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Beyond transparency: The double-edged effects of animal husbandry and welfare information on consumer perceptions of meat

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ABSTRACT

Animal welfare plays an increasingly important role in consumers' meat purchase decisions. Many consumers demand additional and more transparent information about the meaning of animal welfare labels and actual husbandry practices, particularly regarding the conditions under which the animals were kept. Since product packaging offers only limited possibilities for communicating detailed information, new technologies such as blockchain technology enable the provision of additional, largely tamper-proof information via QR codes on product packaging. This paper investigates whether additional information may not only enhance consumer approval of more "ethical" meat but also elicit negative psychological effects that may ultimately prevent its purchase. Based on a pre-study and two experiments conducted in the context of organic poultry farming, we show that the type of information plays a critical role. Additional information framed in relative terms is associated with higher anticipated overall meat quality and purchase intention. In contrast, additional information framed in absolute terms may evoke a sobering realization and psychological discomfort, which in turn are linked to less favorable evaluations of anticipated overall meat quality.

1. Introduction

In spring 2025, the discount store Aldi, one of Germany's largest food retailers, announced that fresh meat would start to be arranged according to the type of animal husbandry rather than by species, as is typically the case in food retailing. Products originating from higher-welfare farming systems (including organic production) would be separated from those derived from conventional husbandry systems. This restructuring aims to facilitate consumers' ability to identify and access products that meet higher welfare standards (Das, 2025). Indeed, in recent years, animal welfare (AW) has gained increasing global attention (Bryant et al., 2024), reflecting growing interest among consumers across diverse regions (Ammann et al., 2024; Peschel et al., 2025; Sinclair et al., 2022). However, the salience of AW concerns varies across countries (Sinclair et al., 2022), and the willingness to strengthen AW legislation is particularly pronounced in Europe (Mata et al., 2023), as reflected in a European Commission (2023a) report stating that "90% of Europeans consider that farming and breeding practices should meet basic ethical requirements." The present research is situated within this European context, where AW concerns are prominently embedded in public discourse.

AW plays a crucial role in consumer decision making (BEUC, 2024; Alonso et al., 2020), as confirmed when consumers are asked which features they consider essential in the "supermarket of the future" (Groeppel-Klein & Grub, 2026). However, as a credence attribute (Darby & Karni, 1973), AW cannot be directly assessed, making transparent and trustworthy communication particularly important (Schütz et al., 2023). Responding to this demand, various AW labels have been introduced (Esbjerg et al., 2022). AW labels (e.g., information about the type of animal husbandry) function as extrinsic quality cues that help consumers evaluate overall product quality, including AW, prior to purchase (Grunert et al., 2004).

However, labels on product packaging often fail to convey AW, as consumers are confronted with many different and competing labels, leading to confusion about what they actually stand for (Abrams et al., 2010; Ingenbleek & Krampe, 2022). Consumers therefore increasingly demand additional, transparent and more-detailed information on AW labels, particularly about the conditions under which the animals were kept (Schütz et al., 2023; Xu et al., 2023). However, space on meat packaging is limited (Schütz et al., 2023). To provide additional information, food retailers such as Carrefour (Carrefour, 2018) have adopted blockchain technology (BCT). By scanning a QR code on the packaging,

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consumers can access verifiable and largely tamper-proof information about key stages (e.g., breeding, animal husbandry) of the supply chain (Ellahi et al., 2024). Despite the growing importance of AW and the potential of BCT to offer transparent information, research remains limited regarding how the content of AW information accessed through such technology-mediated channels should be framed to shape consumer evaluations. In this context, the psychological and emotional complexity of the topic (Feinberg et al., 2019) could play a role: AW communication intersects with the so-called meat paradox, the cognitive conflict between disliking the harm done to animals while simultaneously enjoying eating meat (Loughnan et al., 2010). Cognitive dissonance theory (Festinger, 1957) is often applied to explain this cognitive conflict, which, in the context of meat consumption, is referred to as meat-related cognitive dissonance (MRCD): inconsistency between cognitions leads to an aversive arousal (Rothgerber, 2020). MRCD can be elicited by various factors, with information about how animals have been reared representing a potential trigger (Rothgerber, 2020). Research also shows that consumers often hold idealized expectations of husbandry practices, particularly in production systems perceived as more AW friendly, which can conflict with reality (Ingenbleek & Krampe, 2022; Kühl et al., 2023). According to our reasoning, this discrepancy between expectations and reality (inconsistency), which we refer to as a sobering realization in the present context, represents the cognitive component of dissonance and may give rise to aversive arousal (as the affective component). In response, consumers may attempt to reduce or entirely avoid meat consumption (Fechner & Isbanner, 2025; Weingarten & Lagerkvist, 2023). The present paper does not aim to promote or discourage meat consumption per se, but to examine how different types of information shape the evaluation of higher AW meat products among consumers who consider purchasing meat.

