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The suppression of moral engagement in consumer responses to animal slaughter

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ABSTRACT

Despite growing research on meat-animal reminders, the psychological impact of slaughter exposure on consumers remains underexplored. In this preregistered experiment, we examined whether exposing consumers to animal slaughter increases their willingness to substitute meat by activating a moral engagement process involving perceived harm, prevention beliefs, and personal norms. A sample of 392 UK meat-eating participants were recruited and randomly assigned to view one of four images: an image of animal slaughter (i.e., chicken or pig) or a control image (i.e., chicken or pork meat prepared for consumption). Mediation analyses revealed that slaughter exposure did not directly affect willingness to substitute meat but had an indirect effect through the moral engagement process, activated through increased perceived harm, prevention beliefs, and personal norms. This indirect effect was stronger upon exposure to pig slaughter than to chicken slaughter. Higher meat consumption and especially higher meat attachment suppressed the moral engagement process, reducing the impact of animal slaughter on willingness to substitute meat. In both slaughter conditions, indirect effects were stronger when personal norms were bypassed, suggesting that perceived harm and prevention beliefs alone can shift meat-eating intentions. While subject to methodological limitations, our study informs the design of interventions to promote moral engagement towards animals and encourage meat substitution and highlights the importance of strengthening prevention beliefs and addressing meat attachment.

1. Introduction

While animals raised for food are scientifically recognized as sentient beings (Brambell, 1967; Dawkins, 2008), more than 73 billion are slaughtered annually worldwide, largely out of consumers' sight and treated as mere commodities (Sanders, 2024; Taylor & Fraser, 2017). In slaughterhouses, they endure significant physical and emotional stress (Fonseca, 2019; Grandin, 1998; Nielsen, Depner, et al., 2020; Pachirat, 2011), often exacerbated by untrained personnel (Saxmose Nielsen, Depner, et al., 2020); poorly designed equipment; electric prods; rough handling (Grandin, 2010); and various other forms of abuse (Nagesh, 2017; Slade & Alleyne, 2023; Millestein, 2024; Prater, 2024;).

Performing, facilitating, or witnessing the slaughter process has been associated with symptoms of post-traumatic stress disorder (Beirne, 2004; MacNair, 2002; Slade & Alleyne, 2023), depression (Hutz et al., 2013; Lander et al., 2016), and heightened aggression – such as anger-hostility, psychosis, and physical violence (Emhan et al., 2009; Slade & Alleyne, 2023). Maladjustment to slaughter-related tasks often triggers affective responses (e.g., guilt, shame), leading to maladaptive coping strategies like emotional detachment (McLoughlin, 2019); and psychological distress (Emhan et al., 2009; Slade & Alleyne, 2023).

In contrast to slaughterhouse workers, consumers are physically and emotionally distanced from the act of animal slaughter, a separation that inhibits moral concern for animals (Graça et al., 2015, 2016). However; this psychological distance can be disrupted through reminders of meat's living animal origins; triggering the *meat paradox* (Bastian & Loughnan, 2017): the psychological tension that arises when consumers recognize that their enjoyment of meat conflicts with their moral concern for animal suffering (Dowsett et al., 2018; Festinger, 1957; Rothgerber, 2020). Consumers manage this tension through several coping strategies like

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moral disengagement from meat (Camilleri et al., 2020; Graça et al., 2016), meat-eating justifications (Hartmann & Siegrist, 2020; Mertens & Oberhoff, 2023; Piazza et al., 2015), as well as through behavioral change, such as reducing meat consumption or adopting plant-based diets (Rosenfeld & Burrow, 2017). A further motivational factor in shaping these responses is *meat attachment* – the hedonic motivation; dependence; and perceived entitlement associated with eating meat (Graça et al., 2015).

Consistent with this argument, recent studies indicate that exposure to animal cruelty can reduce motivation to consume meat (Souza & O'Dwyer, 2022) and increase willingness for dietary change (Feinberg et al., 2019; Fonseca & De Groeve, 2025). The use of animal cruelty appeals is, however, not without potential drawbacks. Besides potentially triggering psychological defense mechanisms such as moral disengagement and meat-eating justifications (Fonseca & De Groeve, 2025; Souza & O'Dwyer, 2022), such messages may risk normalizing violence towards animals, provoke perceptions of intrusive moralization (Fernández, 2021); or even reinforce speciesist attitudes (Feinberg et al., 2019; Fonseca & De Groeve, 2025; Herrewijn et al., 2021; Souza & O'Dwyer, 2022).

Exposure to animals used for meat production can increase moral emotions such as empathy towards farmed animals, disgust towards meat, anger towards people involved in meat production, and guilt over one's consumption (Earle et al., 2019; Fonseca & De Groeve, 2025; Kunst & Hohle, 2016). These emotional responses have been shown to decrease willingness to eat meat (Cordts et al., 2014; Johnson et al., 2021; Tian et al., 2016; Zickfeld et al., 2018), thereby revealing one pathway of moral engagement among consumers (Feinberg et al., 2019; Fonseca & De Groeve, 2025). Despite growing research on meat-animal reminders (Dowsett et al., 2018); consumer responses to animal slaughter remain underexplored (Bayer et al., 2023; Benningstad & Kunst, 2020). Although exposure to animal slaughter likely triggers moral emotions, our study examines moral engagement as a socio-cognitive process. Specifically, we investigate whether exposure to animal slaughter increases willingness to eat less meat through social cognitions that underpin moral engagement.

1.1. Animal slaughter mediated by moral engagement

We construe *moral engagement* as the psychological process through which people activate their personal moral norms to guide their behaviors in a particular situation. It is the opposite of moral *dis*engagement (Bandura, 1999, 2011); in which individuals do not apply these moral standards to themselves in a particular context; by denying; reconstruing or justifying harmful behavior. The activation of *personal* (moral) *norms* involves two key social cognitions: the perception that one's behavior is harmful to another (i.e.; *perceived harm*) and that one can prevent this harm from occurring (i.e.; *prevention beliefs*). Our conceptualization of moral engagement builds on harm-centric theories of morality (Schein & Gray, 2018); moral disengagement theory (Bandura, 2011); and the norm activation model (NAM) (De Groot & Steg, 2009), which are elaborated in the following section.

Perceived harm, in harm-centric morality theories, is what turns ordinary behaviors into moral issues, a process known as moralization (Feinberg et al., 2019). The theory of dyadic morality (Schein & Gray, 2018) posits that people judge a behavior in moral terms when it involves a dyad of harm; construed as an intentional agent causing damage to a vulnerable patient. Importantly; *perceived harm* in this sense does not denote actual pain or suffering per se; but *perceptions* of suffering; reduced welfare; and wrongdoing (Tangney & Stuewig, 2007). While perceiving someone being hurt constitutes a direct cue for harm to be perceived; an act can be *perceived* as *harmful* and moralized even in the absence of actual damage or vulnerable victims. Conversely; in the absence of *perceived harm*; actions are merely seen as matters of personal preference; taste or convention rather than morality (Bastian & Loughnan, 2017; Rothgerber, 2020).

The theory of dyadic morality helps explain why meat consumption may be viewed as a morally neutral dietary choice, while others view it as morally problematic (Dowsett et al., 2018). Although the consumption of meat necessarily involves harms associated with meat production – such as animal suffering; environmental degradation; or human health risks – these harms are not directly noticeable in everyday situations. As long as these harmful consequences remain out of sight and out of mind (Kunst & Hohle, 2016); the default assumption is that eating meat is harmless; which precludes the activation and application of moral standards (Bandura, 2011). However; when attention is directed to the victims of these harms; moral judgments tend to shift. Consistent with this; concerns about animal welfare; rather than environmental or sustainability motives; are among the strongest drivers of self-reported meat reduction and the adoption of plant-based diets (Fonseca & Sanchez-Sabate, 2022). Consumers' negative views of animal slaughter often focus on the surrounding process; including the stressful; fear-inducing environment and animal handling (Bayer et al., 2023). Accordingly, when consumers are confronted with the reality of animal slaughter, we expect that they *perceive* more *harm* associated with meat-eating. Even though modern animal welfare regulations require animals to be stunned prior to slaughter to avoid suffering during bleeding (with limited exceptions such as certain ritual slaughter practices), exposure to a slaughtered, bleeding animal can nonetheless invoke *perceived harm*. This may occur because visible cues of blood and death signal physical damage to the animal's body and because consumers may infer suffering that potentially happened before slaughter (e.g., pre-slaughter handling, stunning).

