Animal rights, environment, or health? Effects of argument type and dissonance on the attitudes toward the consumption of animals.

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Abstract

The scientific literature and advocacy organisations highlight three harm-related arguments as paramount reasons for the reduction and cessation of the consumption of animal-derived products (ADP) – violence toward animals, damage to the environment, and human health. However, research on their comparative effects is scarce and there is no clear definition of which type of argument is the most effective in restricting ADP consumption. Based on cognitive dissonance theory, this study aimed to investigate the effects of these types of arguments on meat-eaters' attitudes and beliefs toward the propositions of reducing and ceasing ADP consumption. The study sample comprised 545 Brazilian adults. We adopted an experimental between-subjects design based on the presentation of vignettes. Each participant responded to one of the vignettes (animal rights, environmental, or health arguments) or a control condition. Results showed that greater levels of ADP-related dissonance provoked greater positive attitudes toward the reduction and cessation of ADP consumption. Compared to baseline, the animal rights and environmental messages significantly increased dissonance and positive attitudes toward ADP restriction, but not the health argument. Participants most frequently adopted the dissonance-management strategies of denial of responsibility, denial of harm, and the articulation of beliefs favourable to change. The discussion highlights that the different effects of social influence contexts and argument types depend on their capacity to reveal ADP consumption as morally problematic behaviour. To our knowledge, this is the first study to experimentally compare the effects of animal rights, environmental and health-related arguments in generating ADP-related dissonance and attitude change.

Keywords: animal rights, cognitive dissonance, attitudes, meat, environment, health.

1. Introduction

The consumption of animal-derived products (ADP) as food, mostly 'meat', 'dairy', and eggs (animal flesh and secretions), is a common and frequent practice worldwide. However, individuals, groups, and organisations have been challenging or condemning the exploitation of animals (non-human animals) for food or any other purpose. Authors argue that the use of animals is ethically unjustifiable because they are sentient beings and subjects of a life, capable of having interests and suffering (Joy, 2010; Regan, 1983/2004; Singer, 1990). Bryant (2019) states that "If we take this suffering seriously, the sheer scale and intensity surely means that today's animal agriculture represents one of the largest moral failings of our time" (p. 1-2). The United Nations Food and Agriculture Organisation states that animal agriculture is one of the major causes of global warming, environmental degradation, deforestation, pollution, land use, and water consumption (FAO, 2006). The consumption of ADP[1] is also relevant to human health. There is strong evidence that 'meat' consumption is correlated with diseases such as colorectal cancer, cardiovascular disease, and diabetes (Godfray et al., 2018). Plant-based diets are associated with significantly lower risks of morbidity and mortality (Academy of Nutrition and Dietetics, 2016).

Joy (2010) argues that humans tend to empathise with animals and believe that harming animals is wrong. At the same time, most humans eat 'meat' and other ADP, having at least some conscious understanding that this practice involves harming and killing animals. Therefore, eating ADP may entail cognitive dissonance (Joy, 2010). Cognitive dissonance is a psychologically aversive state. More specifically, cognitive dissonance is a state of arousal that an individual labels as negative and attributes to an internal source, generating an intrapersonal psychological discomfort which is the motivation for attitude and/or behaviour change (Cooper, 2007). It engenders an imperative drive, with different magnitudes, for the reduction of the discomfort through the processes of adding cognitions, changing cognitions, attitudes, or behaviours (Cooper, 2007; Festinger, 1957; Joy, 2010).

Due to societal and individual avoidance mechanisms, meat-eaters are unlikely to experience constant food-related dissonance in everyday life (Rothgerber, 2020). Individuals dissociate 'meat' from its animal origins as one of the most basic ways of avoiding dissonance (Benningstad & Kunst, 2020). They may perceive eating 'meat' and other ADP as a normal part of merely 'eating' (Bastian & Loughnan, 2017). Joy (2010) argues that this relative absence of dissonance is a result of *carnism*, i.e., a ubiquitous ideology with social,

[1] Animal-derived products.

institutional, and subjective aspects that prevents the emergence of dissonance-inducing cognitions and provides justifications for the use and consumption of animals. When dissonance-avoidance mechanisms fail, individuals must change their behaviour (e.g., cease ADP consumption) or actively engage in other dissonance-reduction strategies. According to Bastian and Loughnan (2017), these strategies include (1) the denial of harm caused by the problematic behaviour; (2) the denial of personal responsibility concerning the behaviour; and (3) the bolstering of identity, which is threatened by the behaviour.

Like the current paper, many scientific articles on the psychology of eating animals highlight, typically in their first paragraphs, three main types of argument relevant to the restriction of ADP consumption: (1) The rights and suffering of animals; (2) the environment; and (3) human health (e.g., Bryant, 2019; Earle, Hodson, Dhont & MacInnis, 2019; Mathur et al., 2021, and many others). Concerning possible changes in attitudes toward ADP consumption, studies have gathered data on the impact of the health message (e.g., Parkinson, Twine & Griffin, 2019), environmental claims (e.g., Jalil, Tasoff & Bustamante, 2019), and arguments about the suffering and the rights of animals (e.g., Earle et al., 2019; Mathur et al., 2021). In his dissonance-based model, Rothgerber (2020) lists the welfare of animals, the environment, and personal health as the aspects of the consumption of animals that produce dissonance.

However, the literature is lacking systematic comparisons of the effects of these different types of arguments. Mathur et al. (2021) conjectured that animal welfare messages would be more effective in producing dissonance than environmental or health messages but stated that this idea remained speculative. In his comprehensive review of the literature on the subject, Rothgerber (2020) states that "This distinction about what issue directs MRCD [Meat-Related Cognitive Dissonance] has typically been ignored" (p. 8). The systematic comparison of these different types of argument is the aim of the present study.

2. Methods

2.1. The current study

The current study investigates which type of argument showing the harm produced by the consumption of animals – animal rights, the environment, or health – is the most powerful for generating dissonance and attitude change among meat-eaters. We induced cognitive dissonance through the presentation of vignettes outlining these three types of arguments and examined their effects on attitudes toward reducing and ceasing the consumption of ADP.

Based on dissonance theory (Cooper, 2007; Elliot & Devine, 1994; Festinger, 1957), we considered two hypotheses: (H_1) greater levels of cognitive dissonance would lead to greater levels of positive attitudes toward the propositions of reducing and ceasing ADP consumption; and (H_2) the experimental conditions would induce greater positive attitudes toward the propositions of reducing and ceasing ADP consumption in comparison to a control condition. To test H_2, we assessed the different effects of the three types of argument on dissonance, attitudes, and beliefs.

The phenomenon in question may be investigated through different theoretical lenses, such as the theory of reasoned action (Fishbein & Ajzen, 1975) and moral disengagement (Bandura, 1999). We use the theory of cognitive dissonance because it highlights the presence of morally problematic behaviour and the social influence processes that engender the mentioned negative arousal (Cooper, 2007). Therefore, this theoretical lens may be especially relevant for advocacy and policymaking, practices that often aim to tackle harmful behaviours. Furthermore, the theory posits that dissonance acts as a mediator between problematic behaviour and attitude change (Elliot & Devine, 1994), which is the theoretical basis for the mediation model adopted in this study (Cf. the topic Methods). In a certain context of social influence, individuals perceive that their behaviour has aversive consequences → they experience negative arousal involving psychological discomfort (dissonance) → they change their attitudes and mobilise beliefs (rationalisations) to make the consequences of the problematic behaviour appear non-aversive (Cooper, 2007).

