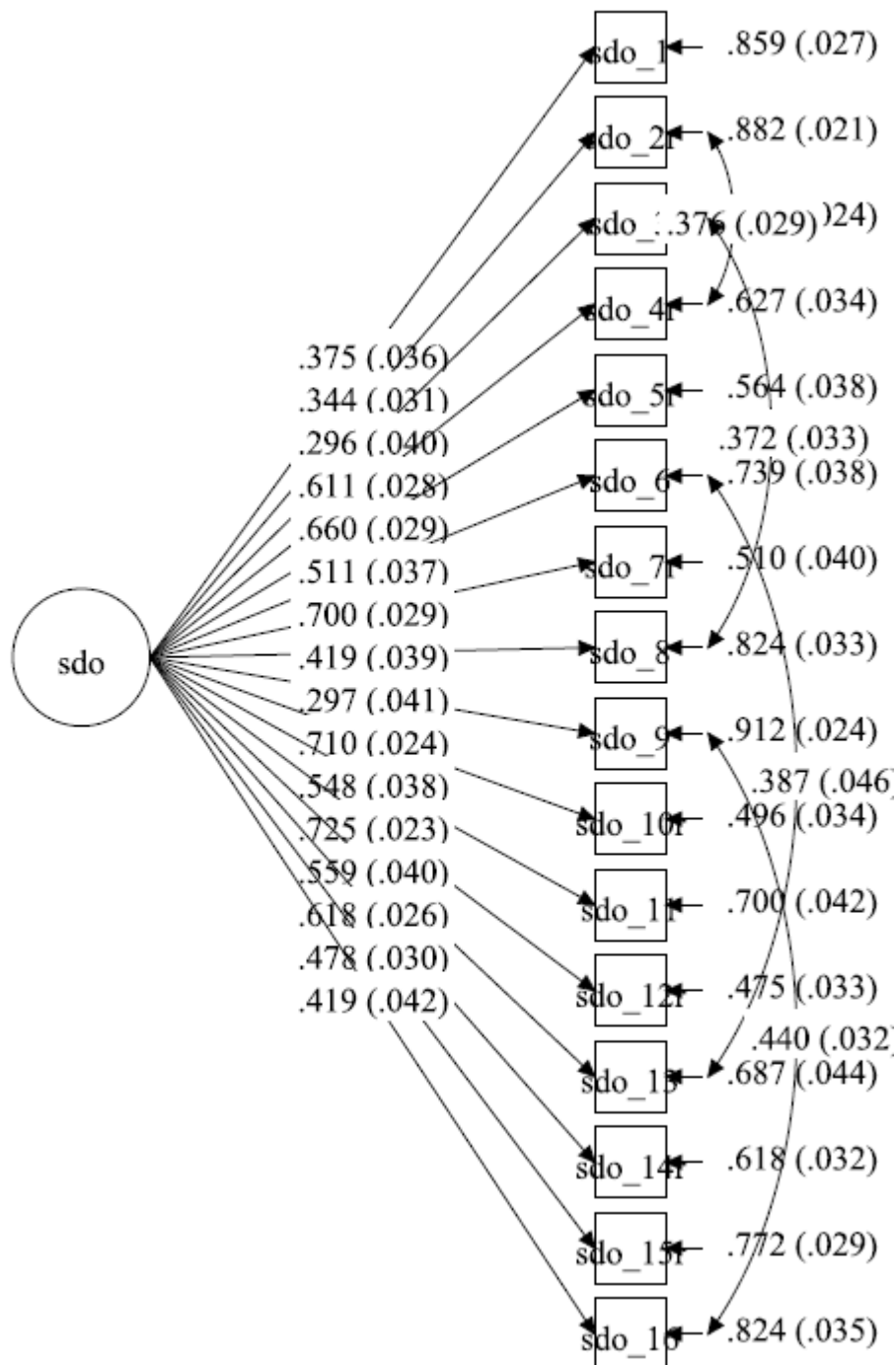


**Figure S1.** Structural equation model assessing the indirect effects of gender on speciesism and human supremacy via SDO and empathy using item-level data instead of item parcels. *Note.*  $N = 1002$ . Indicators for the latent variables are item parcels excluded from the figure owing to space constraints.  $**p < .01$ .  $***p < .001$ . Model fit:  $SB\chi^2(683) = 2579.45$ ,  $p < .001$ ; RMSEA = .053 [90% CI = .050, .055]; CFI = .86; SRMR = .060.