While *perceived harm* is essential for activating moral engagement, it is not sufficient. *Prevention beliefs* are also required for moral engagement to take place. When someone is morally engaged, they not only *perceive harm* but also believe they can make a difference and prevent that harm from occurring. This theorizing is consistent with the NAM (De Groot & Steg, 2009), in which people must become both aware of the negative consequences of their actions and ascribe responsibility to themselves, before prosocial intentions and behavior can manifest through the activation of personal norms.

A *personal norm* is an individual's conviction that something is morally right or wrong (Weibel et al., 2019). It involves a sense of moral obligation to perform or refrain from specific actions; with feelings of guilt when this norm is violated (Bamberg & Möser, 2007; Schwartz, 1977) and feelings of pride in the case of compliance (Onwezen et al., 2013). The NAM is often conceived as a mediation model (Carfora et al., 2020; De Groot & Steg, 2009) in which awareness of consequences (*perceived harm*) predicts ascription of responsibility (*prevention beliefs*), which in turn predicts *personal norms.* Although the NAM has been successful in explaining environmental behavior (Bamberg & Möser, 2007; Jackson, 2019); including meat consumption (Carfora et al., 2020; Onwezen et al., 2013), to our knowledge, no studies have tested the NAM's sequential mediation in response to animal slaughter. However, research generally finds support for the causal chain of *perceived harm*ful consequences → perceived responsibility/*prevention beliefs* → *personal norms* in predicting prosocial intentions (Carfora et al., 2020; Onwezen et al., 2013). Therefore, in this study, we tested whether exposure to animal slaughter increases moral engagement to substitute meat by increasing *perceived harm* to animals associated with meat-eating, perceptions of responsibility through beliefs that one can avoid this harm by eating less meat, and the activation of *personal norms* to reduce one's meat intake.

As highlighted by research on the *meat paradox* (Rothgerber, 2020; Souza & O'Dwyer, 2022); an important factor that can undermine moral engagement and meat substitution is one's love for meat; known as *meat attachment* (Graça et al., 2015): individuals who consume more meat are more likely to be meat-attached; which reduces their *willingness to substitute meat* (Graça et al., 2016). *Meat attachment* also shapes self-regulatory processes; such that perceptions of animal harm and personal responsibility are distorted or reconstrued in motivated ways

(Bastian & Loughnan, 2017; De Groeve et al., 2022). *Meat attachment* can both obscure *perceived harm* and weaken *prevention beliefs* by denying (e.g., diffusing, displacing) responsibility (Graça et al., 2016; Rothgerber, 2020) and justifying meat as a necessity (De Groeve et al., 2022; Piazza et al., 2015). As a result, the activation of *personal norms* or moral standards is impeded and moral *dis*engagement occurs (Bandura, 1999, 2011). Conversely; individuals with weaker *meat attachment* tend to be more open to dietary change; showing less emotional investment; lower commitment to meat; and fewer psychological defense mechanisms (Graça et al., 2015; Piazza et al., 2015; Rothgerber, 2014). We therefore also explored whether a stronger (vs. weaker) *meat attachment* negatively predicted moral engagement (i.e., *perceived harm, prevention beliefs, personal norms*) following exposure to *animal slaughter*.

1.2. Targeted species for this study

For this study, we selected two target species: *chickens* and *pigs*. We selected these species because they are the most widely consumed land animals (birds and mammals, respectively), especially in Western diets. Annually, an estimated 76.25 billion *chickens* and 1.51 billion *pigs* are slaughtered globally for meat consumption (Ritchie et al., 2023); despite both species exhibiting capacities for conscious awareness and emotional depth. *Chickens* demonstrate a range of cognitive and emotional abilities indicative of sentience; including the experience of both negative and positive emotions; such as fear; anticipation; and anxiety; and the ability to make decisions in their own interest (Marino, 2017). *Pigs* exhibit cognitive capacities comparable to those of dogs and young children; display self-awareness; and experience emotions that closely resemble those of humans (Marino & Colvin, 2016). Although current legislation in the UK; EU and US is designed to minimize stress and suffering during slaughter (European Parliament and the Council of the European Union, 2009; Humane Methods of Slaughter Act (7 U.S.C. §§ 1901–1907), 2002; The welfare of animals at the time of killing, 2015); scarce empirical assessments of slaughterhouses document welfare problems arising from failures in proper implementation. In slaughterhouses; both broiler *chickens* and *pigs* may be subjected to substantial suffering during pre-slaughter handling and stunning. For *chickens;* welfare risks include rough handling; deprivation of food and water; overcrowding; and ineffective stunning procedures resulting from inadequate equipment or untrained personnel (Nielsen et al., 2019; Harmse, Engelbrecht and Bekker, 2016; Mota-Rojas, 2026). Such conditions can lead to birds remaining conscious during slaughter and experiencing severe pain (Nielsen et al., 2019). For *pigs;* welfare risks in the pre-stunning phase also include rough handling (Lee et al., 2023) and prolonged deprivation of food and water; leading to fear; fatigue; and distress (Nielsen, Depner, et al., 2020; Saxmose Nielsen et al., 2020). Stunning methods themselves also raise welfare concerns: carbon dioxide stunning induces respiratory distress; panic; and pain prior to loss of consciousness; while electrical stunning may fail to render animals immediately unconscious (Fonseca, 2019; Mace & Knight, 2025). In such cases, *pigs* may regain consciousness and experience intense pain during bleeding (Fonseca, 2019; Nielsen, Depner, et al., 2020). Bleeding is the final stage of the slaughter process, during which the animal's neck is cut, causing rapid blood loss and death. Although the practices described above highlight many serious welfare issues, the present experimental study used images of a *chicken* and a *pig* that are in the bleeding stage of slaughter.

1.3. The present study

Given the scarcity of research on this topic, the primary objective of the present study was to investigate the extent to which exposure to animal slaughter influences individuals' *willingness to substitute meat*, and whether this relationship is sequentially mediated by *perceived harm, prevention beliefs, and personal norms* – constructs that collectively reflect moral engagement. Fig. 1 depicts this sequential mediation model, which was tested for both targeted species – *chickens* and *pigs* – for the sake of replicability. Meat-only images were used as controls (see method section).

In other words, we expected that exposure to animal slaughter versus *meat* alone stimuli would lead to greater moral engagement (i.e., higher *perceived harm, prevention beliefs* and *personal norms*), and increased *willingness to substitute meat*. More specifically, we hypothesized that participants exposed to *animal slaughter* (vs. *meat control images*) would:

H1: report higher *perceived harm*.

H2: show stronger *prevention beliefs*.

H3: report stronger *personal moral norms*.

H4: indicate greater *willingness to substitute meat*.

Furthermore, we hypothesized that:

H5: higher *perceived harm* is positively associated with higher *prevention beliefs*.

H6: higher *prevention beliefs* predict stronger *personal moral norms*.

H7: stronger *personal norms* predict greater *willingness to substitute meat*.

All hypotheses are depicted in Fig. 1 and were preregistered on OSF: https://osf.io/kasbz/files/mntke

2. Method

2.1. Study design

This study employed a between-subjects experimental design, where participants were randomly assigned to one of four conditions (see Table 1). In the *control conditions,* participants were exposed to an image

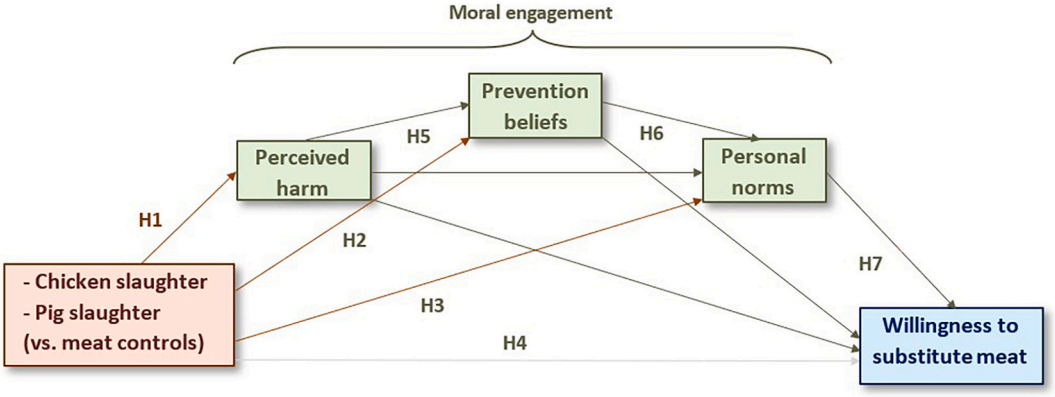

Fig. 1. Conceptual overview of the study. **Note.** Colors distinguish constructs and pathways: brown = experimental groups; green = moral-engagement mediators; blue = outcome variable.