We also analysed the effects of sex and 'ideological rationalisation of dominance' (social dominance orientation and system justification beliefs – Cf. Jost, Glaser, Kruglanski & Sulloway, 2003) on the investigated attitudes. The literature refers to important sex/gender differences in the representations and practices related to the consumption of animals (e.g., Adams, 1990/2015; Dowsett, Semmler, Bray, Ankeny & Chur-Hansen, 2018; Rothgerber, 2013). Studies also showed psychological-ideological aspects of the dominance and exploitation perpetrated against animals (Dhont & Hodson, 2014; Dhont, Hodson, Costello & MacInnis, 2014). Hence, it is relevant to evaluate how sex and ideological rationalisation influence the analyses carried out in the current research. The study was preregistered at osf.io/ykp4q.

2.2. The context of the study

The participants of this study were Brazilian adults. Brazil is an industrialised country, characterised by significant urbanisation that goes far beyond the most visible cities

of Rio de Janeiro and São Paulo (Garmany & Pereira, 2019). It is profoundly influenced by globalisation and large media and social media infrastructures (Garmany & Pereira, 2019) and is one of the biggest producers of ADP in the world (USDA, 2022). Despite the high consumption and cultural importance of ADP in Brazil, Ruby et al. (2016) found that Brazilians expressed more concern about the consumption of animals than participants of other nationalities (higher 'beef ambivalence' and admiration of vegetarians).

A 2018 survey conducted by the Brazilian Institute of Public Opinion and Statistics found that 14% of the Brazilian population identified as vegetarians (G1, 2018). According to the survey, the number of vegetarians in urban areas has doubled in six years (G1, 2018). In Brazil, challenges to the dominant culture of exploiting and consuming animals have been gaining increasing visibility on social media and traditional media (Mota & Santos, 2020) and awareness about the environmental impacts of ADP production has been growing. In the last three years, the destruction of ecosystems like the Amazon rainforest and the Pantanal has increased markedly, aggravating the risk of drought and electricity shortage, and generating public outcry (Spring, 2021; Spring & Brito, 2021).

2.3. Participants and ethics

Five hundred and forty-five Brazilian adults (18 years old or over) participated in this study. We recruited individuals aged 18 or over by convenience because they could independently provide consent. Participants were 283 women and 262 men, consumers of ADP, most of them living in urban areas in the southeast Brazil. Their mean age was 31.65 years old (*SD* = 13.50). They had mean monthly per-capita earnings of USD 538.84 (*SD* = 585.55), which correspond to the typical earnings of the Brazilian middle class. Most participants were professionals in occupations requiring technical and/or higher-education training, such as managers, lawyers, social workers, bank clerks, engineers, and teachers. One hundred and sixty-eight participants (31%) were students. All participants gave informed consent before participation. We observed Brazilian ethics guidelines for research with human beings, following the Declaration of Helsinki. The Research Ethics Committee of the first author's university approved the research project, with the letter n. 2.751.410.

2.4. Procedures and instruments

We collected data in June and July 2021. We recruited participants online through social media, sending them a link to an online questionnaire built on the Qualtrics platform.

Under the supervision of the first author, undergraduate students sent the link to their contact lists on the platforms *Facebook*, *WhatsApp*, and *Instagram*. We informed participants that we were conducting a survey on eating practices aiming to know their perceptions and attitudes toward the consumption of "meat, dairy, eggs, and other types of food". We used three experimental conditions and two control conditions. The randomization mechanism embedded in the Qualtrics platform randomly allocated each participant to one of these five conditions. We used the Qualtrics block randomisation function at the beginning of the 'Survey Flow' configured to 'Evenly Present Elements' (conditions). Each participant responded to only one condition (between-subjects design). We used the following research instruments in the same sequence as presented here.

Vignettes and restriction statement (conditions). In the experimental conditions, participants read vignettes containing specific types of arguments for reducing and ceasing ADP consumption: (1) animal rights, (2) environmental, and (3) health arguments (respectively 'Animals', 'Environment', and 'Health'). The original versions of the vignettes in Portuguese had equivalent numbers of words, respectively 382, 382, and 383 words. Table 1 shows the translations of the vignettes into English. They were written based on the literature and documentary films on the subject. Their purpose was to emulate claims in favour of the reduction and cessation of ADP consumption popularised by contemporary media, documentaries, and social media (Andersen & Kuhn, 2014, 2017; Hancox, 2018).

Table 1

Vignettes employed in each one of the three experimental conditions.

Condition	Vignette
(1) Animals	Eating meat may seem to be a trivial behaviour, but it influences the welfare of animals raised or captured for human consumption. Non-human animals are just as sensitive as human beings. They do not have the same type of linguistic and rational consciousness as human beings, but they are sentient, that is, they have the capacity of feeling, of recognizing themselves in their feelings, of wanting to avoid suffering, physical pain, and death. The production of meat, eggs and dairy is no longer artisanal and has become industrial. Animals raised in that mode of production are treated like things and like machines. Baby chicks are born in artificial brooders, thousands at the time. They will never touch their mother, never will be able to freely run or peck. To avoid cannibalism due to the stress that the birds endure, the baby chicks have their beak cut without anaesthesia. Chickens are raised in small spaces, three or four chickens in a 50 centimetres cage. Milk cows produce milk only when they give birth to a baby calf. To that end, they are constantly kept pregnant through artificial means. When the baby calf is born, she or he is separated from her or his mother, generating vehement and persistent cries of protest from the cow. The milk that would feed the baby calf is destined for human consumption in the form of milk, yoghurt, cheese, etc. The cow's mammary glands are constantly inflamed, wounded and sore because of the over-exploitation. Bovines are branded with hot irons, and they have their horns cut without anaesthesia. At the time of slaughter, they are forced to pass through narrow corridors; they present mydriasis, the dilatation of the pupil, which is a sign of panic, and they frequently try to back up. Their throats are cut while the circulation is still in function, to allow blood drain. Fish and other sea animals also feel pain, and when taken out of the