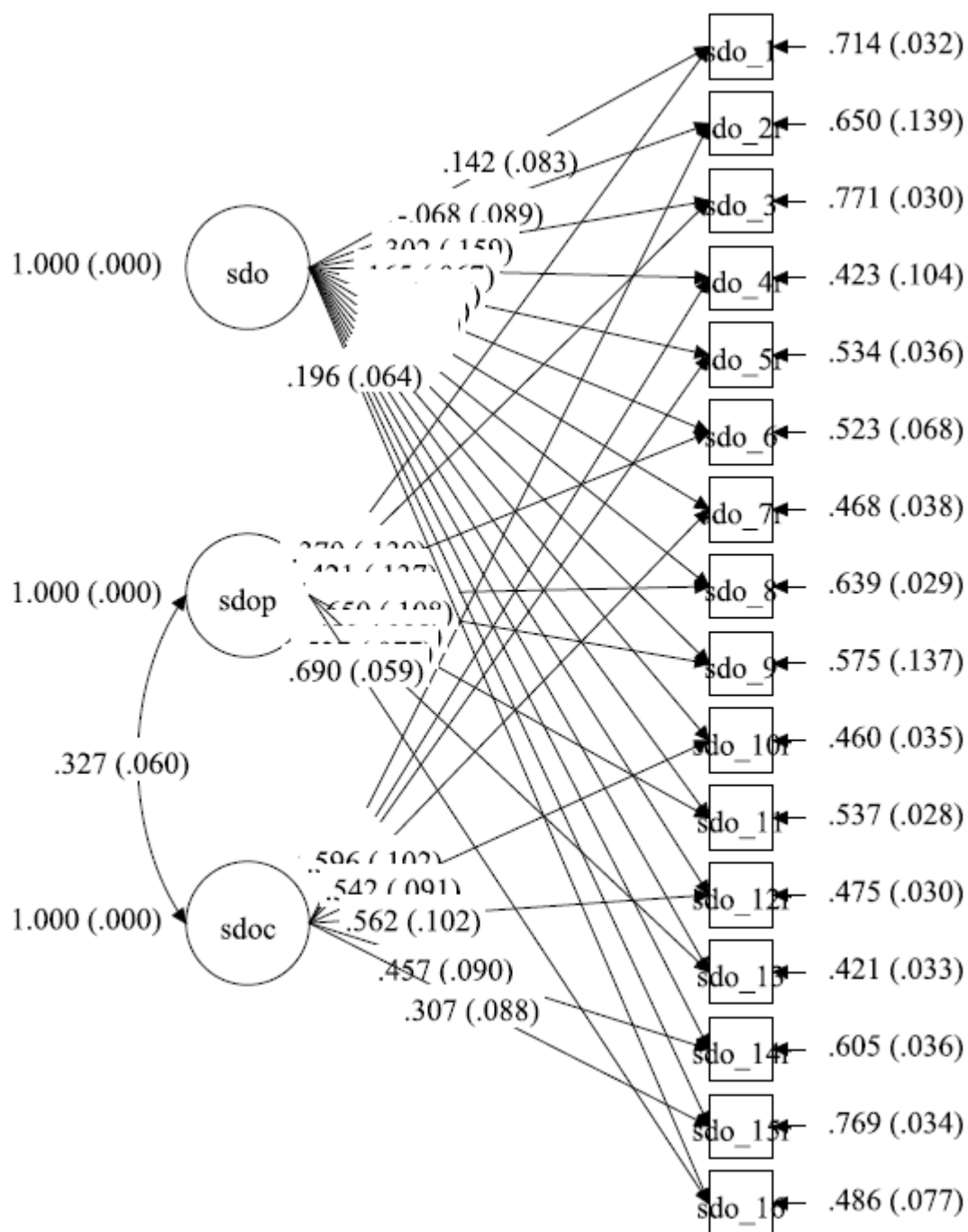
**Confirmatory Factor Analysis**

We ran confirmatory factor analysis for each measure. We first ran the basic models and inspected the modification indices to improve model fit. Figures S3 to S6 present the results allowing some error terms to correlate. Overall, all measures showed acceptable fit to the data.

We first ran confirmatory factor analysis for each measure to confirm their psychometric properties and reliability their individual items (see Supplementary Material). Considering the advantages of using items parcels over item-level data, we created four items parcels for SDO and empathy measures, and three item parcels for speciesism and