Table 1
Study conditions and stimuli.

Text: "Please look at the following image [of a condition] before proceeding to the next section of the questionnaire. We will ask you some questions related to this image."			
Control conditions		**Animal slaughter conditions**	
Chicken drumstick (0)	**Pork chop (1)**	**Chicken being slaughtered (2)**	**Pig being slaughtered (3)**
			

of either a *"chicken drumstick"* ("0") or a *"pork chop"* ("1"). In the *animal slaughter conditions,* participants were exposed to an image of either a *"chicken being slaughtered*" ("2") or a *"pig being slaughtered"* ("3"). The slaughter images depict the bleeding stage and were selected to reflect slaughter practices in Western slaughterhouse contexts.

2.2. Sample and data collection

Using G*Power 3.1.9.7, an apriori power analysis for an independent samples t-test (two-tailed) indicates that a sample of 200 participants (100 per condition) is needed to detect a small-to-medium effect size $d = 0.40$ for a power of 0.80 at a standard 0.05 alpha error probability. Because we test hypotheses for two species, this implies a sample of 400 participants. A sample of 420 participants (105 per condition) was targeted to ensure sufficient power and account for potential dropout. To minimize sampling bias and prevent influencing participants' expectations, they were informed that the study aimed to "examine beliefs and preferences related to food consumption" and that their participation involved "viewing an image and answering a short questionnaire", though participants were cautioned that the image might be potentially disturbing and that they could revoke consent at any time, in line with ethical guidelines.

We recruited participants from the UK via the crowdsourcing platform Prolific. After providing informed consent, participants were asked demographic questions (i.e., gender, age and education level) and were then randomly assigned to one of four conditions shown in Table 1. After being allocated to one of four conditions, all participants completed confirmatory measures to test our hypotheses. In a sequential order, we measured participants' *perceived harm, prevention beliefs, personal norms*, and *willingness to substitute meat*. Participants then completed measures of *meat attachment* and *meat consumption frequency*. Finally, participants were debriefed before returning to Prolific for payment.

Given that our inclusion criteria specified individuals who consumed meat, we used Prolific's pre-screening filters to recruit only participants who indicated that they eat meat. Accordingly, self-identified vegetarians on Prolific were not invited to participate. Still, 26 participants in our sample reported not consuming any type of meat (see §2.4.5) and were thus excluded after data collection, as well as 2 participants who failed the manipulation check (see §2.4.4). The final sample comprised 392 participants (211 men, 176 women, 4 non-binary individuals, and 1 who preferred not to disclose their gender), representing a diverse age range ($M_{age} = 45.3$ years, $SD_{age} = 12.8$) and varied educational levels (see Table 2).

This study received ethical approval from the IRB of Iscte-IUL (University Institute of Lisbon; reference n.° 21 [PF 21/2025].

2.3. Measures

To test our hypotheses, we developed a questionnaire (preregistered on OSF: https://osf.io/pjrhu) with measures derived from previous studies. Table 3 gives an overview of the variables we measured in our study and their internal consistency. All confirmatory measures used 7-point Likert scales and items within each scale were randomized. The order of the confirmatory constructs (*perceived harm, prevention beliefs, personal norms*, *willingness to substitute meat*) and *meat attachment* was also randomized to prevent order effects.

Table 2
Demographics ($N = 392$).

Variable	Category	N	% of Sample	UK-Population (%)
Gender	Man	211	53.8%	49.4%
	Woman	176	44.9%	50.6%
	Non-binary	4	1.0%	~0.5%
	Prefer not to say	1	0.3%	–
Age	18–29 years	46	11.7%	~17%
	30–39 years	106	27%	~13%
	40–49 years	82	20.9%	~15%
	50–59	94	23.9%	~12%
	60+ years	64	16.3%	~30%
Education	No formal qualifications	1	3%	18.2%
	Secondary education	86	21.9%	~13%
	Further education	71	18.1%	~17%
	Undergraduate degree (Ba/BSc)	163	41.6%	~26%
	Graduate degree (Ma/MSc/MPhil)	63	16.1%	~14%
	Doctorate degree (PhD)	8	2%	~2%

Note. UK population benchmarks: gender, age (Census, 2022) and education (Census 2021, 2023).

2.3.1. Moral engagement

To measure the different components of *moral engagement*, we adapted three scales from Carfora et al. (2020), all employing a 7-point Likert scale ranging from *"strongly disagree"* (1) to *"strongly agree"* (7) (see Table 3).

Perceived harm – Measured as the extent to which participants (dis) agree with statements related to the effect of meat consumption on animal suffering (e.g., *Meat consumption causes animal suffering*).

Prevention beliefs – Measured as the extent to which participants (dis)agree with statements related to the usefulness of reducing meat consumption to prevent animal suffering (e.g., *I think it is useful to eat less meat to reduce animal suffering*).

Personal norms – Measured as the extent to which participants (dis) agree with statements related to meat consumption as a moralized issue (e.g., *I feel morally obliged to reduce my meat consumption*).

2.3.2. Willingness to substitute meat consumption

We asked participants to rate their willingness to *eat meat, eat less meat, stop eating meat*, and *follow a plant-based diet*, with response options ranging from *very unwilling* (1) to *very willing* (7). This scale was adapted from Graça et al. (2015). Based on a preregistered exploratory factor analysis (principal axis extraction, oblimin rotation) of our four main

Table 3
Study variables, including scale sources, items and Cronbach's α reliability scores.

Variables (Source)	Items	α
Perceived harm (Carfora et al.; 2020)	Meat consumption causes animal suffering.	
	A reduction of meat consumption contributes to animal welfare.	**0.88**
	Meat consumption causes serious harm to animals.	
Prevention beliefs (Carfora et al.; 2020)	I think it is useful to eat less meat to reduce animal suffering.	
	I can take on responsibility for animal welfare by eating less meat.	**0.90**
	I think I can contribute to reducing the slaughtering of animals by eating less meat.	
Personal norms (Carfora et al.; 2020)	I would feel guilty if I didn't reduce my meat consumption.	
	I feel morally obliged to reduce my meat consumption.	**0.86**
	Eating meat is against my moral principles.	
Willingness to substitute meat (Graça et al.; 2015)	Eat meat. *	
	Stop eating meat.	**0.82**
	Follow a plant-based diet	
Meat attachment (Graça et al.; 2015)	To eat meat is one of the good pleasures in life.	
	I love meals with meat.	
	A good steak is without comparison.	
	I'm a big fan of meat.	
	By eating meat, I'm reminded of the death and suffering of animals. *	
	To eat meat is disrespectful towards life. *	
	I feel bad when I think of eating meat. *	
	Meat reminds me of diseases. *	
	To eat meat is an unquestionable right of every person.	**0.86**
	According to our position in the food chain, we have the right to eat meat.	
	Eating meat is a natural and undisputable practice.	
	I don't picture myself without eating meat regularly.	
	If I couldn't eat meat, I would feel weak.	
	I would feel fine with a meatless diet. *	
	If I was forced to stop eating meat, I would feel sad.	
	Meat is irreplaceable in my diet.	
Meat consumption frequency (Feltz et al.; 2023)	Beef (steak, meatballs, in tacos, etc.)	
	Pork (pork chops, ham, ribs, etc.)	
	Chicken (drumsticks, in soup, grilled chicken, etc.)	**n.a.**
	Fish and seafood (tuna, shrimp, crab, etc.)	
	Meat (any type of meat, including beef, pork, chicken, fish and seafood, or other meats)	

Note. Items marked with an asterisk (*) are reverse-coded.

variables, we decided to exclude the *eat less meat* item, because it loaded poorly (0.34) with the factor including the other willingness to substitute items and had a higher cross-loading with the factor that included prevention beliefs (0.35). All the remaining items loaded sufficiently high (>0.40) on their respective factors and were therefore retained.

2.3.3. Meat attachment

We asked participants to rate statements (hedonism, affinity, entitlement, dependence) related to eating meat, with response options ranging from *strongly disagree* (1) to *strongly agree* (7). This scale was adapted from Graça et al. (2015).