	water, die by asphyxiation or decompression. Pregnant pigs are raised in narrow cages which only allow them to lay down or stand up, they cannot turn around. Baby pigs are castrated without anaesthesia. The animals frequently suffer from wounds and diseases, but they do not receive treatment. They are frequently forced to slaughter by beating. Avoiding the consumption of animal products is important to animal welfare. Each one of us needs to reduce the consumption of meat, fish, milk, cheese, eggs, and other animal products or to completely stop consuming these products.
(2) Environment	Ten thousand years ago, a short time ago considering the age of planet Earth, 99% of planetary biomass were constituted of wild animals, and today 98% of the biomass is constituted of humans and animals raised for human consumption. On a global scale, animal farming, (the raising of cows, pigs, chickens, and other animals for human consumption) is responsible for the emission of 18% of greenhouse gases because of the deforestation caused by the farming of food for the animals and the methane emissions related to the animals' digestive processes among other factors. For comparative purposes, all the gases emitted by cars, buses, planes, trains, etc., (that is, by all the transport sector) are equivalent to 13% of these gases. So, animal farming is the biggest cause or at least one of the biggest causes of the greenhouse effect and global warming. With respect to water consumption on a global scale, animal farming consumes 20% to 33% of the total. Almost 9,500 litres of water are needed to produce around half a kilogram of meat, 1,800 litres of water for around 10 eggs, and almost 3,400 litres of water for around half a kilogram of cheese. A thousand litres of water are necessary to produce one litre of milk. Because of the destruction of natural habitats, the use of pesticides and fertilizers, among other factors, animal farming is the main cause of species extinction, water pollution and ocean dead zones. Three-quarters of the world's fishing areas are over-exploited or depleted. It is possible that there will be fishless oceans by 2048. For each kilogram of fish caught, up to five kilograms of non-commercial marine animals are also caught and killed as by-kill (animals caught unintentionally while catching the targeted animals). Animal farming is responsible for around 91% of the destruction of the Amazon. All over the world, one to two acres of tropical forest are deforested per second, and the main cause is the raising of animals or farming for feeding the animals. Avoiding the consumption of animal products is important for the environment. Each one of us needs to reduce the consumption of meat, fish, milk, cheese, eggs, and other animal products or to completely stop consuming these products.
(3) Health	Factors related to lifestyle may be responsible for 70% of diseases and deaths. One portion of processed meat per day increases by 51% the risk of developing diabetes. The World Health Organization has classified bacon and sausage as causes of cancer. Bacteria toxins present in meat lead the human body, in a few minutes, to a peak of inflammation, and the arteries to become rigid or paralysed. Chicken meat may be one of the main sources of sodium and cholesterol. Eating one egg per day is as harmful as smoking five cigarettes, in regard to life expectancy. Dairy, that is, milk, cheeses, yoghurts, etc., may be the main source of saturated fat. There are four main concerns with health-hazardous substances accumulated in fish: polychlorinated biphenyls (PCB), mercury, cholesterol, and saturated fat. Fish may be mercury sponges and toxins bio-accumulate in their flesh. Eating animal products is the source of 93% of the contamination of the human body by dioxins, toxic substances that may cause problems to the immunological system and cancer, among others. There is a strong connection between dairy and autoimmune diseases such as rheumatoid arthritis and multiple sclerosis. The majority of people in the world is lactose intolerant. Milk is a fluid with hormones, and because of the processes used in its extraction, contains pus. Dairy foods are related to different types of cancer. Only 5% to 10% of cancer have genetic causes. The ingestion of any animal protein increases the levels of the IGF-1 hormone, which promotes the growth of cancer. There are at least 450 different types of drugs administered to animals for animal agriculture, including antibiotics, which increases the number of resistant bacteria. Almost all commercial meat may be contaminated with faecal bacteria. The individual who eats meat has one chance in three of having diabetes and two chances in three of gaining weight. The man who eats meat has one chance in two of having cancer and a woman, one chance in three. Avoiding the consumption of animal products is important for health. Each one of us needs to reduce the consumption of meat, fish, milk, cheese, eggs, and other animal products or to completely stop consuming these products.

The three vignettes ended with the same *restriction statement*, "Each one of us needs to reduce the consumption of meat, fish, milk, cheese, eggs, and other animal products or to completely stop consuming these products", corresponding to two propositions, Reducing ADP and Ceasing ADP. In the control conditions (Control 1 and Control 2), the participants did not read a vignette, but only the restriction statement. In Control 1, participants responded to a measure of affect (described below) after reading the restriction statement whereas in Control 2 they responded to the affect measure beforehand. We proposed two control conditions to examine if the restriction statement would have in itself an impact on the production of dissonance-relevant affect (i.e., if the Control 1 condition would engender significantly higher levels of negative affect than Control 2). In the conditions with vignettes and Control 1, the affect measure was presented immediately after the text. The other measures also followed as presented here.

Affect measure. Based on Elliot and Devine (1994), we used a self-report affect scale composed of 14 items: uncomfortable, uneasy, bothered, restless, angry toward myself, dissatisfied with myself, annoyed with myself, embarrassed, and ashamed (negative affect); and happy, good, friendly, energetic, and optimistic (positive affect). In line with the concept of cognitive dissonance (Cooper, 2007), we expected to use only the negative affect items as a measure of the phenomenon (the positive affect items were included to provide contrast and enhance the reflexivity and quality of the responses). The presentation of the items of this scale was randomised. We asked participants to consider the question "how are you feeling at this moment" and respond to each item on a scale from 1 (not at all) to 5 (very much). We submitted the findings to exploratory factor analysis and excluded the items 'restless' and 'energetic' to avoid cross-loading. We then treated the remaining 12 items with new exploratory factor analysis (principal component analysis, oblimin rotation with Kaiser normalisation). We obtained a clear two-factor solution, 'negative affect' (sample reliability McDonald's $\omega = .91$, eigenvalue = 5.89, explaining 49% of the total variance) and 'positive affect' (sample reliability $\omega = .84$, eigenvalue = 1.89, explaining 16% of the total variance). All factor loadings were above .60 (negative affect) and .70 (positive affect). We considered only the findings of the negative affect scale, with 8 items (uncomfortable, uneasy, bothered, angry toward myself, dissatisfied with myself, annoyed with myself, embarrassed, and ashamed), referred to as *Dissonance*. We interpreted this scale as a measure of the psychological discomfort (one of the manifestations of cognitive dissonance as defined above) induced by the vignettes and restriction statement, with higher scores signalling greater dissonance.

Attitudes toward restricting ADP consumption. We asked participants to consider the text they had read and respond to the following items: "Each one of us needs to reduce the consumption of meat, fish, milk, cheese, eggs, and other animal-derived products" and "Each one of us needs to completely stop consuming these animal-derived products". Responses were on a 6-point scale with no middle point (forced-choice scale) comprising 'strongly disagree, disagree, slightly disagree, slightly agree, agree, and strongly agree'. These items correspond to the propositions Reducing ADP and Ceasing ADP, the main dependent variables in this study. Higher scores were interpreted as greater positive attitudes toward the propositions. After each item, we included the following request "Please, give reasons for your answer. Your opinion is important. Please, feel free to write as much as you want", and a box allowing for open answers.

Persuasiveness of the vignette and restriction statement. We asked participants to reveal how 'persuasive (convincing)' they considered the 'text' they had read, i.e., the vignettes or, in the control conditions, simply the restriction statement. Participants responded on a scale of 1 to 5, comprising 'not at all persuasive, a little persuasive, more or less persuasive, very persuasive, and extremely persuasive'.

Social Dominance Orientation. We used the short version of the social dominance orientation measure validated in Brazil by Vilanova, Soares, Duarte and Costa (2022, preprint), based on the SDO_7 scale developed by Ho et al. (2015). This scale assesses two subdimensions of social dominance orientation, *Dominance* (SDO-D scale) and *Anti-Egalitarianism* (SDO-E scale). The dominance subdimension encompasses the attitudes of individuals toward the superior position of certain social groups to the detriment of underprivileged groups. The anti-egalitarianism subdimension refers to their attitudes toward the belief that all social groups should have equal access to opportunities and resources (Ho et al., 2015). This instrument comprises 8 items such as "An ideal society requires some groups to be on top and others to be on the bottom" (SDO-D scale, sample reliability $\omega = .77$) and "It is unjust to try to make groups equal" (SDO-E scale, sample reliability $\omega = .71$). This scale is an updated instrument that considers the two dimensions of SDO with a balanced number of items and allows for brief self-administration (Vilanova et al., 2022, preprint).

System Justification. We used the system justification scale constructed by Silva (2021). The scale is unidimensional and includes 6 items such as "Come to think of it, our society is fair" and "Generally speaking, things in Brazil are as they should be" (sample reliability $\omega = .80$). This scale was recently constructed, showed satisfactory validity and reliability, allows for brief self-administration, and is adapted to the Brazilian context (Silva, 2021).

Sociodemographic information. We included questions about age, sex (in this case, due to the research design, we referred to 'sex' and asked for a binary identification as female or male), city and state, occupation, monthly family income, and if the participant followed a vegetarian or vegan diet. The question about diet included a brief explanation about what was meant by vegetarian ("no consumption of meat, but consuming other animal-derived products such as dairy and/or eggs") and vegan ("no animal-derived products"). At the end of the survey, participants were debriefed (we explained the experimental procedure to the participants and provided references for the vignettes). All the materials and data of this study are available at https://osf.io/tmh7g/?view_only=f906516c2d0f4ddc99621c0e3fd59f19.