Overall, this raises the question whether consumers' expressed demand for transparent information about animal husbandry and AW conflicts with the possibility that such transparency might evoke or intensify unpleasant reactions. Moreover, the limited empirical research available to date suggests that providing more-detailed information about the meaning of AW labels and the actual conditions under which the animals are reared (e.g., "increased space per bird") can enhance consumer understanding and support for such labels (Cornish et al., 2020; Schütz et al., 2023). In this context, of particular importance are the words chosen and the way information is framed to communicate insights to lay consumers (Vigors, 2019), leading to the question whether the type of information (i.e., how descriptions of animal husbandry practices are framed) plays a critical role. To date, it remains unclear how consumers respond when practices such as "increased space per bird" are disclosed, prompting the question whether information should be framed in relative (proportional change) or absolute (concrete figures) terms. Our contribution examines how different framings influence consumer evaluations of "ethical" meat and proposes that framing in relative terms may be more effective than framing in absolute terms. More specifically, we investigate which types of information lead to more favorable evaluations and higher purchase intentions for products with higher AW standards. Providing information in certain formats may risk undermining the perceived value of higher-welfare products. This is particularly relevant, as the majority of meat still originates from conventional production systems (European Commission, 2023b).

Our paper investigates sobering realization and psychological discomfort in the context of meat, animal husbandry, and AW, examining their role in consumer responses to different types (framed in relative vs. absolute terms) of BCT-based information. The studies do not focus on whether consumers actually scan a QR code but rather examine how they would react to different framings if they had scanned it. From a theoretical viewpoint, this paper contributes to a better understanding of framing effects in the context of ethical products such as organic meat. From a managerial perspective, it offers insights into how retailers and suppliers can communicate the benefits of AW products more effectively.

2. Theoretical background and hypotheses development

2.1. Cue utilization theory and communication of enhanced AW

According to cue utilization theory (Olson & Jacoby, 1972), quality cues are understood as "informational stimuli that are, according to the consumer, related to the quality of the product, and can be ascertained by the consumer through the senses prior to consumption" (Steenkamp, 1990, p. 312). Intrinsic cues (properties that cannot be changed without altering the physical characteristics of the product) must be distinguished from extrinsic cues (properties that are not part of the physical product) (Olson & Jacoby, 1972). The color of the meat, fat content, and fat marbling are examples of intrinsic cues, whereas packaging, AW labels and production systems (animal husbandry) are extrinsic cues (Aboah & Lees, 2020; Grunert et al., 2004). The perceived cues result in quality expectations (Grunert et al., 2004). AW and production systems are particularly relevant in consumer decision making (Aboah & Lees, 2020; Peschel et al., 2025), although they represent credence attributes (Darby & Karni, 1973) that cannot be directly assessed by consumers. Extrinsic cues, such as AW labels, are therefore frequently used to communicate improved AW conditions to consumers (Ingenbleek & Krampe, 2022; Thibault et al., 2022). However, the many different labels can lead to confusion among consumers, as it is unclear what they actually stand for, thereby highlighting the importance of transparent and trustworthy communication (Abrams et al., 2010; Ingenbleek & Krampe, 2022; Schütz et al., 2023).

Providing additional information about the meaning of AW labels (and not only presenting "pure" AW labels on the product packages) seems to be a promising strategy and can positively affect consumer behavior, e.g., intention to purchase welfare-enhanced products (Cornish et al., 2020; Schütz et al., 2023) or consumer liking (Napolitano et al., 2013). For instance, Cornish et al. (2020) show that consumers who receive more-detailed information about the animal husbandry (e.g., "increased space per bird") are significantly more likely to buy products with better AW than consumers without further information. In the context of organic labels, Hoogland et al. (2007) show that consumers rate chicken products carrying an organic label and additional information better in terms of AW than identical products carrying only the organic label. However, Schütz et al. (2023) rightly observe that space on product packaging is limited and show that the use of images, videos, or 360-degree virtual reality formats to provide additional information about animal husbandry can improve evaluations of the related AW (Schütz et al., 2022, 2023). Taken together, these findings indicate that supplementing AW labels with more-detailed explanatory information can strengthen consumer responses. From a cue utilization perspective, such approaches enrich existing extrinsic cues by adding predefined textual or immersive content, yet the cue itself remains primarily static at the POS. In contrast, technology-mediated systems such as blockchain technology (BCT) enable access to product-specific, detailed, and potentially verifiable supply chain information via QR codes. Consumers can then selectively retrieve the aspects they consider most relevant, such as housing size or rearing period. In this sense, BCT offers a more-flexible mechanism to communicate credence attributes in a detailed and potentially trustworthy manner. Consistent with this view, prior research in other food contexts suggests that BCT represents a suitable mechanism for communicating credence attributes and potentially enhancing consumer trust in sustainability-related claims (Contini et al., 2023; Tria et al., 2025).

2.2. BCT as a communication tool of AW

The potential of BCT is significant for many business areas, including marketing and especially food and agriculture (Kshetri, 2018; Marthews & Tucker, 2023; Peres et al., 2023). Briefly, blockchain is defined as "a

digital, decentralized and distributed ledger in which transactions are logged and added in chronological order with the goal of creating permanent and tamperproof records" (Treiblmaier, 2018, p. 547). BCT thus answers questions such as who performed which actions, at what time, and at what location (Kshetri, 2018). Moreover, a key advantage is that once data is stored in the blockchain, it cannot be changed (Kshetri, 2018). This information can be used to determine, for example, whether cold chains for fresh products are being maintained in order to ensure high product quality and safety (Kshetri, 2018). This makes BCT particularly suitable for traceability and transparency within the meat supply chain (Peres et al., 2023; Rejeb et al., 2020; Sander et al., 2018). Products can be traced from origin through to final distribution (Arvana et al., 2023; Groeppel-Klein & Kirsch, 2023; Kaliji et al., 2025). By scanning a QR code, consumers can obtain information from different stakeholders (e.g., farmers, processors) within the supply chain about various aspects, e.g., birth date, animal husbandry, AW, feed, breed, medical treatments, and slaughter (Cordero-;Gutiérrez et al., 2025; Groeppel-Klein & Kirsch, 2023; Kaliji et al., 2025). Although few make use of this option at the point-of-sale (POS) when pressed for time (Groeppel-Klein & Kirsch, 2023), it is plausible that many will scan the code later.