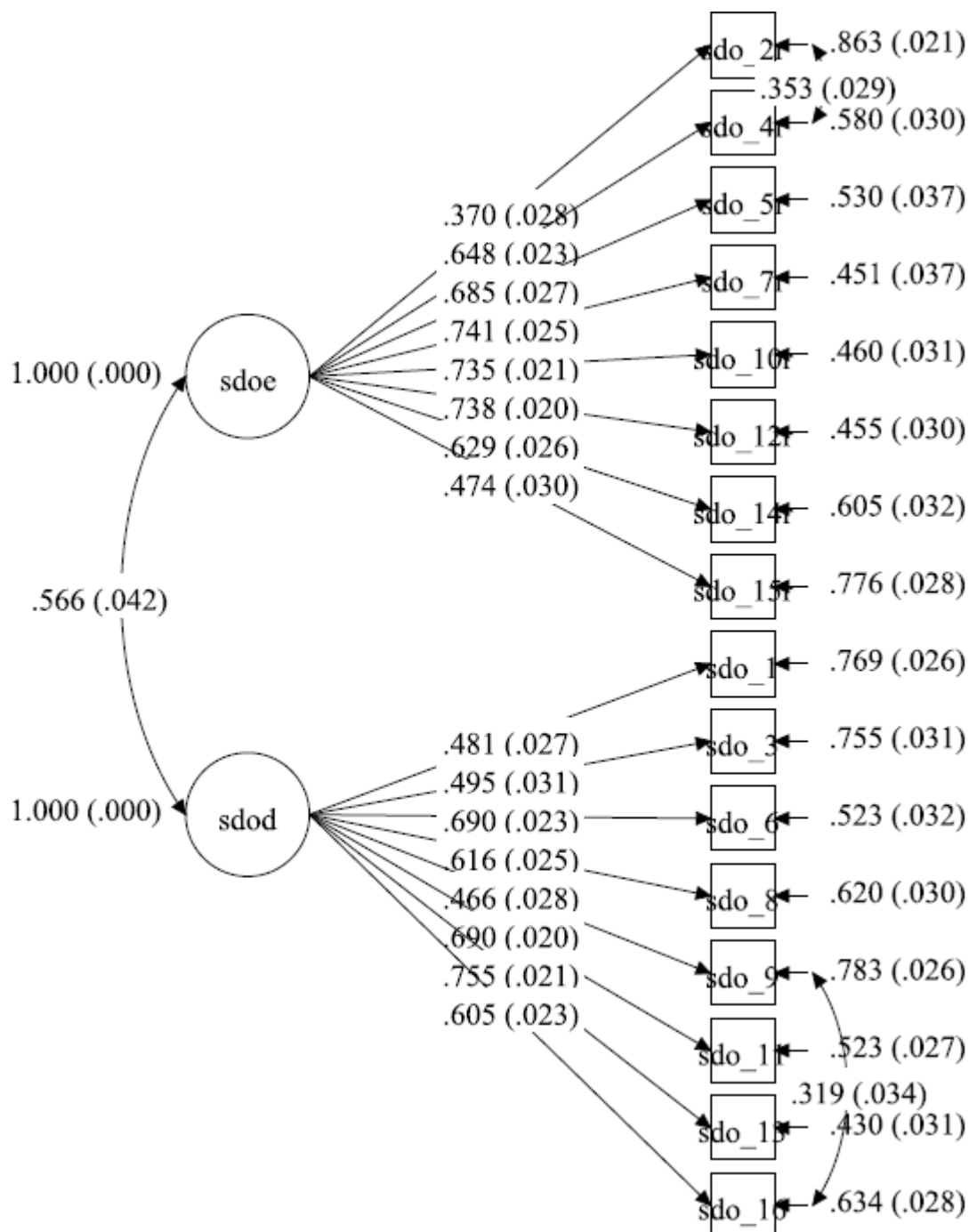


**Figure S2.** Confirmatory factor analysis of the 16-item Social Dominance Orientation (SDO) Scale (Pratto et al., 1994). Model fit:  $SB\chi^2(100) = 1035.21, p < .001$ ; RMSEA = .085 [90% CI = .081, .090]; CFI = .80; SRMR = .087.