2.5. Data analysis

We conducted correlation analyses to assess the relations among the variables of interest. To test Hypothesis 1, we used linear regression analyses, entering Dissonance as the explanatory variable and Reducing ADP and Ceasing ADP as dependent variables, controlling for Age and Sex. To test Hypothesis 2, we conducted factorial ANOVAs, entering the Conditions (vignettes and control) and Sex as independent variables, as well as ANOVAs within women and men entering only the Conditions as the independent variable. An *a priori* power analysis for the 2x5 (Sex by Conditions) Factorial ANOVAs based on the software G*Power (Faul, Erdfelder, Lang & Buchner, 2007) found that a sample of 430 participants was necessary to achieve 0.95 power at the alpha level of 0.05, i.e., 43 participants per cell. We stopped data collection when we reached at least 43 participants per cell.

We adopted a mediation design to account for the role of Dissonance in the relation between the Conditions and the targeted attitudes. We used the PROCESS macro (Hayes, 2013), Model 4, to assess the effects of the Conditions (variable x) on the attitudes toward Reducing ADP and Ceasing ADP (variable y) through the mediation of Dissonance (variable m), controlling for Sex and Age. We inserted the Conditions as a multi-categorical explanatory variable and used indicator coding (Hayes & Preacher, 2014) to ascertain the effects of the conditions with vignettes (Animals, Environment, and Health) in comparison to Control and then the effects of Animals and Environment in comparison to Health. To make statistical inferences regarding the indirect effects of x on y, we relied on bootstrap confidence intervals based on 5,000 bootstrap samples (Hayes, 2013). Monte Carlo post-hoc power analyses for indirect effects (Schoemann, Boulton & Short, 2017) verified that the observed power ranged from 0.92 to 0.99 for all statistically significant indirect effects (*ab* paths) in these mediation models. To analyse the impact of ideological rationalisation (Social

Dominance Orientation and System Justification), we used Models 7 and 14 of the PROCESS macro (Hayes, 2013), entering the ideological measures as possible moderators (variable w) of *a*-paths and *b*-paths. We used the software SPSS and adopted the alpha level of 0.05 for all statistical analyses. Following Byrne (2016), we adopted the value ranges of skewness between -1 to +1 and kurtosis between -7 and +7 to indicate the acceptable levels of normality in the distribution of the continuous variables. The continuous variables did not present problematic departures from normality (except for a small departure in the skewness of the System Justification measure; Cf. skewness and kurtosis in the supplementary material). Tables S1 and S2 (supplementary material) provide values for convergent (AVE) and discriminant (HTMT) validity for the pertinent measures.

The open questions aimed to investigate how participants justified their positions concerning the reduction and cessation of ADP consumption. We used content analysis (Weber, 1990) to treat the justifications provided in the conditions with vignettes and assess their connections with the management of dissonance. We coded the participants' answers into formalised sentences expressing 'beliefs'. We then categorised the beliefs into previously defined classes, through mutually exclusive classification, according to the dissonance-management strategies proposed by Bastian and Loughnan (2017), i.e., the denial of responsibility, denial of harm, and bolstering of identity. Finally, we examined the associations between the presence of these dissonance-management strategies and vignette, using chi-square analyses. We present the illustration and rationale for the content analysis in Table S3.

3. Results

3.1. The effects of dissonance and the conditions on the targeted attitudes

We analysed the patterns in the data concerning negative affect and the attitudes toward the propositions of Reducing ADP and Ceasing ADP. Table 2 shows the number of participants, means and standard deviations of these variables in each condition by sex. As the mean level of negative affect in Control 1 was not higher than in Control 2, we carried out all the subsequent analyses considering only the Control 1 condition (which is comparable to the experimental conditions because participants responded to the negative affect scale after reading the restriction statement). Therefore, for the main analyses, the total sample comprised 403 participants. Table 3 shows the correlations among the study variables.

We conducted multiple linear regression analyses to determine the effect of Dissonance on attitudes toward Reducing ADP and Ceasing ADP controlling for Age and Sex. The model explained 22% of the variance in attitudes toward Reducing ADP consumption, $F(3, 399) = 38.51$, $p < .001$, $R^2_{adjusted} = .22$, and only Dissonance was a significant predictor, $B = .68$, 95% CI = [.55, .81], $p < .001$. The same regression model explained 23% of the variance in the attitudes toward Ceasing ADP consumption, $F(3, 399) = 40.54$, $p < .001$, $R^2_{adjusted} = .23$. In this case, Dissonance, $B = .73$, 95% CI = [.59, .87], $p < .001$, and Sex (Women), $B = .32$, 95% CI = [.06, .58], $p = .01$, were significant predictors. These results are in line with Hypothesis 1.

We assessed if the Conditions in interaction with Sex would provoke significant differences in the attitudes toward Reducing ADP and Ceasing ADP. The Factorial ANOVAs did not yield significant results, respectively F (3, 395) = .08, p = .971; and F (3, 395) = .44, p = .721. ANOVAs within women and men did not produce significant results either (Fs < 2.03, ps > .111). To analyse how the Conditions impacted the targeted attitudes, it is necessary to consider their effects on Dissonance and the role of Dissonance as a mediator.

We conducted mediation analyses based on Model 4 provided by the PROCESS macro (Hayes, 2013). Figure 1 shows that, in comparison to Control, only the Animals and Environment conditions had significant effects on attitudes toward Reducing ADP, and only their indirect effects were statistically significant. Animals and Environment had positive effects on Dissonance, respectively $a_1 = 0.61$, $\beta = 0.66$, $SE = 0.13$, $t(397) = 4.84$, 95% CI [0.36, 0.86], $p < .001$, and $a_2 = 0.53$, $\beta = 0.56$, $SE = 0.12$, $t(397) = 4.27$, 95% CI [0.28, 0.77], $p < .001$. Dissonance had a positive effect on Reducing ADP, $b_1 = 0.66$, $\beta = 0.44$, $SE = 0.07$, $t(396) = 9.48$, 95% CI [0.52, 0.79], $p < .001$. The indirect effect of Animals on Reducing ADP was $a_1b_1 = 0.40$, $BootSE = 0.10$, 95% BootCI [0.21, 0.62]. The indirect effect of Environment on Reducing ADP was $a_2b_1 = 0.35$, $BootSE = 0.09$, 95% BootCI [0.19, 0.53].

Figure 2 shows that the results were similar concerning the attitudes toward Ceasing ADP with only Animals and Environment presenting significant effects. Dissonance had a positive effect on Ceasing ADP, $b_1 = 0.77$, $\beta = 0.49$, $SE = 0.07$, $t(396) = 10.60$, 95% CI [0.63, 0.91], $p < .001$. Animals had a significant positive indirect effect on Ceasing ADP, $a_1b_1 = 0.47$, $BootSE = 0.12$, 95% BootCI [0.25, 0.72]. Environment had a direct negative effect on Ceasing ADP, $c_2 = -0.53$, $\beta = -0.36$, $SE = 0.18$, $t(396) = -2.89$, 95% CI [- 0.89, - 0.17], $p = .004$, as well as a mediated positive effect, $a_2b_1 = 0.41$, $BootSE = 0.09$, 95% BootCI [0.22, 0.61].