Feng et al. (2020) envisage how different data can be visualized in the blockchain by various actors. In particular, the recording of animal husbandry and AW practices (Cordero-Gutiérrez et al., 2025; Patel et al., 2023) can provide consumers with detailed information. However, to our knowledge, there are no studies investigating how consumers react to different framings of animal husbandry and AW information provided by BCT.

We employ BCT as an example of a technology-mediated information system in which stored data are considered tamper-proof. Such systems may become increasingly relevant as information can be accessed not only at the POS but also beyond the purchase situation (e.g., at home). In principle, however, the types of information we examine could also be presented via POS displays. Thus, BCT serves as a means of smart information presentation; however, the technology itself in relation to consumers' trust in information provided by BCT is beyond the scope of the present article and has been investigated in prior studies (e.g., Garaus & Treiblmaier, 2021). Precisely because BCT enables access to more-detailed information about credence attributes, the way in which this information is framed becomes particularly relevant for consumer evaluations. The following section therefore draws on framing theory to examine how different presentations of animal husbandry information may shape consumer responses.

2.3. Framing of AW information

To convey information about AW, claims are often made in the communication policies of companies and retailers (Bech-Larsen et al., 2024). Information claims relating to AW, such as "Higher Welfare Promise – Our chickens have more room to peck, perch, and play in spacious poultry houses" (Tesco, 2025), and specifically for organic products, e.g., "Free range" (Aldi, n.d.), are found in AW product advertising. However, as noted, the question arises how consumers react to such claims when the meaning of statements such as, "Our chickens have more room," is specified. Consequently, Vigors (2019) highlights the importance of the words used and the way information is framed. Put simply, framing means that different representations of, for example, an event or a message, can influence behavior, even if they express the same content (Chong & Druckman, 2007; Tversky & Kahneman, 1981). For meat, Levin and Gaeth (1988) show that a product framed as either "75% lean" (positive frame, emphasizing leanness) or "25% fat" (negative frame, emphasizing fat content) is evaluated differently by consumers: the quality is rated significantly more highly under the positive frame than under the negative frame. While information and messages can be framed in various ways (e.g., positive vs. negative), we focus on relative and absolute (Covey, 2007). In the field of medicine, for example, the mortality reduction achieved by a drug can be described as either relative ("reduction by one-third") or absolute ("from 6% to 4%") (Perneger & Agoritsas, 2011). In that study, patients rated a drug significantly more positively when relative mortality reduction was presented compared to absolute. However, to our knowledge, no studies have investigated how consumers respond to such framing (relative vs. absolute) in the context of animal husbandry and AW. Bech-Larsen et al. (2024) address a similar issue, investigating whether original AW claims (e.g., "20% more space in the stable") should be supplemented with qualifying information (e.g., "16 instead of 20 chickens per m^2"), which substantiates and contextualizes the original claim. Both claims substantiate the same 20% improvement; however, the second condition provides additional information. To test this, Bech-Larsen et al. (2024) exposed consumers either to the original AW claim only or to the original claim plus the qualifying information. For the example of poultry housing size, there was no significant difference between the groups in response to the item, "This claim indicates that the chicken had a good life" (Bech-Larsen et al., 2024, p. 8). Building on these findings, we argue that, although Bech-Larsen et al. (2024) found no significant differences, differences may emerge in the context of organic animal husbandry.

Based on these examples, we define framing in relative terms as expressing improvements comparatively or proportionally, whereas framing in absolute terms refers to specifying the concrete numerical values underlying these improvements.

These framing formats may influence whether the information confirms or disconfirms consumers' prior beliefs about animal husbandry. When discrepancies emerge, cognitive dissonance may arise. The following section outlines this mechanism.

2.4. Cognitive dissonance and sobering realization

The psychology of eating animals is inherently complex (Loughnan et al., 2014; Rothgerber & Rosenfeld, 2021), as consumers often experience tension between disliking the harm done to animals while simultaneously enjoying eating meat. As described, this phenomenon is referred to as the meat paradox (Loughnan et al., 2010). Scientists often use insights from cognitive dissonance theory (Festinger, 1957) to explain the meat paradox (Bastian & Loughnan, 2017; Rothgerber, 2020). In general, the theory states that dissonance – mismatched relationships between cognitions – leads to psychological discomfort (Festinger, 1957). When this psychological state of arousal is related to meat, it is known as meat-related cognitive dissonance (MRCD) (Rothgerber, 2020). Rothgerber (2020, p. 2) defines MRCD "as occurring when the arousal is specifically related to one's status as a meat eater; that is, the cognitive dissonance state involves recognition of one's behavior as a meat eater and a belief, attitude, or value that this behavior contradicts, such as the aforementioned love of animals." The aversive arousal arises because of an inconsistency between cognitions (Rothgerber, 2020).