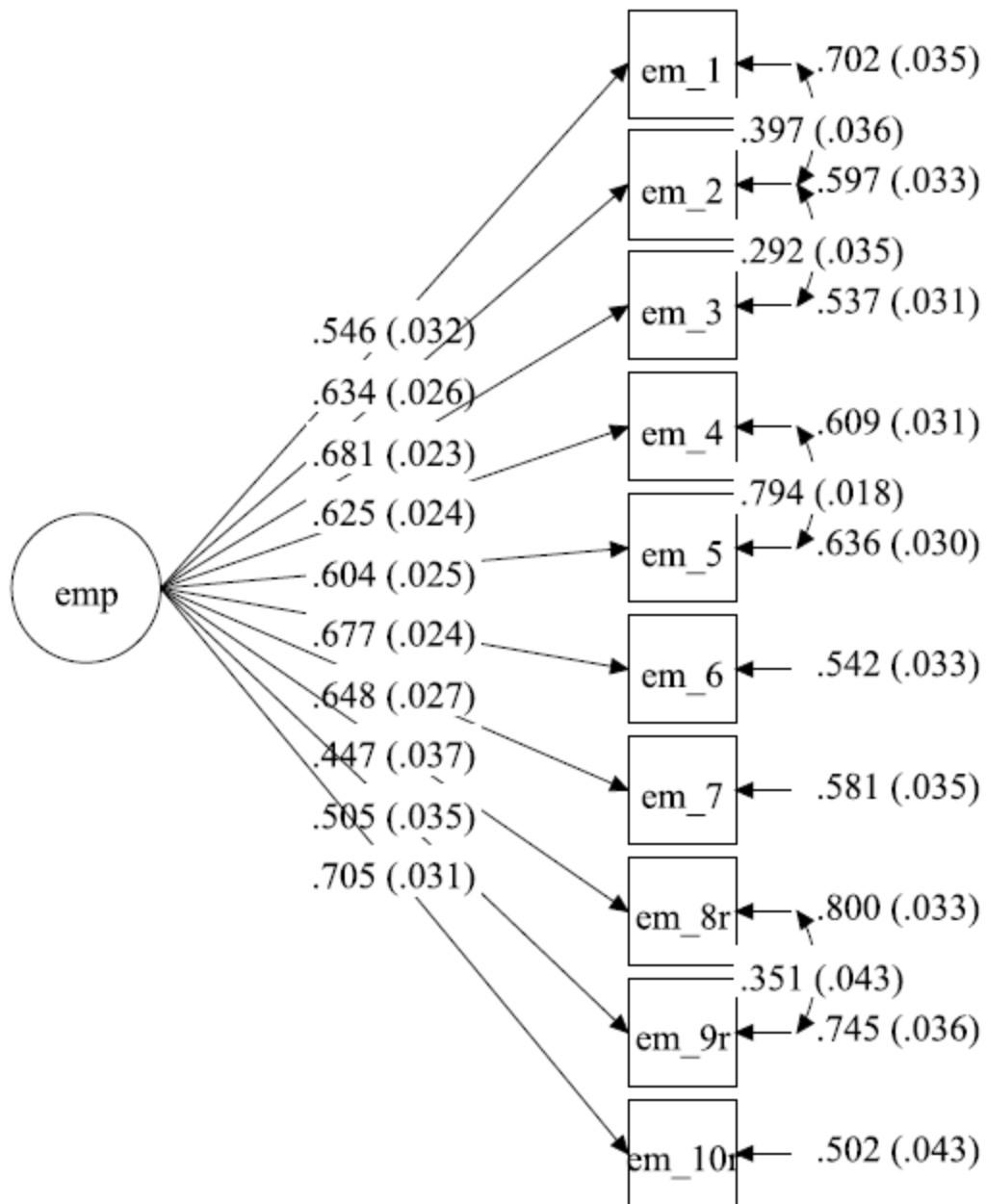


**Figure S3.** Confirmatory factor analysis of the 16-item Social Dominance Orientation (SDO) Scale (Pratto et al., 1994) including ‘method’ dimensions (i.e., pro-trait and con-trait item wordings). Model fit:  $SB\chi^2(87) = 406.10, p < .001$ ; RMSEA = .053 [90% CI = .048, .059]; CFI = .93; SRMR = .035.