Taken together, these results are in line with Hypothesis 1 and partially support Hypothesis 2. Only two of the three types of argument (Animals and Environment) induced

greater positive attitudes toward the propositions of Reducing ADP and Ceasing ADP in comparison to Control. The Health argument did not significantly differ from Control. Participants rated the persuasiveness of the three vignettes similarly: Animals (M = 3.26, SD = 1.09), Environment (M = 3.17, SD = .84), and Health (M = 3.05, SD = 1.05). The differences among these ratings were non-significant, $F(2, 280) = 1.01$, p = .37. The vignettes did not differ because of their perceived persuasiveness but because of the magnitude of dissonance they produced.

We investigated the effects of ideological rationalisation of dominance (SDO-D, SDO-E, and System Justification) on the models described above. We used models 7 and 14 of the PROCESS macro (Hayes, 2013) entering these variables as variable w to assess if they moderated the effects of the vignettes on Dissonance (a-paths) or Dissonance on Reducing ADP and Ceasing ADP (b-paths). The results were non-significant (p values ranging from .056 to .952) indicating that the effects of the vignettes on Dissonance and Dissonance on the attitudes toward the propositions of restricting ADP consumption were independent of Social Dominance Orientation and System Justification. However, as Table 3 shows, these variables were negatively correlated with attitudes toward restricting ADP consumption.

To further compare the effects of the vignettes, we suppressed Control from the mediation model and assessed the effects of Animals and Environment in relation to Health (N = 283). In this model, Animals and Environment had positive effects on Dissonance, respectively $a_1 = 0.44$, β = 0.46, SE = 0.13, $t(278) = 3.27$, 95% CI [0.17, 0.70], p = .001, and $a_2 = 0.35$, β = 0.37, SE = 0.13, $t(278) = 2.69$, 95% CI [0.09, 0.61], p = .007; Dissonance had a positive effect on Reducing ADP, $b_1 = 0.71$, β = 0.48, SE = 0.08, $t(277) = 8.88$, 95% CI [0.55, 0.87], $p < .001$ and on Ceasing ADP, $b_1 = 0.94$, β = 0.59, SE = 0.08, $t(277) = 11.90$, 95% CI [0.78, 1.09], $p < .001$. The indirect effect of Animals on Reducing ADP and Ceasing ADP was respectively $a_1b_1 = 0.31$, $BootSE$ = 0.11, 95% BootCI [0.11, 0.54] and $a_1b_1 = 0.41$, $BootSE$ = 0.14, 95% BootCI [0.13, 0.69]. The indirect effect of Environment on Reducing ADP and Ceasing ADP was respectively $a_2b_1 = 0.25$, $BootSE$ = 0.09, 95% BootCI [0.08, 0.45] and $a_2b_1 = 0.33$, $BootSE$ = 0.11, 95% BootCI [0.11, 0.55]. This model directly shows that Animals and Environment had significant greater impact on Dissonance and the targeted attitudes than Health.

Table 2

Number of participants, means and standard deviations of Negative Affect, Reducing ADP and Ceasing ADP in each condition by Sex.

	Animals			Environment			Health			Control 1			Control 2		
	- Affect *M* (*SD*)	Reduce *M* (*SD*)	Cease *M* (*SD*)	- Affect *M* (*SD*)	Reduce *M* (*SD*)	Cease *M* (*SD*)	- Affect *M* (*SD*)	Reduce *M* (*SD*)	Cease *M* (*SD*)	- Affect *M* (*SD*)	Reduce *M* (*SD*)	Cease *M* (*SD*)	- Affect *M* (*SD*)	Reduce *M* (*SD*)	Cease *M* (*SD*)
Women	2.95 (1.07)	4.63 (1.29) *N* = 43	3.02 (1.62)	2.62 (0.85)	4.56 (1.25) *N* = 43	2.56 (1.35)	2.44 (0.89)	4.09 (1.50) *N* = 57	2.74 (1.51)	2.22 (0.89)	4.24 (1.27) *N* = 62	2.90 (1.58)	2.48 (0.93)	4.09 (1.45) *N* = 78	2.95 (1.57)
Men	2.44 (1.01)	4.28 (1.57) *N* = 43	2.51 (1.57)	2.57 (0.79)	4.33 (1.32) *N* = 52	2.35 (1.37)	2.11 (0.91)	3.78 (1.39) *N* = 45	2.09 (1.39)	2.05 (0.82)	3.83 (1.42) *N* = 58	2.29 (1.27)	2.29 (0.80)	3.41 (1.58) *N* = 64	1.95 (1.27)
Total	2.69 (1.07)	4.45 (1.44) *N* = 86	2.77 (1.61)	2.59 (0.81)	4.43 (1.29) *N* = 95	2.44 (1.35)	2.30 (0.91)	3.95 (1.45) *N* = 102	2.45 (1.49)	2.14 (0.86)	4.04 (1.36) *N* = 120	2.61 (1.46)	2.39 (0.88)	3.78 (1.54) *N* = 142	2.50 (1.52)

Note. $N = 545$.

Table 3

Summary of intercorrelations and descriptive statistics.

		Mean	***SD***	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	Dissonance	2.40	0.93	1							
2	Reducing ADP	4.20	1.40	.46***	1						
3	Ceasing ADP	2.56	1.48	.46***	.57***	1					
4	Persuasiveness	2.91	1.06	.45***	.32***	.33***	1				
5	Dominance (SDO-D)	2.03	0.81	- .07	- .17***	- .09	- .01	1			
6	Anti-egalitarianism (SDO-E)	2.09	0.75	- .07	- .20***	- .16**	- .03	.54***	1		
7	System justification	1.66	0.72	- .14**	- .19***	- .07	- .01	.39***	.36**	1	
8	Age	32.12	13.65	-.12*	- .10*	- .00	- .03	.07	.10*	.36***	1

Note. $N = 403$.

* p < .05, ** p < .01, *** p < .001.

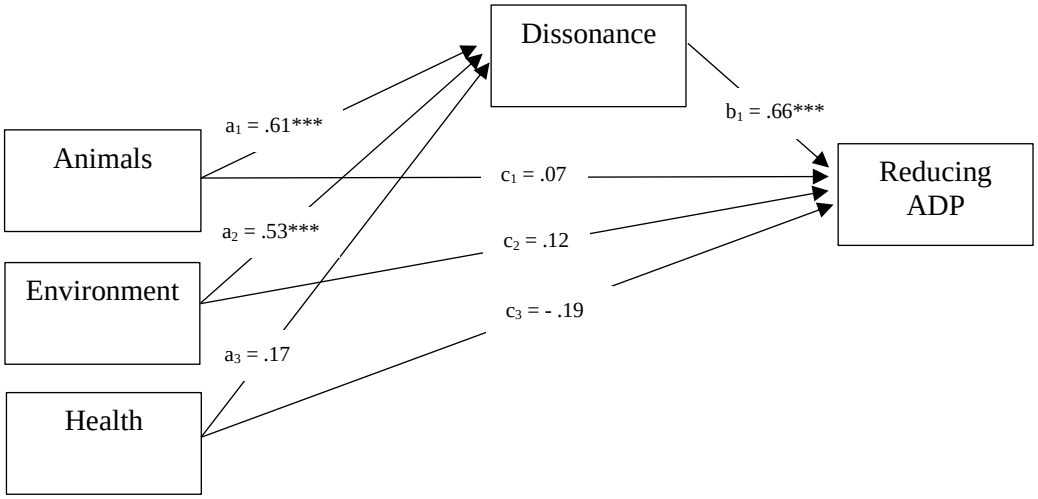

Figure 1. Mediation model showing the impact of the different types of argument on the attitudes toward REDUCING the consumption of animal-derived products through the activation of dissonance.