Festinger's early work did not clearly specify whether dissonance is cognitive or emotional (Sweeney et al., 2000). Ong et al. (2017, p. 61), however, emphasize that "dissonance theorists generally agree that both cognitive and affective aspects to cognitive dissonance exist." Accordingly, inconsistency between cognitions (cognitive component) in the context of meat consumption is required to elicit an aversive arousal (psychological discomfort, affective component) (Ong et al., 2017; Rothgerber, 2020). However, Ong et al. (2017) note that food-related studies on cognitive dissonance often fail to specify what exactly triggers dissonance. For instance, Weingarten and Lagerkvist (2023) focus on only one dimension of cognitive dissonance. Therefore, our study examines both cognitive and affective components as part of MRCD. The affective component is referred to hereafter as psychological discomfort. The cognitive component, which we refer to as a "sobering realization" in the present context, is explained below.

The literature identifies several paradigms, all of which assume that

cognitive inconsistency triggers dissonance (Harmon-Jones & Harmon-Jones, 2007; Ong et al., 2017). One particularly relevant paradigm for our study is the belief disconfirmation paradigm (Harmon-Jones & Harmon-Jones, 2007), which demonstrates that individuals experience dissonance when confronted with information that is inconsistent with their beliefs. In our context, consumers generally hold positive attitudes toward AW-friendly products (especially organic meat), while possessing limited knowledge of organic animal husbandry, leading to high expectations and idealized perceptions (Kühl et al., 2023). Based on this reasoning, beliefs and reality may diverge depending on the type of information provided. This cognitive discrepancy may be experienced as a sobering realization when consumers encounter information that highlights a mismatch between their idealized expectations and the actual conditions, even under more AW-friendly production systems. Such a sobering realization (cognitive component) may, in turn, give rise to aversive arousal in the form of psychological discomfort (affective component) (Ong et al., 2017; Rothgerber, 2020). In the present context, we therefore define dissonance as a construct consisting of a cognitive component, namely the sobering comparison of expectations regarding AW and the information received, and an affective component, which leads to psychological discomfort as a result of the sobering realization. In our empirical studies, we will consider the affective component to be a consequence of the cognitive component.

Various mechanisms may be activated to reduce dissonance (Rothgerber, 2020). While behavioral change toward a meat-free diet represents one possible reduction strategy, Rothgerber (2020) notes that such behavioral adjustments are relatively uncommon. Nevertheless, empirical studies demonstrate that dissonance can increase the choice of vegetarian dishes or reduce the willingness to eat meat (Bouwman et al., 2022; Isbanner et al., 2025; Tian et al., 2016; Weingarten & Lagerkvist, 2023). Beyond behavioral change, dissonance can be reduced through attitude change (Harmon-Jones & Harmon-Jones, 2007). In meat-related contexts, this may manifest in various forms, including devaluing farm animals by attributing lower emotional capacities to them, or engaging in pro-meat justifications by portraying meat consumption as natural or necessary (Rothgerber, 2020). In addition, responsibility attribution plays a role in dissonance reduction. Consumers may engage in "third-party blame" by holding retailers or policymakers accountable for insufficient AW standards rather than assuming personal responsibility (Miele, 2010; Rothgerber, 2020). According to this view, consumers themselves think they can do little to improve AW (Rothgerber, 2020). However, little attention has been paid to the question of whether dissonance can also devalue the perception of the quality of the product itself, an issue we will address in this article.

Prior research found that higher dissonance is associated with lower satisfaction and greater difficulty in evaluating product quality (Sweeney et al., 2000). In the present context, this suggests that discomfort arising from a discrepancy between expectations and production realities may manifest in less-favorable anticipated overall quality evaluations of the respective meat product.

2.5. Contribution and hypotheses

To our knowledge, no prior research has examined how differently framed animal husbandry and AW information delivered via technology-mediated systems such as BCT shapes consumer evaluations. The present study conceptualizes BCT as a high-transparency information context in which the framing of credence attributes becomes particularly significant. The contribution of this paper lies in examining whether the framing of information influences the perception of anticipated overall meat quality and purchase intention. Specifically, we propose that differently framed information delivered via a high-transparency, technology-mediated channel (BCT) may evoke a sobering realization, which in turn may elicit psychological discomfort and ultimately relate to less-favorable evaluations of anticipated overall meat quality.

This research aims, first, to contribute to the theoretical understanding of the significance of framing in the field of food research. Second, it investigates, from a more application-oriented perspective, how information related to higher-welfare products can be communicated more effectively in markets where credence attributes are central. This is not only a socio-politically relevant objective but also highly important for suppliers and retailers, who must communicate effectively the advantages of their higher-priced offerings.

Providing additional information on the meaning of an AW label appears to be a promising communication strategy to meet consumers' demands for more transparency. However, consumer knowledge about organic animal husbandry practices is still low (Bayer & Kühl, 2024b). Kühl et al. (2023) argue that this lack of knowledge, combined with generally positive attitudes, fosters high expectations and idealized perceptions. In line with this, Ingenbleek and Krampe (2022) emphasize that actual standards, particularly in welfare-enhanced or organic husbandry systems, may differ substantially from consumers' perceptions. Larger discrepancies may emerge when consumers are confronted with inconsistent information about specific practices (Kühl et al., 2023). This assumption aligns with the argument proposed by Ingenbleek and Krampe (2022), that even in organic farming, actual conditions often deviate from consumers' idealized notions. They illustrate this with the example of longer rearing periods for organic poultry compared to conventional systems: in organic farming, slow-growing breeds must be reared for at least 81 days, whereas fast-growing breeds in conventional production reach slaughter weight in about 40 days. According to the authors, this factual difference may fall far short of consumers' expectations of a "long and happy life" (p. 3) when choosing AW-friendly products. Hence the question arises whether the framing of additional information affects consumers' anticipation of overall meat quality.