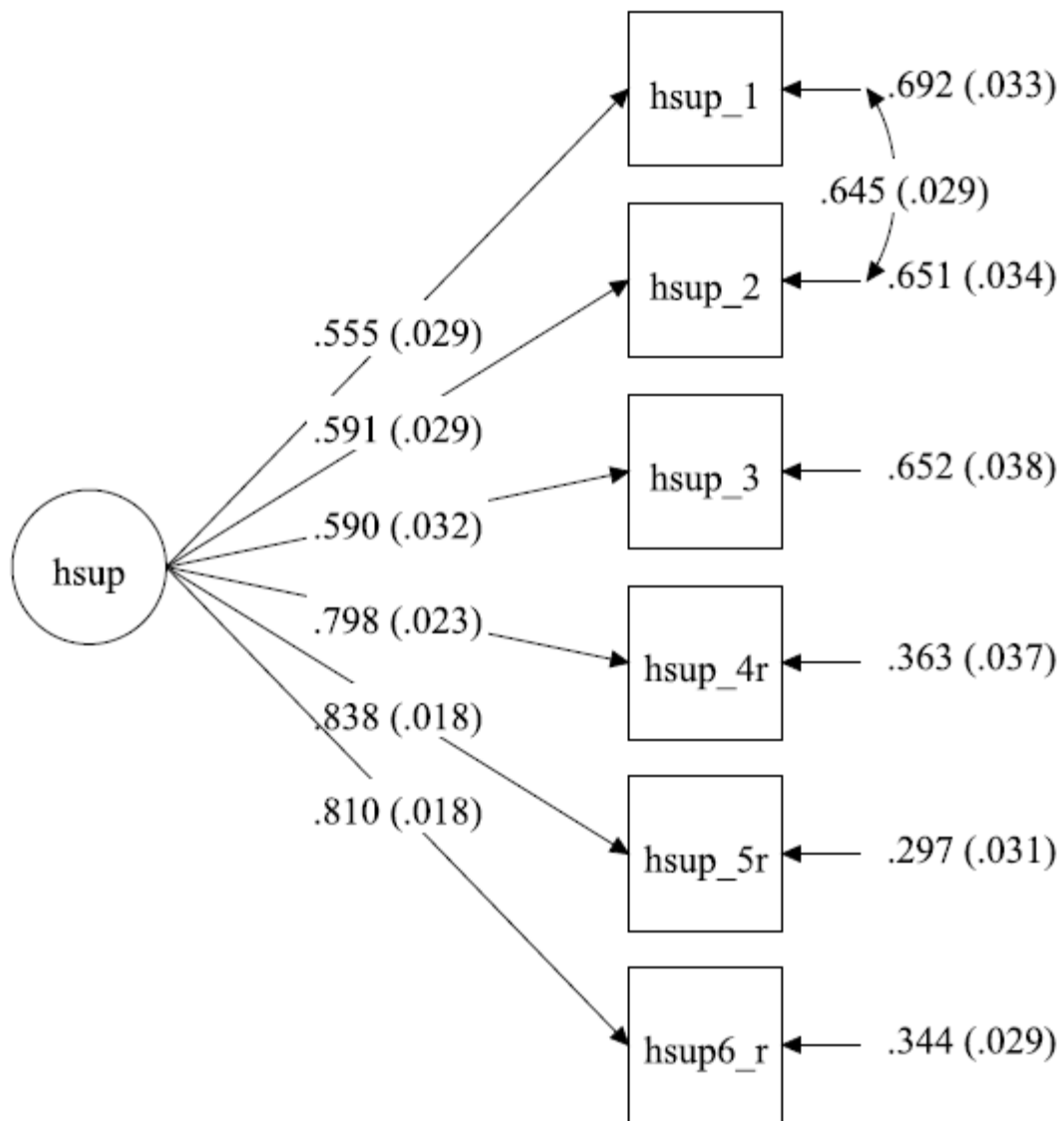




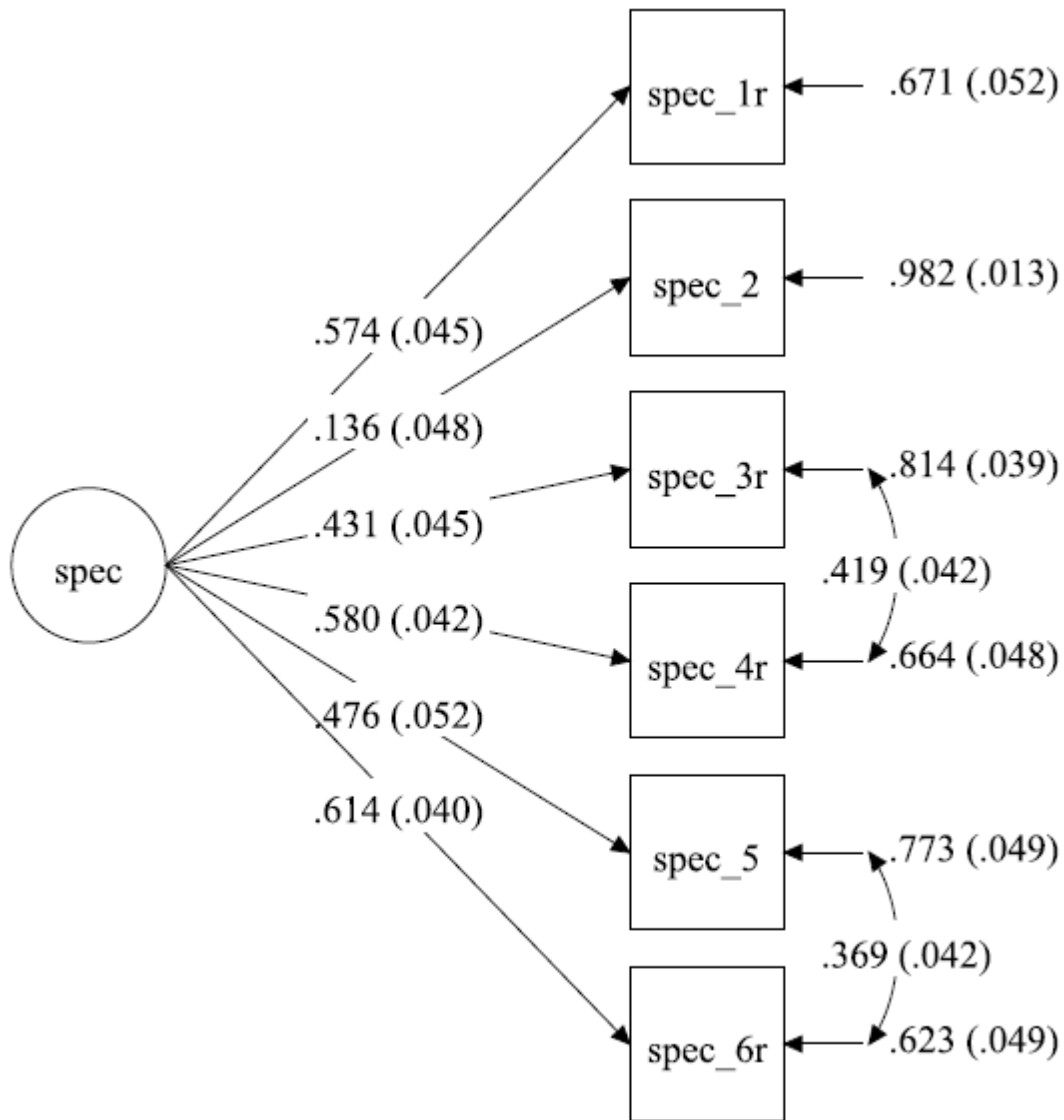
**Figure S4.** Confirmatory factor analysis of the 16-item Social Dominance Orientation (SDO) Scale (Pratto et al., 1994) of a two-factor model including SDO-E and SDO-D. Model fit:  $SB\chi^2(101) = 379.98$ ,  $p < .001$ ; RMSEA = .046 [90% CI = .041, .051]; CFI = .94; SRMR = .041.