Note. All coefficients are unstandardised. The variables Sex and Age are not shown and had significant effects on Dissonance, respectively .29*** (Men = 0, Women = 1) and - .01***.
*** ≤ .001

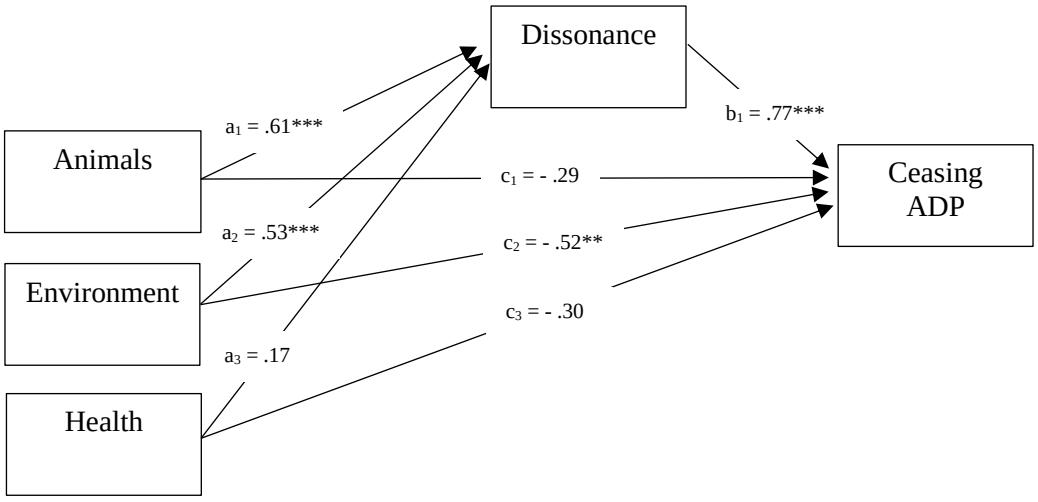

Figure 2. Mediation model showing the impact of the different types of argument on the attitudes toward CEASING the consumption of animal-derived products through the activation of dissonance.

Note. All coefficients are unstandardised. The variables Sex and Age are not shown and had significant effects on Dissonance, respectively .29*** (Men = 0, Women = 1) and - .01***. Sex had a significant effect on Ceasing ADP, .29*.
* < .05
** < .01
*** ≤ .001

3.2. The beliefs mobilised to manage dissonance

We asked participants to provide justifications for their reactions to the Reducing ADP and Ceasing ADP propositions and analysed their open answers with content analysis. We considered only the conditions with vignettes (in which participants were exposed to explicit descriptions of ADP-related harm). The content analysis showed the beliefs that the participants mobilised to deal with challenges to (their) ADP consumption. Most of their beliefs were unfavourable to change but participants also expressed favourable ideas. We categorised the identified beliefs into the dissonance-management strategies proposed by Bastian and Loughnan (2017) – the denial of responsibility, denial of harm, and bolstering of identity (which we expanded to bolstering and protecting identity). However, some of the identified unfavourable beliefs did not deny responsibility, harm, or bolster identity, but referred to a more dismissive and aggressive way of coping with dissonance that we called 'entitlement to harm'. Table 4 shows the results of the content analysis.

Table 4

Beliefs and dissonance-management strategies mobilised by participants in reaction to the propositions of reducing and ceasing the consumption of animal-derived products.

Strategies	***Beliefs***	***N*** [a]	***%*** [b]
Denial of Responsibility	ADP are necessary/essential	80	28.2
	Changing is difficult/impossible/utopian	62	21.9
	ADP are cultural/normal/habit	47	16.6
	ADP are natural to humans	22	7.8
	Alternatives are expensive/unavailable	12	4.2
	We should prioritise tackling poverty and hunger	12	4.2
	It is useless to change because few people would change	12	4.2
	Government/society/industries are responsible	5	1.8
	It is the way I was raised	4	1.4
	Humans are naturally selfish/irresponsible	2	0.7
	God created the animals for humans	1	0.4
	Total (participants) Denial of Responsibility [c]	184	65.0
Denial of Harm	The problem is overconsumption	81	28.6
	The problem is the production method/industrialisation	47	16.6
	The health claims are not reliable	19	6.7
	I do not believe the motives	6	2.1
	The environmental claims are not reliable	3	1.1
	Animals were raised to be consumed/It avoids their extinction	2	0.7
	Animals do not have rights	1	0.4
	Dairy and egg production does not hurt animals	1	0.4
	The claims about the animals are not reliable	1	0.4
	The problem is overpopulation	1	0.4
	The problem is the traffic in animals	1	0.4
	Total (participants) Denial of Harm [c]	128	45.2

Bolstering and Protecting Identity	I am already reducing my ADP consumption	15	5.3
	Ceasing ADP consumption is a radicalism	14	4.9
	Veganism should not be imposed	13	4.6
	Veganism is dangerous to health	3	1.1
	I do not see myself as a vegan	1	0.4
	Total (participants) Bolstering and Protecting Identity [c]	45	15.9
Entitlement to Harm	One has the right to eat what one wants	14	4.9
	Meat and other ADP are tasty	7	2.5
	I will not do it/I will never do it	5	1.8
	Total (participants) Entitlement to Harm [c]	24	8.4
Favourable Beliefs	To reduce the damage to the environment	59	20.8
	To reduce the suffering and death of animals	38	13.4
	To protect/promote human health	37	13.1
	Restricting consumption is possible/necessary	35	12.4
	It is important to raise awareness about the impacts of ADP	17	6.0
	There are alternatives/ADP are not necessary	15	5.3
	It is possible to move gradually toward ceasing	12	4.2
	It is necessary to modify society and markets	9	3.2
	ADP consumption is obsolete	2	0.7
	I do not like meat	1	0.4
	To protect future generations	1	0.4
	Total (participants) Favourable Beliefs [c]	149	52.6

Note. N = 283 (conditions with vignettes). Non-categorised answers = 10. No answer = 5.
[a] Participants cited different beliefs, so the total count does not correspond to the number of participants. Each type of belief was counted only once per participant even if they mentioned it more than once in reaction to the two propositions (Reducing ADP and Ceasing ADP).
[b] The percentages of beliefs were calculated in relation to the number of participants.
[c] The rows reporting the strategies' total count refer to numbers and percentages of participants (not beliefs). Each strategy was counted only once per participant.

The most prevalent strategy for coping with dissonance, used by 65% of the participants, was the denial of responsibility for the harm that the vignettes described. Almost one-third of the sample believed that ADP are necessary to the functioning of the human body and health. Other frequent beliefs expressing denial of responsibility were that restricting ADP consumption was difficult or impossible, ADP are cultural, normal, and natural to humans. Participants denied personal responsibility 'blaming' something or someone else for ADP production and consumption – the human body, human nature, government, industries, society, other individuals, traditions, family, and God.

Participants also often employed the denial of harm (45.2% of participants). They mainly denied that ADP consumption was a harmful practice by stating that the problem was overconsumption and/or the method/industrialisation of ADP production. These ideas imply that it is possible to produce and consume ADP in a correct, sensible, and harmless way. Some participants denied harm stating that they did not find the vignettes credible, which was more frequent in the case of the Health vignette.

Compared to the denial of responsibility and harm, a smaller percentage of participants referred to beliefs that reinforced their identities (15.9%), such as stating that they were already reducing their ADP consumption. In this study, we found that this strategy

to cope with dissonance did not only include the bolstering but also a defence of threatened identity. Participants explicitly referred to vegans as an outgroup, stating that veganism should not be imposed or that it was harmful to health. Some qualified those who cease ADP consumption as "radicals", safeguarding their ADP-consumer identity as sensible and balanced. Therefore, we named this dissonance-management strategy as bolstering and protecting identity.