2.3.4. Manipulation checks

After the confirmatory measures, we assessed whether participants paid attention and remembered which condition they were exposed to by asking: *"Earlier in the survey, you were exposed to an image. Which of the following best describes the content of the image you were shown?"* Participants chose from the following options: *(1) a chicken drumstick*; *(2) a pork chop*; *(3) a beef steak*; *(4) a chicken being slaughtered*; *(5) a pig being slaughtered*; *(6) a cow being slaughtered*; or *(7) "other"*, where they could specify a different description in text. In the *chicken control*, all 100 participants (100%) correctly indicated that they had seen a *chicken drumstick*. In the *pork control*, 2 participants (2%) incorrectly indicated that they had seen a beef steak and were excluded from further analysis. An additional 14 participants in this condition selected "other" and wrote descriptions such as "ribs," "rack of ribs," or "pork ribs," suggesting that they recognized the image but did not agree with the label "pork chop." Taken together, 98% of participants in the *pork control* (84 correct +14 semantically correct = 98 out of 100%) accurately recognized the image content. In the *chicken being slaughtered condition*, all 98 participants (100%) correctly identified the image. Similarly, in the *pig being slaughtered condition*, 96 participants (100%) correctly identified the image.

Except for the two excluded participants from the pork control, all remaining 392 participants passed the attention check and were retained for the main analyses. These two exclusions did not meaningfully affect the results.

2.3.5. Exploratory measures

Meat consumption frequency – We measured *meat consumption frequency* based on a diet-related scale from Feltz et al. (2023). We asked participants to select the following types of food they eat occasionally: *beef, pork, chicken, fish* and *seafood* and *meat* in general. For each item, we asked participants how many days a week they eat it with their main meal, with answer options ranging from 0 to 7. The general "meat" item was used to exclude participants who answered "0" from our analysis, as preregistered (see also §2.2). This item, excluding the "0″ answers, was used to examine the role of *meat consumption frequency* in exploratory correlation and covariate analyses. In the species-specific mediation models (see §3.2.2), *pork consumption frequency* was included in the *pig* model, and *chicken consumption frequency* in the *chicken* model.

2.4. Statistical analyses

Reverse-coded items were recoded prior to analysis, and for each construct, items were averaged to create composite scores. In the descriptive analyses, we computed Pearson correlations among the main and exploratory variables, including age and education, and point-biserial correlations for gender.

2.4.1. Independent t-tests and ANOVA

For each species (*chicken, pig*), we test hypotheses **H1-H4** using four independent t-tests comparing participants in the slaughter condition versus the control condition on each of the four dependent variables: perceived harm, prevention beliefs, personal norms, and willingness to substitute meat. Levene's tests indicated that the homogeneity assumption was only violated for perceived harm in the pig condition, $F(1, 192) = 6.34$, $p = .013$, so in this case, a Welsh-adjusted test was performed instead. Cohen's d effect sizes are reported using (Sawilowsky, 2009) guidelines: $d = 0.20$ (small), $d = 0.50$ (medium), $d = 0.80$ (large), $d = 1.20$ (very large), and $d = 2.00$ (huge).

Additionally, we conducted one exploratory 2 (*slaughter* vs. *control*) x 2 (species: *pig* vs. *chicken*) ANOVA for each dependent variable to examine potential main effects of species and interaction effects - that is, whether the impact of slaughter exposure differed by species. To express the amount of variance explained, we used partial eta-squared (η_p^2) with the following rules of thumb derived from Cohen (1988): $\eta_p^2 \approx 0.01$ (small), 0.06 (medium) and 0.14 (large).

2.4.2. Mediation analyses

To test whether the effects of slaughter exposure (vs. respective controls) on *willingness to substitute meat* were sequentially mediated by *perceived harm*, *prevention beliefs*, and *personal norms* (thereby testing **H5-H7**), we used a mediation model with three mediators. Hayes' SPSS

macro PROCESS (model 6) allows the calculation of this model, including indirect, direct and total effects.

Statistical inference for direct and total effects on *willingness to substitute meat* is based on effect coefficients, *t* and *p* values, and confidence intervals based on ordinary least squares (OLS) regression (with standard 0.05 alpha error probability). For the indirect effects, we used 95% percentile-based bootstrap confidence intervals (using 10,000 bootstrap samples) (Hayes, 2022). For omnibus tests of the total and direct effects; R^2; *F* and *p* values were used. Continuous predictor variables were mean-centered to make regression coefficients more interpretable; and we used heteroscedasticity-consistent standard errors (HC3); as recommended by Hayes (2022). We also explored whether *meat attachment* moderated the sequential mediation model using PROCESS Model 92, which allows for moderation across all paths.

All data analyses were conducted using SPSS version 29. All hypotheses and the analysis plan were pre-registered before data collection and analysis. The complete dataset is available on the OSF project page: https://osf.io/ayx7c

3. Results

3.1. Descriptive correlations

Table 4 shows the correlations between both confirmatory and exploratory variables. The four main variables (*perceived harm*, *prevention beliefs*, *personal norms*, and *willingness to substitute meat*) were all significantly and positively intercorrelated, with medium-to-strong associations (rs = 0.42 to 0.73). These variables were all strongly and negatively correlated with *meat attachment* ($rs = -0.56$ to -0.71) and, to a lesser extent, with *meat consumption frequency* ($rs = -0.19$ to -0.36), while *meat attachment* and *meat consumption frequency* were positively correlated ($r = 0.42$).

Concerning demographic variables, *gender* showed weak correlations: women (vs. men) reported slightly stronger *prevention beliefs* ($r = 0.12$, $p = .016$), *personal norms* ($r = 0.13$, $p = .008$), and *willingness to substitute meat* ($r = 0.19$, $p < .001$), and lower *meat attachment* ($r = -0.20$, $p < .001$). *Age* was weakly and negatively correlated with *meat attachment* ($r = -0.12$, $p = .017$) and *meat consumption frequency* ($r = -0.22$, $p < .001$). *Education* was not significantly associated with the main study variables.

In sum, the main variables were interrelated in the expected directions, supporting the theoretical structure of the model and providing a basis for the subsequent hypothesis testing.

3.2. Independent t-tests and ANOVA

3.2.1. Confirmatory analyses

Fig. 2 shows the effects of perceived *animal slaughter* (vs. *meat control*) on the main study variables for both the *chicken* and *pig* conditions. Exploratory results for *meat attachment* are also shown.

In line with H1, participants exposed to animal *slaughter conditions* (vs. *meat control*) *perceived* significantly more *harm* in meat-eating. Participants in the *chicken slaughter condition* reported significantly higher *perceived harm* ($M = 5.38$, $SD = 1.28$) than those from the *chicken*

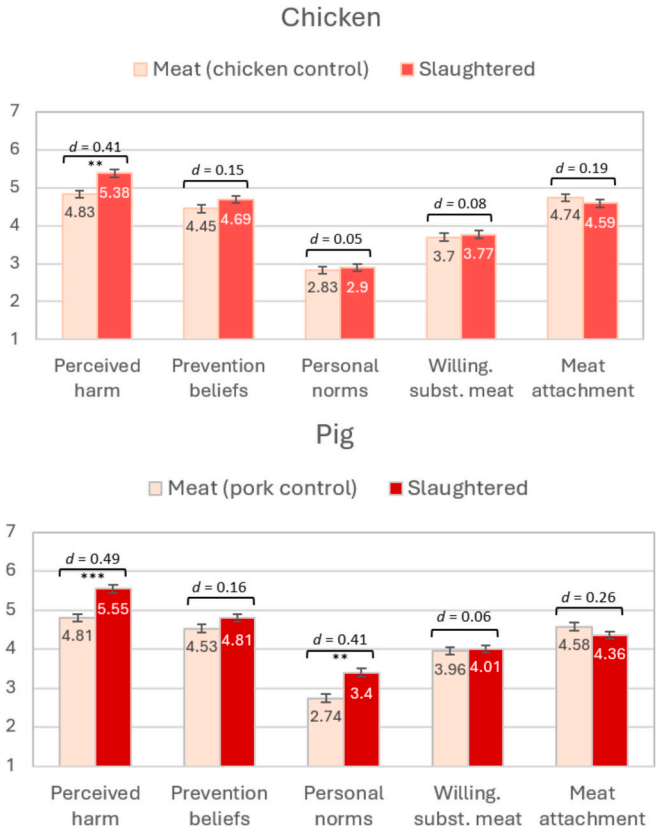

Fig. 2. Effect of conditions on outcome variables.