Specifically, we argue that information, for instance about rearing periods in organic vs. conventional systems, can (similar to Bech-Larsen et al. (2024)) be framed either in absolute terms (such as, "81 days compared to 40 days in conventional production") or in relative terms (such as, "Twice as long as in conventional production"). Both sentences describe the same improvement: a 100% increase in the rearing period. However, we assume that information framed in absolute terms (compared to framed in relative terms), by providing the actual numerical conditions, leads to perceptions of lower-anticipated overall meat quality because consumers often hold different expectations of husbandry practices. For instance, they may perceive the rearing period as extremely short (less than three months), even though this practice represents a clear improvement on conventional farming. In contrast, we assume that information framed in relative terms leads to perceptions of higher-anticipated overall meat quality because it highlights improvement ("Twice as long as in conventional production"). Therefore, and contrary to the empirical evidence suggesting that additional information is perceived positively (Cornish et al., 2020; Hoogland et al., 2007; Schütz et al., 2023), we argue that the effect depends on the type of information.

It is important to emphasize here that framing information in relative terms is factually as accurate as framing in absolute terms. The formulations are not unclear or misleading in terms of content, but rather use a different communicative frame. The use of relational formulations therefore does not imply deliberate misrepresentation, despite not using "hard numbers." These differences may influence how consumers interpret and evaluate higher-welfare products. This is particularly relevant considering that, for instance, in the EU, around 90% of broiler production still comes from intensive systems, while less than 10% originates from alternative systems (e.g., free-range or organic) (Better Chicken Commitment, n.d.). Our study focuses on user-oriented quality as one type of food quality, referring to the consumer's subjective perception (Brunsø et al., 2002). From a consumer perspective, quality does not primarily concern objective attributes, but rather perceived or experienced quality (Steenkamp, 1990). Brunsø et al. (2002) emphasize

that, from a consumer perspective, food quality is a multidimensional construct that can be divided into four dimensions: taste and appearance, health, convenience, and process. In our study, we do not address the taste and appearance or convenience dimensions, which are difficult to assess within an experimental setting. Instead, we focus primarily on the process dimension, which covers production-related aspects such as organic farming and AW, and to a lesser extent on the health dimension, both of which represent credence attributes (Brunsø et al., 2002). Taken together, these aspects form what we refer to as the anticipated overall meat quality. Based on this reasoning, we propose our first hypothesis:

Hypothesis 1. Additional information framed in relative terms about organic animal husbandry, delivered via BCT, leads to higher anticipated overall meat quality than additional information framed in absolute terms.

To examine the psychological processes that may underlie this main effect, we propose that two processes may play a role.

First, additional information framed in absolute terms exposes consumers to explicit figures that reveal the reality of production practices. Given consumers' generally positive attitudes but limited knowledge of husbandry practices (Kühl et al., 2023), we assume that information framed in absolute terms may be experienced as a sobering realization. As an example, Lusk (2018) shows that consumers systematically overestimate the lifespan of broiler chickens, with most respondents believing that broilers live about twice as long as they actually do. By contrast, information framed in relative terms directs attention toward relative improvements rather than absolute conditions. Thus, we assume that this process may result in lower perceived inconsistency – that is, a lower degree of sobering realization.

Second, we assume that sobering realization (cognitive inconsistency) may give rise to aversive arousal perceived as psychological discomfort. The greater the sobering realization, the stronger the associated psychological discomfort. Consumers who feel discomfort may question whether the meat really meets "good" quality standards. Conversely, information framed in relative terms may result in a less pronounced sobering realization and, consequently, a lower level of psychological discomfort, which in turn may be associated with more favorable evaluations of anticipated overall meat quality.

Based on this reasoning, we propose the following hypothesis:

Hypothesis 2. The positive effect of additional information about organic animal husbandry framed in relative (vs. absolute) terms, delivered via BCT, on anticipated overall meat quality is serially mediated by a less-sobering realization and lower psychological discomfort.

We also argue that information framed in relative (vs. absolute) terms fosters higher purchase intentions for organic meat. This reflects the idea that communication should emphasize the comparative advantages of organic production without absolute figures that may obscure these benefits. Framing information in relative terms that highlight improvements over conventional standards may, therefore, strengthen consumers' willingness to buy organic products.

Hypothesis 3. Additional information framed in relative terms about organic animal husbandry, delivered via BCT, leads to a higher purchase intention than additional information framed in absolute terms.

3. Explorative pre-study to analyze the relevance of AW information

Since BCT was still relatively unknown in the food sector in 2023, we conducted an explorative pre-study ($n = 142$; 54.9% female; 61.2% aged over 50) at the POS in the (pre-packaged) poultry section of a hypermarket. We focus on poultry, as it plays an increasingly important role in global meat production and consumption. Forecasts indicate that poultry consumption will continue to rise worldwide, including in the EU, where it is expected to replace other meats such as beef and pork (OECD & FAO, 2025).