**Figure S5.** Confirmatory factor analysis of the 10-item empathy measure from the International Personality Item Pool (IPIP; Goldberg, 2002). Model fit:  $SB\chi^2(7) = 31.28$ ,  $p < .001$ ; RMSEA = .059 [90% CI = .039, .080]; CFI = .97; SRMR = .025.



**Figure S7.** Confirmatory factor analysis of the six-item measure of beliefs in human supremacy (Dhont & Hodson, 2014). Model fit:  $SB\chi^2(8) = 119.37, p < .001$ ; RMSEA = .118 [90% CI = .100, .137]; CFI = .94; SRMR = .061.

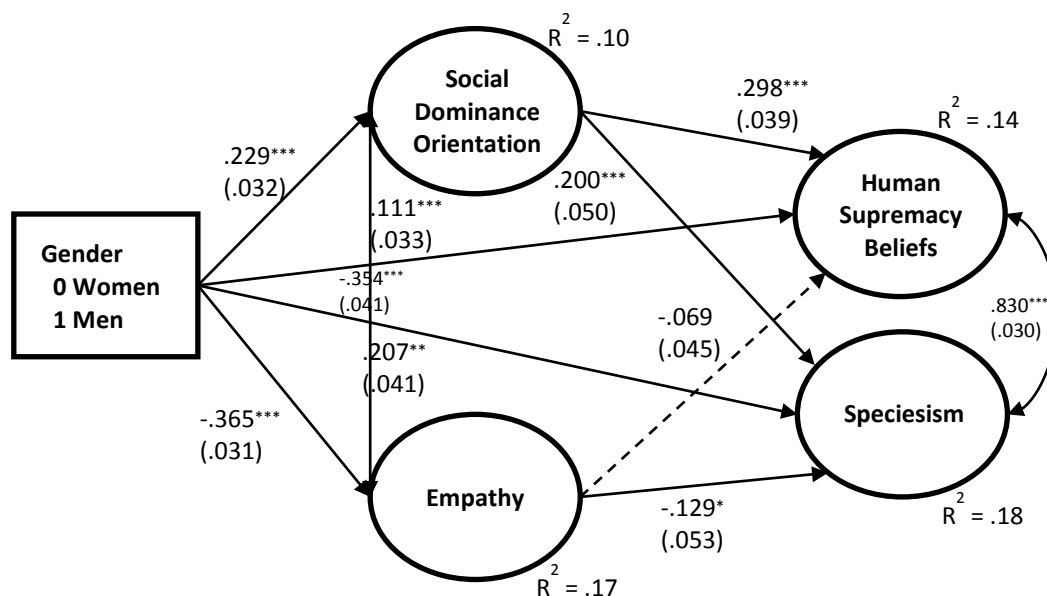


**Figure S6.** Confirmatory factor analysis of the six-item measure of speciesism (Dhont et al., 2014). Model fit:  $SB\chi^2(8) = 119.37, p < .001$ ; RMSEA = .118 [90% CI = .100, .137]; CFI = .94; SRMR = .061.