Table 4
Means, standard deviations and correlations for study variables.

#	Variable	M	SD	1	2	3	4	5	6	7	8
1	Perceived harm	5.14	1.46								
2	Prevention beliefs	4.62	1.65	.73**							
3	Personal norms	2.96	1.52	.60**	.70**						
4	Willing. sub. meat	3.86	0.90	.42**	.55**	.55**					
5	Meat attachment	4.57	0.85	-.56**	-60**	-.71**	-.57**				
6	Meat cons. freq.	3.24	0.98	-.19**	-.33**	-.34**	-.36**	.42**			
7	Gender	-	-	.08	.12*	.13**	.19**	-.20**	-.08		
8	Age	45.3	12.8	-.09	-.06	-.03	-.03	-.12*	-.22**	-.06	
9	Education	-	-	.05	.01	.01	.04	-.07	.07	.00	-.14*

Note. Red indicates positive correlations; blue indicates negative correlations; color intensity reflects magnitude. Pearson correlations are reported for all variables except gender, which uses point-biserial coefficients. * $p < .05$; ** $p < .01$ (two-tailed).

control ($M = 4.83$, $SD = 1.43$), $t(194.43) = -2.88$, $p = .004$, $d = 0.41$. Likewise, participants in the *pig slaughter* condition reported significantly higher *perceived harm* ($M = 5.55$, $SD = 1.30$) compared to those in the *pork control* ($M = 4.81$, $SD = 1.67$), $t(182.65) = -3.42$, $p < .001$, $d = 0.49$.

H2 was not supported. *Prevention beliefs* did not differ significantly between *slaughter* and *control conditions* for either species.

H3 was partially supported: participants in the *pig slaughter condition* reported significantly stronger *personal norms* ($M = 3.40$, $SD = 1.61$) than those in the *pork control* ($M = 2.74$, $SD = 1.57$), $t(191.52) = -2.88$, $p = .004$, $d = 0.41$, while no significant differences in *personal norms* were observed between the *chicken slaughter condition* ($M = 2.90$, $SD = 1.40$) and the *chicken drumstick control* ($M = 2.83$, $SD = 1.45$), $t(195.98) = -0.34$, $p = .740$, $d = 0.05$. This apparent interaction effect of species was small and marginally significant, $F(1, 388) = 3.75$, $p = .054$, $\eta_p^2 = 0.010$, according to an exploratory 2 (*slaughter* vs. *control*) x 2 (species: *pig* vs. *chicken*) ANOVA test.

H4 was not supported. *Willingness to substitute meat* did not differ between the *chicken slaughter condition* ($M = 3.77$, SD = 0.85) and *chicken control* ($M = 3.70$, $SD = 0.82$), $t(195.47) = -0.58$, $p = .56$, $d = 0.08$, nor between the *pig slaughter condition* ($M = 4.01$, SD = 1.02) and *pork control* ($M = 3.96$, $SD = 0.93$), $t(189.58) = -0.39$, $p = .701$, $d = 0.06$. An exploratory 2 (species: *chicken* vs. *pig*) x 2 (experiment: *meat* vs. *slaughter*) ANOVA test revealed a small main effect of species, such that participants in the *chicken* (vs. *pig*) conditions reported a lower *willingness to substitute meat*, $F(1, 388) = 7.63$, $p = .006$, $\eta_p^2 = 0.019$.

Exploratorily, *meat attachment* was lower in the *animal slaughter conditions*, but this difference was not statistically significant compared to *control conditions*. For *chicken*, participants in the *slaughter condition* ($M = 4.59$, $SD = 0.78$) did not differ from those in the *chicken control* ($M = 4.74$, $SD = 0.83$), $t(195.53) = 1.30$, $p = .195$, $d = 0.19$. Similarly, for *pig*, participants' *willingness to substitute meat* in the *slaughter condition* ($M = 4.36$, $SD = 0.83$) did not differ from those in the *pork control* ($M = 4.58$, $SD = 0.91$), $t(190.97) = 1.80$, $p = .074$, $d = 0.26$. However, an exploratory 2 (species: *chicken* vs. *pig*) x 2 (experiment: *meat* vs. *slaughter*) ANOVA with *meat attachment* as the outcome revealed significant main effects for species, $F(1, 388) = 5.15$, $p = .024$, and experiment type, $F(1\ 388) = 4.85$ $p = .028$, with greater attachment in the *chicken* (vs. *pig*) and *meat* (vs. *slaughter*) conditions.

In sum, **H1** was supported, with *slaughter* exposure increasing *perceived harm* for both *slaughter* conditions. **H2** was not supported, as *prevention beliefs* did not differ between conditions. **H3** was partially supported, with stronger *personal norms* in the *pig condition*. **H4** was not supported, as the *willingness to substitute meat* did not differ across animal *slaughter conditions*.

3.3. Mediation analysis

3.3.1. Effects of slaughter exposure on perceived harm, prevention beliefs, personal norms and willingness to substitute meat

To examine whether the effects of *slaughter* exposure (vs. respective *controls*) on *willingness to substitute meat* were sequentially mediated by *perceived harm, prevention beliefs, and personal norms*, we conducted two separate mediation analyses with SPSS (model 6), one for each species. Fig. 3 summarizes the output of the models (see Table S1 and Table S2 for a structured overview of direct, total and indirect effects of experimental conditions).

We found that exposure to *chicken slaughter* (vs. control), $a_1 = 0.55$, $SE = 0.19$, $t(198) = 2.87$, 95% CI [0.17, 0.93], $p < .001$, and especially to *pig slaughter* (vs. control), $a_1 = 0.73$, $SE = 0.21$, $t(194) = 3.41$, 95% CI [0.31, 1.16], $p < .001$, significantly increased participants' *perceived harm*. **H5-H7 were supported** for both species: *perceived harm* positively predicted *prevention beliefs* both in the *chicken* ($d_1 = 0.82$, SE = 0.06, $t(198) = 13.85$, 95% CI [0.70, 0.93], $p < .001$) and *pig* model ($d_1 = 0.87$, SE = 0.06, $t(194) = 15.85$, 95% CI [0.77, 0.98], $p < .001$). *Prevention beliefs*, in turn, positively predicted *personal norms* both in the *chicken,* $d_2 = 0.57$, SE = 0.07, $t(198) = 8.56$, 95% CI [0.44, 0.70], $p < .001$, and *pig* model, $d_2 = 0.48$, SE = 0.07, $t(194) = 7.04$, 95% CI [0.34, 0.61], $p < .001$. Finally, *personal norms* positively predicted *willingness to substitute meat,* both in the *chicken,* $b_2 = 0.14$, SE = 0.05, $t(198) = 2.88$, 95% CI [0.04, 0.23], $p < .001$, and *pig* model, $b_2 = 0.25$, SE = 0.05, $t(194) = 5.03$, 95% CI [0.15, 0.35], $p < .001$. An exposure to the *animal slaughter conditions* thus had an indirect, positive effect on *willingness to substitute meat* via *perceived harm*, *prevention beliefs* and *personal norms*, both in the *chicken, IE* = 0.04, SE = 0.02, 95% BootCI [0.01, 0.08], and *pig* model, *IE* = 0.08, SE = 0.03, 95% BootCI [0.03, 0.14].

However, we also found that *personal norms* were not necessary to increase *willingness to substitute meat* via *perceived harm* and *prevention beliefs,* as the indirect effects were stronger without *personal norms*, both in the *chicken* model, *IE* = 0.09, SE = 0.04, 95% BootCI [0.02, 0.19], and *pig* model, *IE* = 0.10, SE = 0.05, 95% BootCI [0.02, 0.22]. In addition, *perceived harm* predicted *personal norms* after controlling for *prevention beliefs*, both in the *chicken,* $d_3 = 0.14$, SE = 0.06, $t(198) = 2.16$, 95% CI [0.01, 0.28], $p < .05$, and *pig* model, $d_3 = 0.28$, SE = 0.07, $t(194) = 3.59$, 95% CI [0.13, 0.44], $p < .001$. However, only in the *pig* model was there a significant indirect positive effect of *perceived harm → personal norms → willingness to substitute meat*, independent of *prevention beliefs*, *IE* = 0.05, SE = 0.02, 95% BootCI [0.02, 0.10].