The aim of this survey was to examine whether consumers are, in principle, interested in receiving additional information about poultry via BCT. Participants were asked to imagine that, by scanning a QR code, they could access a wide range of information beyond what is on the product packaging. They were then presented with seven aspects of animal husbandry for which additional information could be provided and asked to indicate which would be particularly relevant to them when purchasing poultry, if they were available. Participants could select a maximum of two aspects: date of slaughter, age at slaughter, name of slaughterhouse, date of birth, poultry housing size, feed used, and medical history of the animal (including information on medication used, e.g., antibiotics). The results show how relevant the information is to consumers: medical history (51.4%), poultry housing size (45.1%), feed used (38.7%), date of slaughter (24.6%), name of slaughterhouse (16.9%), age at slaughter (15.5%), and date of birth (2.8%).

Some aspects of these findings form the starting point for our experimental studies. However, the way these results are evaluated and interpreted is crucial for understanding the focus of the experiments. Although information about medical history and feed emerged as highly relevant, we chose not to include these aspects in the experiments. Such information can vary substantially across individual animals and farms, making standardization in an experimental setting difficult. Nevertheless, the results are relevant in that this additional information is important. Moreover, in the context of poultry production, differences in AW are often linked to variations in key husbandry parameters such as environmental enrichment (e.g., perches), diet, genetics (e.g., slow-growing vs. fast-growing broiler strains), and stocking density. These factors are considered central to determining the degree of extensiveness of a farming system and are frequently discussed in relation to AW outcomes (Marchewka et al., 2023). Building on these characteristics, we focused on two aspects that are relevant to AW, readily understandable for consumers, and particularly suitable for operationalizing comparisons between conventional and organic production systems: slaughter age (respectively slow-growing vs. fast-growing) and stocking density (respectively poultry housing size). Furthermore, both aspects represent relevant factors of interest to consumers, as demonstrated by the explorative pre-study.

In summary, it became apparent that consumers are generally interested in additional information provided by BCT. All participants expressed interest in such information (selecting at least one aspect), especially regarding husbandry practices. Based on this, we first focused on slaughter age (respectively slow-growing vs. fast-growing) as an intuitively understandable indicator of AW. This is appropriate because consumers associate improved AW with a "long and happy life" (Ingenbleek & Krampe, 2022, p. 3). This information can be communicated easily (framed in either absolute or relative terms), allowing us to test the main effect. Next, we extended the investigation to stocking density (poultry housing size). This sequential approach enabled us to examine whether the observed effects are relevant across different types of husbandry information. Furthermore, respondents' objective blockchain knowledge was low: in the BCT knowledge test, approximately 70% selected "I don't know" when answering the questions. This was taken into account in the studies.

4. Study 1

The main objective of Study 1 was to provide evidence for H1 (main effect). We assumed that additional information framed in relative (vs. absolute) terms about organic animal husbandry positively affects anticipated overall meat quality.

4.1. Method

4.1.1. Participants

A total of 196 people participated in the survey, mainly recruited by

students as part of a university course. The prerequisite was at least occasional consumption of poultry. Participants were asked to complete the survey on a PC or tablet, but not on a smartphone. Exclusions were applied for the following reasons: not consuming poultry at least occasionally ($n = 30$), premature termination without answering the dependent variables ($n = 16$), indication that the questionnaire was not answered conscientiously ($n = 2$), incorrect responses to control checks (ensuring that the product was perceived as organic poultry; $n = 6$), processing time (under 5 min) too short $n = 2$, and answering open-ended questions without context (n = 5). This resulted in a final sample of $n = 135$ participants (57.8% females, $M_{age} = 33.29$, $SD_{age} = 13.68$), with $n = 72$ assigned to the information framed in absolute terms condition and $n = 63$ to the information framed in relative terms condition.

4.1.2. Procedure

Study 1 employed a between-subjects design, with type of information about organic animal husbandry (framed in absolute vs. relative terms) as an independent variable and anticipated overall meat quality as the dependent variable. The experimental survey was programmed in Qualtrics. After participants confirmed that they consume poultry at least occasionally, all were asked to note the information on a package of organic chicken (e.g., organic label, weight, price) as well as a QR code ("Scan the QR code to learn more"). Based on the results of the pre-study, we decided to use the lay description of BCT from the study by Groeppel-Klein and Kirsch (2023, p. 45): "Guaranteed trustworthy tracking using blockchain: For complete transparency of the entire supply chain." These stimuli on the product packaging were identical across both experimental groups. Participants were asked to imagine that they had scanned the QR code on the product packaging, which was simulated using a video, and asked to imagine that they were interested in information about the animal husbandry practices used for the organic product. Participants were then randomly assigned to one of the two experimental conditions (see Appendix Fig. A1). Subsequently, measure of the dependent variable was administered, followed by control and manipulation checks. Additional control variables were included, and sociodemographic data were collected at the end of the survey. At the end, participants were debriefed and informed that the information had been manipulated for experimental purposes and that, for instance, the brand and the farm were fictitious.

Measures: All constructs were measured on seven-point scales (1 = *strongly disagree*, 7 = *strongly agree*), unless otherwise specified. Anticipated overall meat quality (including AW) was assessed with seven items (e.g., "The poultry meat from this brand is probably of good quality" α = .92), based on Brunsø et al. (2002) and adapted from Groeppel-Klein and Kirsch (2023) (see Appendix Table A2). Several control variables were included (e.g., knowledge about poultry farming). No significant differences, including sociodemographic variables, were found between the groups. We also included a confounding check: Trust in the information provided via blockchain technology was measured with three items adapted from Groeppel-Klein and Kirsch (2023) (e.g., "The information about poultry rearing provided via blockchain is very trustworthy", α = .94) (see Appendix Table A2).