## Age and Education

One anonymous reviewer questioned whether the demographic variables of age and education would influence the results. First, we examined whether male and female participants differ in terms of age and education level. A  $t$ -test showed that male ( $M = 25.60$ ,  $SD = 9.54$ ) and female ( $M = 26.72$ ,  $SD = 9.76$ ) participants had similar age,  $t(1002) = 1.82$ ,  $p = .069$ . A chi-square test showed that the education level for male (secondary education or lower = 20.6%, tertiary education = 22.2%) and female (secondary education or lower = 25.6%, tertiary education = 31.6%) participants did not differ,  $\chi^2(1, N = 1005) = 1.17$ ,  $p = .306$ .

We then examined whether age and education would affect the main results. Figure S7 presents the results of the main model with age and education included as covariates. As can be seen, the results are virtually identical as those reported in Figure 1. We did not make any theoretical predictions regarding age/education effects, so we decided to report the model without the covariates. For completeness, Table S2 presents the overall correlations with these variables included.



**Figure S7.** Structural equation model assessing the indirect effects of gender on speciesism and human supremacy beliefs via SDO and empathy, including age and education level (0=secondary education or lower, 1=tertiary education) as covariates.

Note.  $N = 995$ . Indicators for the latent variables are item parcels excluded from the figure owing to space constraints.  $*p < .05$ .  $**p < .01$ .  $***p < .001$ .

**Table S2.** Descriptive statistics and correlations among measures.

	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9
1. Gender (0=women,1=men)	—	—	—								
2. Age			-.06 [-.12, .001]	—							
3. Education (0=low,1=high)	—	—	-.04 [-.10, .02]	.21*** [.15, .27]	—						
4. SDO	2.15	.60	.23*** [.17, .29]	-.19*** [-.24, -.14]	-.07* [-.13, -.01]	(.86)					
5. SDO- Dominance	2.21	.71	.24*** [.18, .30]	-.16*** [-.22, -.11]	-.09** [-.16, -.04]	.86 [.83, .88]	(.81)				
6. SDO-Equality	2.09	.70	-.15*** [-.21, -.09]	.17*** [.11, .22]	.02 [-.04, .08]	-.85 [-.87, -.83]	-.45 [-.52, -.38]	(.83)			
7. Empathy	3.67	.65	-.37*** [-.42, -.31]	.15*** [.10, .21]	.02 [-.05, .08]	-.36*** [-.42, -.30]	-.30*** [-.36, -.25]	.32*** [.25, .38]	(.87)		
8. Human supremacy	2.67	.82	.20*** [.14, .25]	-.03 [-.09, .03]	-.02 [-.09, .04]	.30*** [.24, .36]	.27*** [.21, .32]	-.25*** [-.31, -.19]	-.20*** [-.27, -.14]	(.87)	
9. Speciesism	2.78	.68	.25*** [.19, .30]	-.12*** [-.18, -.06]	-.07* [-.13, -.01]	.25*** [.19, .31]	.22*** [.16, .29]	-.21*** [-.26, -.15]	-.21*** [-.28, -.15]	.61*** [.56, .65]	(.67)

*Note.* Numbers in brackets are 95% confidence intervals based on bias-corrected accelerated bootstrapping with 10,000 re-samples in SPSS. Values in diagonal are Cronbach's alphas. Education level: 0=secondary education or lower, 1=tertiary education. \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

### Reference for Supplementary Material

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