Another notable difference between the *chicken* and *pig* model was that participants exposed to *pig slaughter* (vs. control) reported significantly lower *prevention beliefs* after controlling for *perceived harm*, $a_2 = -0.37$, $SE = 0.17$, $t(194) = -2.18$, 95% CI [−0.70, −0.03], $p = .03$, which was not the case for participants exposed to *chicken slaughter* (vs. *control*), $a_2 = -0.22$, SE = 0.16, t(198) = −1.32, 95% CI [−0.53, 0.10],

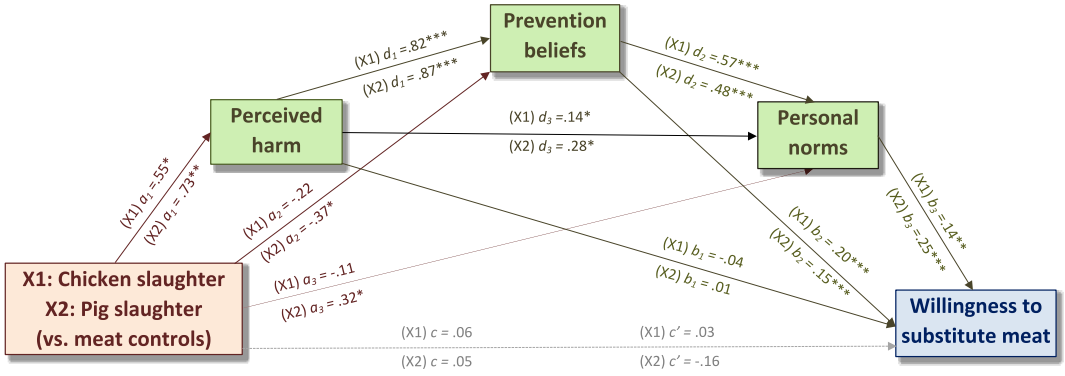

Fig. 3. Mediation model showing the impact of the (X) exposure to *animal slaughter* (X1: *chicken*; X2: *pig*) on the mediators *perceived harm, prevention beliefs, and personal norms* and the outcome *willingness to substitute meat*. **Note.** Standardized path coefficients are shown, * $p < .05$; ** $p < .01$; *** $p < .001$. Confidence intervals for indirect effects were estimated (10,000 bootstrap samples).

$p = .20$. We found that *willingness to substitute meat* in the *pig* model was counteracted by these lower *prevention beliefs* via its effect on *personal norms*, $IE = -0.04$, SE = 0.02, 95% BootCI [−0.10, 0.00]. We also found that the *slaughtered condition* (vs *control*) had a significant effect on *personal norms* after controlling for *perceived harm* and *prevention beliefs* in the *pig* model, $a_3 = 0.32$, $SE = 0.16$, $t(198) = 2.00$, 95% CI [0.01, 0.64], $p = .047$, and not in the *chicken* model, $a_3 = -0.11$, $SE = 0.15$, $t(194) = -0.73$, 95% CI [−0.41, 0.19], $p = .470$. No direct effects of *slaughter* exposure on *willingness to substitute meat* were found for *chicken* ($c' = 0.03$, $p = .75$), or for *pig* ($c' = -0.16$, $p = .15$) experimental conditions.

In sum, the sequential pathway supported **H5-H7** for both species: *slaughter* exposure increased *perceived harm*, which in turn predicted stronger *prevention beliefs*, *personal norms*, and ultimately – higher *willingness to substitute meat*. No direct effects were observed from *animal slaughter* to *willingness to substitute meat.*

3.3.2. Influence of meat attachment and meat consumption frequency on the mediation pathway

We conducted two exploratory analyses by including *meat attachment, chicken consumption frequency,* and *pork consumption frequency* as covariates in correspondent *chicken* and *pig* models (using Model 6 from Hayes, 2022). This allowed us to control for the potential influence of these covariates on each mediator (*perceived harm*, *prevention beliefs* and *personal norms*) and outcome variable (*willingness to substitute meat*). The results are shown in Fig. 4 (see Table S3 and Table S4 for a structured view of direct, indirect and total effects of experimental conditions).

After accounting for both covariates, the exposure to slaughter on *perceived harm* decreased in both the *chicken* and *pig models*. Although attenuated, *perceived harm* remained a strong predictor of *prevention beliefs* in both the *chicken* and *pig models*, and *prevention beliefs* continued to positively predict *personal norms*. However, *personal norms* no longer predicted *willingness to substitute meat* in the *chicken model*, and marginally predicted *willingness to substitute meat* in the *pig model*.

The indirect effect of (*chicken* and *pig*) slaughter exposure on *willingness to substitute meat* via *perceived harm → prevention beliefs → personal norms* remained significant, albeit marginally, in both models. However, the indirect paths that were previously significant (i.e., *perceived harm → prevention beliefs → willingness to substitute* and *perceived harm → personal norms* and *willingness to substitute*) were no longer statistically significant after including both covariates.

Concerning the direct effects of both covariates, *meat consumption frequency* was a negative predictor of *prevention beliefs* in both the *chicken* and *pig models*, and had a negative effect on *personal norms,* though only in the *pig model.*

Importantly, *meat attachment* emerged as a consistent negative predictor across all mediators – *perceived harm*, *prevention beliefs*, and *personal norms* – and was also associated with lower *willingness to substitute meat* in both models. An exploratory regression showed that *meat consumption frequency* positively predicted *meat attachment*, with stronger association for *pork* (vs. *chicken*).

In sum, *meat attachment* and *meat consumption frequency* attenuated the indirect pathway from *slaughter* exposure to *willingness to substitute meat*, and the sequential mediation remained marginally significant for both species. *Meat consumption frequency* negatively predicted *prevention beliefs* (and *personal norms* in the *pig* model), while *meat attachment* consistently predicted lower scores in *perceived harm, prevention beliefs, personal norms* and reduced *willingness to substitute meat.*

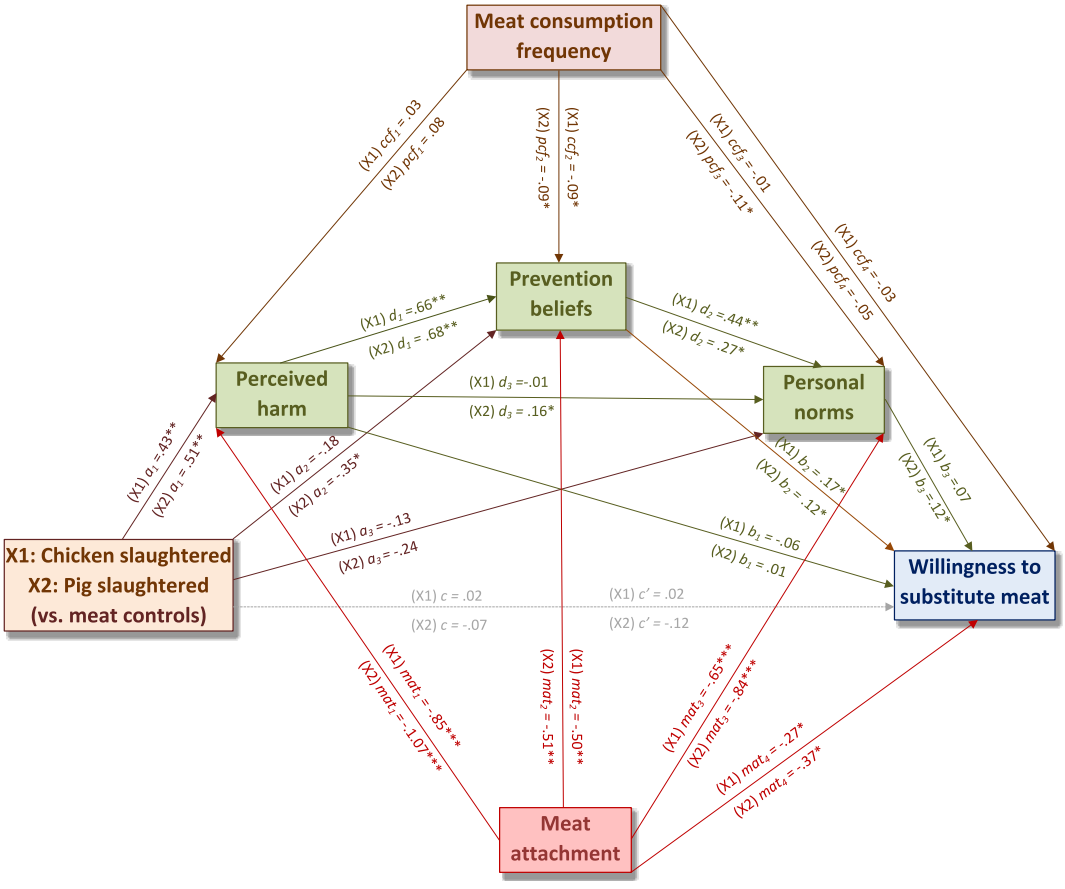

Fig. 4. Mediation model (as in Fig. 3), controlling for covariates *meat attachment* and *meat (chicken and pork) consumption frequency*. **Note.** Standardized path coefficients are shown, * $p < .05$; ** $p < .01$; *** $p < .001$. Confidence intervals for indirect effects were estimated (10,000 bootstrap samples).