Some participants (8.4%) adopted a position of entitlement to harm, stating that one has the right to eat what one wants, meat and other ADP are tasty, and/or they would not or would never reduce or cease their consumption.

Approximately half of the participants (52.6%) expressed at least one favourable belief toward the reduction or cessation of ADP consumption. Favourable beliefs were however much more frequent in reaction to the Reducing rather than Ceasing ADP proposition (48.4% versus 18.4% of participants). The most frequent favourable beliefs referred to the same themes that the vignettes covered: restricting ADP consumption is important to mitigate the damage to the environment, the suffering and death of animals, and to protect human health. Participants stated that restricting ADP consumption is possible/necessary, it is important to raise awareness about the mentioned impacts, there are alternatives to ADP, and it is possible to move gradually toward ceasing ADP consumption. In most cases (83.8%), participants who expressed positive beliefs did so in articulation with the previously mentioned strategies to cope with dissonance.

We used chi-square analyses to compare the conditions with vignettes regarding the frequency of the five highlighted strategies to cope with dissonance. When participants reacted to the Reducing ADP proposition, there was a significant difference concerning the strategy of denying harm, X^2 (2, N = 283) = 11.34, p = .003. Participants employed more denial of harm justifications in the Health condition (count = 45, expected count = 32.43, X^2 = 11.16, p < .001) and fewer denial of harm justifications in the Animals condition (count = 20, expected count = 27.35, X^2 = 4.16, p = .04). There was also a significant difference concerning favourable beliefs, X^2 (2, N = 283) = 19.87, p < .001. Participants expressed fewer favourable beliefs in the Health condition (count = 32, expected count = 49.37, X^2 = 18.53, p < .001), and more in the Environment condition (count = 59, expected count = 45.98, X^2 = 10.74, p = .001).

In the reactions to the Ceasing ADP proposition, there was a significant difference regarding the strategy of bolstering identity, X^2 (2, N = 283) = 7.09, p = .02, which participants used more frequently than expected in the Environment condition (count = 17, expected count = 10.40, X^2 = 7.06, p = .007). Finally, we also found a significant difference

regarding favourable beliefs, X^2 (2, N = 283) = 6.32, p = .04, which were more prevalent in the Animals condition (count = 23, expected count = 15.80, X^2 = 5.77, p = .01).

4. Discussion

In line with Hypothesis 1, we found that higher levels of cognitive dissonance predicted greater positive attitudes toward reducing and ceasing the consumption of animals. The different types of argument provoked different magnitudes of dissonance (Festinger, 1957). In this regard, the health arguments did not differ from the baseline. The animal rights and environmental arguments, on the other hand, were powerful enough to induce greater levels of cognitive dissonance compared to the baseline and, therefore, to lead to greater positive attitudes toward the restriction of the consumption of animals. Hypothesis 2 was, therefore, partially supported.

Participants were informed that the study was conducted by a Brazilian federal university. These institutions are perceived, in the Brazilian context, as centres of academic knowledge and science (Smaili, 2018). The vignettes were written with academic vocabulary, citing ratios and technical terms. The participants regarded the vignettes, in general, as moderately persuasive. Therefore, a scientific-normative source of social influence clearly stated to the participants that one of their practices, the consumption of animals, was causing considerable harm. The vignettes were indeed centred on the harm caused by consuming animals rather than on the benefits of restricting this consumption. All participants were then personally implicated. The vignettes produced a contradiction between two cognitions (the first formulation of dissonance, Festinger, 1957), i.e., between the beliefs about the harmless and harmful character of a common practice. According to the New Look theory on dissonance (Cooper, 2007), the vignettes produced dissonance because they stated that eating animals caused harm and had foreseeable consequences, that the participants freely chose to do so and were personally responsible for the harmful effects. The vignettes were a threat to self-image. They produced dissonance because a positive self-image is, for most people, incompatible with the causation of such a level of harm (Aronson, 1968).

The participants who read the animal rights and environmental arguments, facing greater levels of dissonance, changed their attitudes (in comparison to baseline), as research on cognitive dissonance has shown to be common (Cooper, 2007; Elliot & Devine, 1994; Festinger, 1957). However, the attitude scores for the proposition of ceasing the consumption of animals were quite low across the conditions. Participants could have changed their attitudes by formulating a compromise solution – ‘reducing the consumption of animal-

derived products is acceptable, ceasing is not'. This compromise is a possible determinant of the direct negative effect that the environmental argument had on the attitudes toward ceasing the consumption of animals (Figure 2). All other variables held constant, participants reacting to the environmental argument were more likely to disagree with the cessation proposition compared to baseline. They may have formulated the cognition that it is possible to save the environment by reducing consumption and therefore ceasing would not be necessary. The animal rights argument, on the other hand, would not allow such cognition, since it made salient that for someone to eat animal-derived products at least one animal must suffer and die.

The finding that the animal rights and environmental arguments had a higher impact than the health argument is at odds with previous studies (Dowsett et al., 2018; Greenebaum, 2012; Parkinson et al., 2019). The focus groups conducted by Parkinson et al. (2019) were based on the same three types of arguments, ethics (animal rights), environmental, and health. In their study, participants associated the animal rights messages with the perception of 'being told what to do' and emotions such as annoyance, anger, and guilt. Consistent with the current study, they might have been the most powerful messages in provoking dissonance. However, they were judged the least credible type of message. The reasons for this may be associated with the conditions of the decision-making process in the focus groups (participants could choose to concentrate on specific messages and were asked to make a group decision on their credibility) and the source of the message (an animal rights advocacy organisation). These conditions might have allowed or led participants to have a knee-jerk reaction against the animal rights arguments.

Dowsett et al. (2018) found that an experimental manipulation evidencing the connection between animals and 'meat' provoked higher 'meat attachment' among men whereas in the present study the animal-focused argument promoted anti-ADP attitudes. This may be due to characteristics of the experimental condition employed by Dowsett et al. (2018). It relied on a demonstration of animals (lambs) as intelligent beings. It focused on the animal-meat connection and animal intelligence instead of animal suffering. It was, therefore, less explicit in showing that the consumption of animals provokes harm.

Our analysis shows that committing to reading information on the harms perpetrated against animals and the environment was more effective to change attitudes than reading about the health hazards. This finding is also somehow opposed to the intuitive belief (held, for example, by participants interviewed by Greenebaum, 2012) that individuals would 'respond better' to health claims because they are 'intrinsically selfish'. It is possible that meat-eaters 'prefer' the health message because it allows them to avoid dissonance, but