4.1.2.1. Stimulus material. In both conditions, the information referred to how animal husbandry (rearing period) in organic poultry farming compares to conventional farming (see Appendix Fig. A1), and the stimuli were developed based on relevant regulatory specifications for both organic and conventional production. In the condition with information framed in absolute terms, participants were presented with the text, "Rearing period: At least 81 days compared to 40 days in conventional breeding," whereas in the condition with information framed in relative terms, they saw the text, "Rearing period: At least twice as long compared to conventional breeding."

4.1.2.2. Manipulation check. To assess the effectiveness of the framing manipulation, a manipulation check was conducted in a separate validation sample ($n = 64$, 48.4 % females, $M_{age} = 37.81$, $SD_{age} = 13.645$). Participants were presented with the same stimuli used in Study 1, in which the information was framed in either absolute or relative terms. Participants responded to a semantic differential item explicitly measuring whether they perceived the information as framed in absolute vs. relative terms ("The information about the rearing of the poultry product, and in particular about the rearing period, was …"), anchored at 1 = "described in concrete numerical values (absolute terms)" and 7 = "described using comparative formulations (relative terms)." Results indicated that information framed in relative terms was rated as significantly higher than information framed in absolute terms (t (62) = −7.822, $p < .001$, $M_{relative\_terms} = 5.91$, $SD_{relative\_terms} = 1.729$, $M_{absolute\_terms} = 2.25$, $SD_{absolute\_terms} = 2.000$). Thus, the manipulation was successful.

4.2. Results

The results revealed that additional information framed in relative terms about organic animal husbandry led to a higher anticipated overall meat quality compared to information framed in absolute terms (t (131.510) = −1.982, $p = .050$, see Fig. 1; Cohen's $d = .336$; small-to-medium effect; Cohen (1988)). Thus, H1 was supported.

Lastly, the confounding check showed no significant differences between the groups in terms of trust in the information provided via BCT (t (133) = .209, $p = .835$, $M_{relative\_terms} = 4.56$, $SD_{relative\_terms} = 1.250$, $M_{absolute\_terms} = 4.61$, $SD_{absolute\_terms} = 1.285$).

As the experimental groups did not differ on any demographic or control variables (all $p_s > .05$), the primary hypothesis tests were conducted without covariates. To examine robustness, we re-estimated the model including frequency of poultry consumption and previous farm visit as covariates, as both variables were significantly associated with anticipated overall meat quality (see Table A4 in the Appendix) and exceeded the recommended effect size threshold of r > .20 (Spilski et al., 2018). The framing effect remained significant when controlling for these covariates (see Table A7 in the Appendix). Other measured variables were not included because they were either unrelated to the dependent variable, conceptually unrelated to the framing mechanism, or measured after the manipulation.

Correlation matrices are provided in the Appendix (Table A3: control variables; Table A4: including demographic variables) to ensure full transparency.

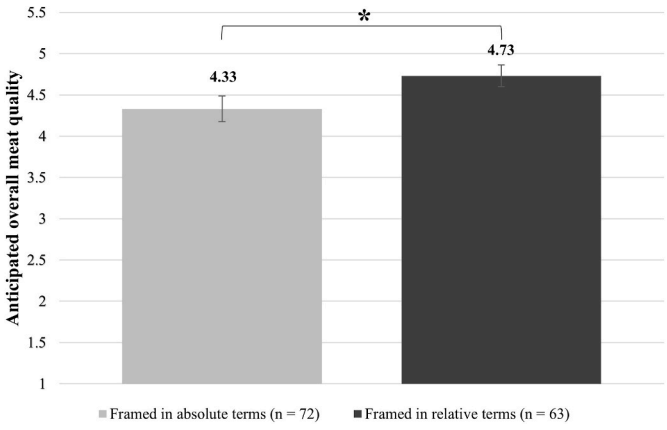

Fig. 1. Anticipated overall meat quality by type of information.
Note: Error bars represent ±1 SE. Framing in relative terms resulted in significantly higher anticipated overall meat quality than framing in absolute terms ($p = .050$). Cohen's $d = .336$. *$p \leq .05$, **$p < .01$, ***$p < .001$.

4.3. Discussion

Study 1 provides evidence for the proposed main effect with additional information framed in relative (vs. absolute) terms about organic animal husbandry leading to a higher anticipated overall meat quality.

In this context, BCT can be used to provide transparent information about animal husbandry, including specific practices and aspects. However, effective communication of meat quality depends on the type of information, with information framed in relative terms proving more effective than information framed in absolute terms.

5. Study 2

In Study 2, there were two main objectives. First, to increase confidence in the findings of Study 1, Study 2 replicates the main effect of the type of information in the context of another organic husbandry practice: stocking density (poultry housing size). Second, we aimed to examine the psychological processes that may explain why additional information framed in absolute (vs. relative) terms about organic animal husbandry may negatively affect anticipated overall meat quality.[1]

5.1. Method

5.1.1. Participants

A total of 508 people participated, again recruited by students as part of a university course. The prerequisite was at least occasional consumption of poultry. Participants were asked to complete the survey on a PC or tablet, but not on a smartphone. Exclusions were made due to not consuming poultry at least occasionally $n = 36$, premature termination without answering the dependent variables $n = 81$, the questionnaire not being answered conscientiously $n = 7$, incorrect answers to control checks (that the product is perceived as organic poultry) $n = 28$, processing time (under 5 min) too short $n = 8$, and answering open questions in Chinese or without context $n = 9$. This resulted in a final sample of $n = 339$ participants (49.3 % females, $M_{age} = 33.39$, $SD_{age} = 14.587$), with $n = 111$ assigned to the information framed in absolute terms condition, $n = 115$ to the information framed in relative terms condition and $n = 113$ to the control group.