3.3.3. Moderating role of meat attachment

After testing the moderating role of *meat attachment* across all mediation pathways, (see results in Table S5, Table S6 and Fig. S1 for a structured view), we did not find any statistical significance effects in the *chicken* model (all *ps* > 0.050). However, in the *pig* model, we found that the effect of *perceived harm* on *personal norms* and the effect of *perceived harm* on *willingness to substitute meat* were attenuated due to higher *meat attachment*. Conversely, the effect of *personal norms* on *willingness to substitute meat* was significantly (and positively) moderated by *meat attachment*.

4. Discussion

4.1. Moral engagement following slaughter exposure

This study examined whether exposure to animal (*chicken* and *pig*) *slaughter* influences meat consumers' *willingness to substitute meat*, and whether this relationship is mediated by moral engagement (i.e., *perceived harm, prevention beliefs and personal norms*). The observed correlations among these main variables further support the coherence of the proposed mediation structure, aligning with theoretical expectations. Consistent with **H1**, participants who were subject to *animal* (especially *pig*) *slaughter* reported significantly higher *perceived harm* compared to respective meat *controls*, and this *perceived harm* sequentially predicted stronger *prevention beliefs* and *personal norms*, increasing *willingness to substitute meat*. These mediating effects are consistent with the NAM model (Carfora et al., 2020); suggesting that exposure to *animal slaughter* can affect *willingness to substitute meat* via moral engagement. However; these effects are only indirect; direct and total effects of *chicken* or *pig slaughter* on *willingness to substitute meat* were both non-significant; indicating that the moral engagement process was disrupted and moral disengagement occurred. These findings are reminiscent of the *meat paradox* (Camilleri et al., 2020); the psychological tension consumers may have to resolve when realizing their meat consumption involves animal suffering. While prior research has shown that reminders of the animal origins of meat can reduce its appeal; this does not necessarily translate into greater openness to plant-based alternatives (Fonseca & De Groeve, 2025; Kunst & Hohle, 2016), as many consumers remain attached to meat. The close to neutral scores for *willingness to substitute* suggest either ambivalence or a lack of strong opinions in this regard.

4.2. Moral disengagement and interspecies differences

Our findings shed light on how moral disengagement is most likely to occur upon exposure to *chicken* and *pig slaughter*. For both species, *prevention beliefs* were not significantly different between *slaughter* and *control conditions*, indicating a lack of support for **H2**, meaning that exposure to animal slaughter did not increase consumers' beliefs about their ability to influence animal harm in the context of their meat consumption. Previous research has found that meat consumers can morally disengage from meat through denying (e.g., diffusing, displacing) responsibility for its harmful effects (Graça et al., 2016) or perceiving meat consumption as natural; normal; necessary and nice (4Ns) (Piazza et al., 2015). Despite these findings; our results also indicate a moderately increased activation of *personal norms* upon exposure to *pig slaughter*; partially due to increased *perceptions of harm*; while we did not find this norm activation via harm in the *chicken condition*. This indicates partial support for H3; where only exposure to *pig slaughter* leads to a heightened sense of moral obligation among participants. Exposure to *pig* (vs. *chicken*) slaughter also elicited a stronger direct effect on *perceived harm*; as well as more pronounced paths from *perceived harm* to both *prevention beliefs* and *personal norms*. These downstream associations are consistent with the expected relationships described in **H5** and **H6**. A potential explanation for the differential norm activation; and stronger downstream effects of perceived harm in the *pig* (vs. *chicken*) condition; is that *pigs* are attributed with higher perceived mental capacities and thus viewed as more vulnerable to harm than *chickens* (Kupsala et al., 2014). Although most consumers generally acknowledge that farmed animals experience pain (Estévez-Moreno et al., 2022; Miranda-de la Lama et al., 2017), *pigs* are perceived as more sentient (i.e., more capable of experiencing pain and stress) than *chickens* when subjected to painful experiences (Phillips & McCulloch, 2005; McGrath et al., 2013; Kupsala et al., 2015; Peden et al., 2020;). Another explanation is that consumers are better able to identify with *pigs*; given their shared mammalian ancestry and features (Amiot, 2020). It is also possible that visual differences of the stimuli contributed to species-related differences in *perceived harm*. For example, the image of the *pig* showed more blood, while the image of the *chicken* appeared darker, which may have made the animal less visible and influenced participants' perception.

Overall, it seems the *potential* for *moral engagement* is stronger in the *pig* (vs. *chicken*) *condition*, implying that the propensity to morally disengage needs to be stronger to maintain the same level of *(un)willingness to substitute meat*. We did find evidence in this direction: upon controlling for *perceived harm*, we found that participants exposed to *pig slaughter* (vs. *control*) generally reported lower *prevention beliefs*, which was not the case when comparing participants in the *chicken* condition. Our findings suggest that the *willingness to substitute meat* after *pig slaughter* exposure is counteracted by these lower *prevention beliefs* via its effect on *personal norms*. This attenuation of the final path is relevant to **H7**, which predicted that stronger *personal norms* would increase *willingness to substitute meat*; our results suggest that this final step is weakened under conditions of *moral disengagement*. Participants therefore seemed to resist a sense of moral obligation to change their diet by reaffirming themselves as unable to prevent animal suffering by substituting meat. Feinberg et al. (2019) described a similar push-and-pull mechanism in the moralization of meat, with moral cognitions (e.g., *perceived harm* and moral piggybacking - which is akin to norm activation) and emotions (e.g., empathy, guilt) pulling in the direction of moralization, and hedonic motivation to eat meat and moral disengagement strategies pushing in the opposite direction. Below, we discuss how *meat attachment* and *meat consumption frequency* disrupted *moral engagement* in our study.

4.3. How meat attachment and meat consumption disrupt moral engagement

For both species, *meat consumption frequency* had an additional negative effect on *prevention beliefs*, indicating that frequent meat consumers viewed themselves as less able or responsible to reduce animal suffering by eating less meat. This finding aligns with previous research showing that higher meat consumption is associated with lower belief in animal mind (Loughnan et al., 2010; Bastian & Loughnan, 2017; Piazza et al., 2015) and lower interest in animal-welfare-friendly products (Miranda-de la Lama et al., 2017). Given that *meat attachment* was controlled for; this remaining negative effect may be due to other factors. People who eat more meat may experience more practical or social barriers to taking responsibility for animal suffering. *Meat consumption frequency* also negatively predicted *willingness to substitute meat*; though this effect was only significant in the *pig* condition; perhaps due to a stronger salience of the *meat paradox* (e.g.; Loughnan et al., 2010), as discussed earlier.

Importantly, higher *meat consumption frequency* predicted stronger *meat attachment*, which emerged as a major robust suppressor of the moral engagement pathway. In both species, *meat attachment* had strong negative effects on all these variables and *willingness to substitute meat*, aligning with previous research on moral disengagement from meat (Graça et al., 2016). Highly meat-attached participants were less *willing to substitute meat* and less likely to acknowledge animal suffering related to meat-eating, to accept responsibility to prevent suffering by eating less meat, or to experience a moral obligation to do so. These effects were stronger for *perceived harm* and in the *pig* (vs. *chicken*) *condition*.

Likewise, only in the *pig condition* were several paths in the mediation model moderated by *meat attachment*: It attenuated the effects of *perceived harm* on *personal norms* and on *willingness to substitute meat*. These effects again suggest that exposure to *pig* (vs. *chicken*) *slaughter* is more morally troublesome, requiring a stronger recruitment of moral disengagement strategies to maintain meat consumption. However, this difference may also stem from the greater visual impact of the *pig* (compared to the *chicken*) stimuli.