615 'agree more strongly' with the environmental and animal rights messages. However, for such
616 an agreement to happen, it seems that the automatic knee-jerk reaction of suppressing the
617 source of dissonance must be avoided. Festinger (1957) discussed these reactions as attempts
618 to *misperceive information* and *invalidate the source*. In the present study, there are two
619 reasons why this kind of automatic rejection may have been avoided: a) a researcher and
620 university were the sources of the message (participants in the study conducted by Parkinson
621 et al., 2019, perceived academics as a trustworthy source of information on the theme); b) the
622 participants signed the consent form explicitly expressing a commitment to reading the
623 vignettes. The present study suggests that, if one can mobilise the attention of meat-eaters to
624 the damage caused by eating animals, exhibiting information about the suffering of animals
625 and the destruction of the environment is more powerful in changing attitudes than referring
626 to the health risks.
627 Mathur et al. (2021) conducted a meta-analysis of studies assessing the effects of
628 interventions appealing to animal rights and their violation. They found that these
629 interventions significantly reduced the intention to buy/eat 'meat', the consumption and
630 purchase of 'meat'. The authors highlight that the commitment to animal rights may be
631 especially powerful and permanent in changing ADP consumption since it links behaviour to
632 identity, ethics, and social movements (Mathur et al., 2021). In line with Jalil et al. (2019),
633 the present study indicated that the environmental message has a significant impact on
634 changing attitudes toward ADP consumption. However, as also noted by Bryant (2019), the
635 environmental message seems to be more susceptible to the belief in a compromise solution
636 that depicts the reduction of consumption as sufficient.
637 Studies have shown the effectiveness of health messages in changing attitudes toward
638 eating practices and promoting the avoidance of detrimental food (e.g., Cheah et al., 2020;
639 Shimul, Cheah & Lou, 2021). The ineffectiveness of the health argument found in this study
640 may be explained by the fact that the health vignette was centred on possible harms of
641 consuming ADP (as opposed to possible benefits of avoiding ADP) and the prevalence of
642 social norms asserting that ADP are not harmful (Bastian & Loughnan, 2017; Joy, 2010).
643 'Meat' is culturally represented as healthy, associated with fertility and strength (Leroy,
644 Brengman, Ryckbosch & Scholliers, 2018), and there is a widespread belief that consuming
645 animals is important and even essential for maintaining good health (Rothgerber, 2020).
646 Participants may have dismissed the harms described in the health vignette perceiving the
647 choice to eat ADP as a morally non-problematic aspect of individual freedom. These
648 interpretations are in line with the theoretical prediction that dissonance only occurs if the
649 involved behaviour is unequivocally perceived as harmful (Cooper, 2007).

The analysis of the participants' open justifications provided further support for these interpretations. Chi-square analyses revealed that the number of participants associating favourable beliefs to the environmental and animal rights messages was higher than expected (and, significantly, in the case of animals, in reaction to the *cessation* proposition). The health message was associated with the denial of harm, possibly because of the perception of ADP as healthy and/or morally non-problematic. The health message elicited fewer favourable beliefs. The association of the environmental message with the strategy of bolstering and protecting identity may be an expression of the increased visibility of ADP-related harms to the environment, whose prevention may be gaining strength as a social norm.

Rothgerber (2020) notes that there is scarce research on the preference of meat-eaters for specific ADP-related dissonance-reduction strategies. The current study indicates that, when ADP-related harm is clearly stated and taken into consideration, the denial of responsibility and harm are the most popular strategies, especially the beliefs that ADP is necessary and that the problem is (merely) overconsumption. In the same context, the formulation of beliefs favourable to the restriction of ADP consumption may also be considered a popular dissonance-management strategy occurring in association with the ones previously highlighted. With the positive beliefs, participants expressed their concerns about the issues raised in the vignettes. They might have also used the positive beliefs as dissonance-management strategies because these beliefs facilitated a positive self-image as 'sensitive' and 'balanced'. Regarding the 'entitlement to harm' strategy identified in this study, the evocation of the '4th N' highlighted by Piazza et al. (2015), i.e., that ADP are 'nice', favours individualistic and hedonistic interests to the detriment of the concerns raised by the vignettes. In this sense, the entitlement to harm strategy may be interpreted as a more aggressive style of denying harm or as reminiscent of a knee-jerk attempt to simply avoid the source of dissonance (Festinger, 1957).

Finally, it is important to consider sex, age, and ideological rationalisation of dominance. Women manifested significantly more dissonance than men in reaction to the descriptions of ADP-related harm. They also expressed greater positive attitudes toward the propositions of restricting ADP consumption. This is consonant with the considerable body of literature showing the associations between masculinity, domination, objectification of the other, and the consumption of animals (e.g., Adams, 1990/2015; Rothgerber, 2013). Since the construction of femininity reinforces empathy, beliefs, and practices of care and self-care (Courtenay, 2000), women were more likely to hold previous cognitions consistent with the restriction propositions. Younger participants reported greater dissonance and were more favourable to the proposition of reducing ADP consumption. This may be due to the higher

use of social media by young people (where they are more likely to acquire relevant information about ADP-related harms) and to the greater tendency of young people to challenge social norms (in this case, challenge carnism). The investigated ideological rationalisations, social dominance orientation, and system justification beliefs did not have significant effects when the different conditions (vignettes and control) were compared. However, we found significant negative correlations between these ideological measures and: (a) dissonance, and (b) attitudes toward the restriction propositions; which is in line with previous studies (e.g., Dhont & Hodson, 2014; Dhont et al., 2014).

Previous studies showed the occurrence of cognitive dissonance associated with ADP consumption (Cf. Rothgerber, 2020), the effects of animal rights (Mathur et al., 2021) and environmental (Jalil et al., 2019) arguments in changing attitudes toward ADP, and qualitative comparisons of different types of arguments in focus groups (Parkinson et al., 2019). The present study advances knowledge by systematically (experimentally) comparing the capacity of animal rights, environmental, and health arguments to provoke dissonance and attitude change. Individuals, groups, organisations, and policymakers interested in promoting the restriction of the consumption of animals may find the present study useful. It shows that, if meat-eaters are committed to considering an ADP harm-related message, the environmental and especially the animal rights arguments are the most powerful in provoking dissonance and attitude change. It also shows the importance of challenging the belief that ADP consumption is essential for good health (one of the most prevalent justifications for ADP consumption in our sample).

Among the limitations of this study, it was based on self-reported dissonance, which is different from the experience of negative arousal. Nevertheless, self-report may be useful to shed light on the more conscious aspects of cognitive dissonance and is considered a valid indication of the phenomenon (Elliot & Devine, 1994). This study focused on the effects of different types of arguments on attitudes and beliefs, providing no information on actual ADP-related behaviour. We approached middle-class participants, and there could be important specificities among working-class individuals in relation to the investigated objects. Participants could only express sex identification in binary terms (female or male). The finding that there was less denial of harm in the animal rights condition should be taken with caution since the significance level (.05) was not adjusted for multiple comparisons. Another limitation is that the current study design did not include a manipulation check. Possible future replications could address this issue. Future research could examine the impact of the types of arguments on ADP-related behaviour. It would be interesting to replicate the current study among working-class individuals and/or individuals from other

nationalities. A psychometric study could investigate the factorial structure of strategies and beliefs to cope with dissonance. A qualitative study (e.g., based on semi-structured interviews) could reveal a more complex picture of how individuals articulate the strategies to cope with dissonance in reaction to the vignettes.

5. Conclusion

This study indicated that greater levels of ADP-related cognitive dissonance provoked greater positive attitudes toward the restriction of ADP consumption. It showed that harm-focused animal rights and environmental messages significantly raised the levels of dissonance and positive attitudes toward the restriction of the consumption of ADP, which was not the case with the health argument. In reaction to clear descriptions of ADP-related harm, the most frequent strategies to cope with dissonance were the denial of responsibility, denial of harm, and the articulation of beliefs favourable to change. The discussion highlights that the perception of ADP consumption as harmful and morally problematic is important for attitude change. These findings may be of interest to individuals and organisations dedicated to the transformation of human-animal relations and the mitigation of the negative impacts caused by the consumption of animals.

Declarations of interest

None.

Authors' contributions

Luiz Gustavo Silva Souza participated in the design of the study, data collection, analysis, interpretation, and writing up of the manuscript. Emma O'Dwyer participated in the data analysis, interpretation, and writing up of the manuscript. The authors have approved the final article.

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