4.4. Practical implications

Our results have practical implications for meat reduction interventions. Interventions may benefit from highlighting the animal suffering inherent in animal production and clearly communicating that individuals can meaningfully reduce harm through their dietary choices. Emphasizing concrete, feasible actions can strengthen perceived personal efficacy and facilitate change without moral pressure (Bastian, 2019). Interventions should also recognize that slaughter imagery may trigger defensive reactions in some consumers, particularly by reducing their perceived responsibility to prevent harm. To mitigate this, messages that convey meat-animal association, while informing on animal sentience – and thus their capacity to suffer – may foster moral engagement. To compensate limited effectiveness of slaughter imagery with consumers that are strongly attached to meat, effective dietary-change strategies may need to complement harm-based messaging with information about the taste, convenience, and nutritional adequacy of plant-based options. Such approaches may help reduce resistance among highly meat-attached individuals and broaden the appeal dietary change (Lacroix & Gifford, 2019).

4.5. Limitations and future research

Our study is not without limitations. First, although the manipulation checks confirmed high levels of stimulus recognition across experimental conditions (i.e., 100% recognition in both slaughter stimuli) - we mistakenly labeled the *pork control* image as a "*pork chop*", whereas the more accurate culinary term would be *"pork ribs"*. Despite this mislabeling, we believe that the ecological validity of the study remains intact, as the stimulus also realistically represented *pork* and fulfilled its intended role as a *control* group compared to the *pig slaughter* condition.

Second, our outcome measures assessed general cognitions related to meat and animal suffering, rather than species-specific cognitions (regarding *chickens* and *pigs*) in response to our stimuli. Our study falsifies the assumption that exposure to the *slaughter* of a particular species is sufficient to increase *willingness to substitute* meat in general. More targeted measures might have yielded stronger effects, although processes of moral disengagement are still likely to suppress such effects (Fonseca & De Groeve, 2025). Moreover; because our study focused only on *pigs* and *chickens*; the generalizability of findings to other species is limited. Consumers' reactions may vary depending on species-specific perceptions of sentience and moral worth (Caviola et al., 2019). Future studies should include a broader range of species used for food (e.g., cows, fish, and sheep) to examine whether similar mechanisms of moral (dis)engagement apply across species.

Third, our stimuli were limited to single, static images depicting the bleeding stage and therefore do not fully represent the slaughter process. The absence of sound, movement, and olfactory cues likely attenuates the visceral impact of the exposure (Dillard, 2008; Fonseca, 2019; Leibler et al., 2017; Millestein, 2024). Moreover, a single image cannot capture the full experience of an animal inside a slaughterhouse (Herrewijn et al., 2021); which includes transportation; handling; stunning; hanging; and other procedures in which welfare commonly may arise. As a result; participants' judgments' may have been shaped primarily by the visual salience of bleeding and death; rather than by inferences about earlier stages of the slaughter process. Future research could examine exposure to these stages; such as handling and stunning; using more immersive formats; including video; virtual reality; or even simulated slaughterhouse environments (see Herrewijn et al., 2021).

Fourth, our measures capture *perceived harm* based on visual stimuli, which does not capture the actual harm and suffering experienced by animals during slaughter. This distinction is important, as participants' moral judgments may reflect intuitive reactions to the images rather than informed assessments of slaughter practices. Participants were not explicitly asked what they perceived in the images, therefore it remains unclear whether responses to the slaughter conditions were primarily driven by the recognition of harm as a morally wrongful outcome (e.g., the animal's death), empathetic inferences about pain or suffering, or other salient visual features the amount of visible blood. Future research could address this limitation by directly assessing participants' interpretations of slaughter imagery and disentangling perceptions of wrongness, suffering, and death as distinct cognitive appraisals. This would allow for a more fine-grained test of the proposed moral engagement process and help clarify which cognitive and/or emotional mechanisms are most consequential for activating *perceived harm*, *prevention beliefs*, and *personal norms*.

Relatedly, future research could examine how participants' rural (versus urban) background and familiarity with farmed animals (Benningstad & Kunst, 2020) and slaughter practices affect *perceived harm* and moral (dis)engagement. Individuals who are aware that animals are stunned before slaughter may not perceive any animal suffering. At the same time; routine exposure to animal killing may lead to desensitization so that slaughterhouse workers may be less responsive to cues of animal suffering (Sebastian; 2025). Future studies could therefore compare perceptions of consumers and slaughterhouse workers and examine whether moral engagement shapes their willingness to perform slaughter-related tasks across different species (Fonseca, 2019).

Fifth, while our experimental design allows for causal inference, the cross-sectional nature of the data limits conclusions about long-term behavioral change. Responses to slaughter imagery may be short-lived, and self-reported measures of dietary motivation are susceptible to social desirability biases, as well as to the known intention-behavior gap (Sheeran & Webb, 2016). Longitudinal studies are needed to assess whether shifts in perceived harm and personal norms translate into changes in meat consumption and whether these are sustained over time (Benningstad & Kunst, 2020). While this study provided important insights into the sociocognitive processes of moral engagement; the model did not include moral emotions; which previous studies have shown are also instrumental in the moral engagement process (Feinberg et al., 2019; Fonseca & De Groeve, 2025). Future studies should incorporate both socio-cognitive and emotional factors.

Finally, our study focused exclusively on *willingness to reduce meat* as a behavioral response to animal welfare concerns (Herchenroeder et al., 2022; Kunst & Haugestad, 2018; Palomo-Vélez et al., 2018; Zickfeld et al., 2018), although consumers may also respond through other pathways, such as willingness to purchase higher-welfare animal products (Carlsson et al., 2007; Miranda-de la Lama et al., 2017), or supporting public policies or advocacy efforts to reduce animal suffering (Polanco & Troy, 2025).

Despite these limitations, our study contributes to the growing literature on moral (dis)engagement and dietary transition, by highlighting *perceived harm* and *prevention beliefs* as key mechanisms for behavioral change, while also revealing that *meat attachment* negatively influences moral engagement towards animals. Participants exhibiting high levels of *meat attachment* (Graça et al., 2015) demonstrated moral disengagement (Graça et al., 2015; Rothgerber, 2020) by lower *perceptions* of *harm* and personal responsibility (Souza & O'Dwyer, 2022).

5. Conclusion

This study demonstrates that exposure to *animal slaughter* (vs. *meat* controls) can indirectly increase meat consumers' *willingness to substitute*

meat through heightened *moral engagement*, via *perceived harm*, *prevention beliefs* and *personal norms*. These effects were more pronounced among participants exposed to *pig slaughter* compared to *chicken slaughter,* although the mechanisms underlying this difference remain speculative. At the same time, stronger moral engagement upon exposure to *pig slaughter* also appeared to elicit stronger resistance. In general, the absence of direct effects on *willingness to substitute meat* suggests that meat consumers tend to morally disengage when confronted with *animal slaughter*, with *meat consumption frequency,* and especially *meat attachment,* emerging as significant barriers to moral engagement.

CRediT authorship contribution statement

Rui Pedro Fonseca: Writing – review & editing, Writing – original draft, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Ben De Groeve:** Writing – review & editing, Writing – original draft, Validation, Methodology, Investigation, Formal analysis, Conceptualization. **Lauren Camilleri:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Conceptualization. **Cristina Godinho:** Writing – review & editing, Validation, Methodology, Conceptualization. **Marília Prada:** Writing – review & editing, Validation, Conceptualization.

Ethical approval

This study was reviewed and approved by IRB of Iscte-IUL (University Institute of Lisbon, reference n° 21(PF 21/2025).

Ethical statement

We, the authors of this manuscript, hereby declare that this research was conducted in accordance with the ethical standards of the relevant institutional and national research committees and with the 1964 Helsinki declaration.

Ethical approval for the involvement of human subjects in this study was granted by the Institutional Review Board (IRB) of Iscte-IUL (University Institute of Lisbon) under reference PF 21/2025. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institution and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

The final sample comprised 392 UK participants recruited through Prolific. Each participant received compensation of approximately 0.70£ for their participation in the study.

Participants provided informed consent prior to their involvement in the study. They were fully informed about the purpose of the research, and that no personal data was required. Participants were assured of their right to withdraw from the study at any time without providing a reason.

We confirm that all relevant protocols were followed to protect the rights and privacy of all participants. No coercion was exerted to participate, and full disclosure of study requirements and risks was provided. Written informed consent was obtained from all participants prior to their participation in the study.

Furthermore, we confirm that vulnerable populations were not included in this research.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.foodqual.2026.105929.

Data availability

All data is availabe in sup. file and links presented on the manuscript

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