5.1.2. Procedure

Study 2 replicated the design from Study 1, a between-subjects design with two conditions of type of information about organic animal husbandry (framed in absolute vs. relative terms) as independent variable. In this case, instead of information on the rearing period, participants were exposed to information concerning poultry housing size. Moreover, we added a control group in which consumers were not provided with any information about stocking density in organic poultry farming compared to conventional farming ("Stocking density in accordance with the organic guidelines of the EU Organic Regulations").

The questionnaire had a similar structure to that used in Study 1. The only differences were the stimulus material (type of information) and the inclusion of the mediators formulated in the hypotheses in addition to the dependent variable. Otherwise, the procedure (e.g., control variables) was identical.

Measures: All constructs were again measured on seven-point scales (1 = *strongly disagree*, 7 = *strongly agree*), unless otherwise specified. Anticipated overall meat quality was assessed, as in the previous study, with the same seven items, based on Brunsø et al. (2002) and adapted from Groeppel-Klein and Kirsch (2023). The scale demonstrated excellent reliability (α = .93). To capture the cognitive component of dissonance, participants responded to a single self-developed observed item ("To be honest, I had a completely different and more positive idea about the rearing conditions (poultry housing size) of organic poultry products"), designed to reflect the proposed sobering realization. Its conceptual basis draws on findings by Kühl et al. (2023), who emphasize that "becoming aware of the gap between individual expectations and the reality on farms" (p. 40) can play a central role in shaping consumer responses. Psychological discomfort was assessed using the five-item scale from Weingarten and Lagerkvist (2023), measured on a seven-point semantic bipolar scale ("How do you feel after reading the information about raising the animal (poultry housing size)?": relaxed-distressed, easy-uneasy, comfortable-uncomfortable, pleased-bothered, calm-upset, α = .90). Weingarten and Lagerkvist (2023) refer to this as cognitive dissonance. However, as noted above, this scale captures only the affective dimension of dissonance. Accordingly, we refer to this measure as psychological discomfort rather than cognitive dissonance, as the cognitive component is not directly assessed.

Purchase intention was captured with a single item on a 100-point scale ("How likely are you to buy this product?"). Again, several control variables were included. No significant differences, including sociodemographic variables, were found between the groups. We also included a confounding check: Trust in the information provided via blockchain technology was again measured with three items adapted from Groeppel-Klein and Kirsch (2023) (e.g., "The information about poultry rearing provided via blockchain is very trustworthy", α = .90) (see Appendix Table A2).

5.1.2.1. Stimulus material. The stimulus material was based on Study 1, but referring to stocking density (poultry housing size) as the husbandry practice, again contrasting information framed in absolute vs. relative terms (based on relevant regulatory specifications). As mentioned, we added a control group with the text, "Stocking density in accordance with the organic guidelines of the EU Organic Regulation." This group was included to test whether consumers value additional, more-detailed information about animal husbandry compared to a simple reference indicating compliance with the EU Organic Regulation. The different stimuli are shown in Fig. 2.

5.1.2.2. Manipulation check. To assess the effectiveness of the framing manipulation, a manipulation check was again conducted in a separate validation sample ($n = 81$, 51.9 % females, $M_{age} = 28.49$, $SD_{age} = 12.610$). Participants were presented with the same stimuli used in Study 2, in which the information was framed in either absolute or relative terms. Participants responded to a semantic differential item, similar to that used in Study 1, explicitly measuring whether they perceived the information as framed in absolute versus relative terms ("The information about the rearing of the poultry product, and in particular about the poultry housing size, was …"), anchored at 1 = "described in concrete numerical values (absolute terms)" and 7 = "described using comparative formulations (relative terms)." Results again indicated that information framed in relative terms was rated as significantly higher than information framed in absolute terms ($t(79) = -12.087$, $p < .001$, $M_{relative\_terms} = 5.74$, $SD_{relative\_terms} = 1.519$, $M_{absolute\_terms} = 1.81$, $SD_{absolute\_terms} = 1.402$). Thus, the manipulation was successful.

5.2. Results

The results replicated H1, which stated that additional information framed in relative (vs. absolute) terms ($M_{relative\_terms} = 4.69$, $SD_{relative\_terms} = 1.264$) about organic animal husbandry leads to higher anticipated overall meat quality ($M_{absolute\_terms} = 4.24$, $SD_{absolute\_terms} = 1.262$; $t(224) = -2.708$, $p = .007$, Cohen's $d = .356$; small-to-medium effect; Cohen (1988)), thereby confirming H1.

To test H2, we ran a serial mediation analysis using Model 6 in PROCESS (Hayes, 2022; version 4.2, 5000 bootstraps). The results

[1] Study 2 was preregistered prior to data collection. The preregistration broadly specified expected effects on cognitive and affective processes (see preregistration at: https://osf.io/eh2jq/).

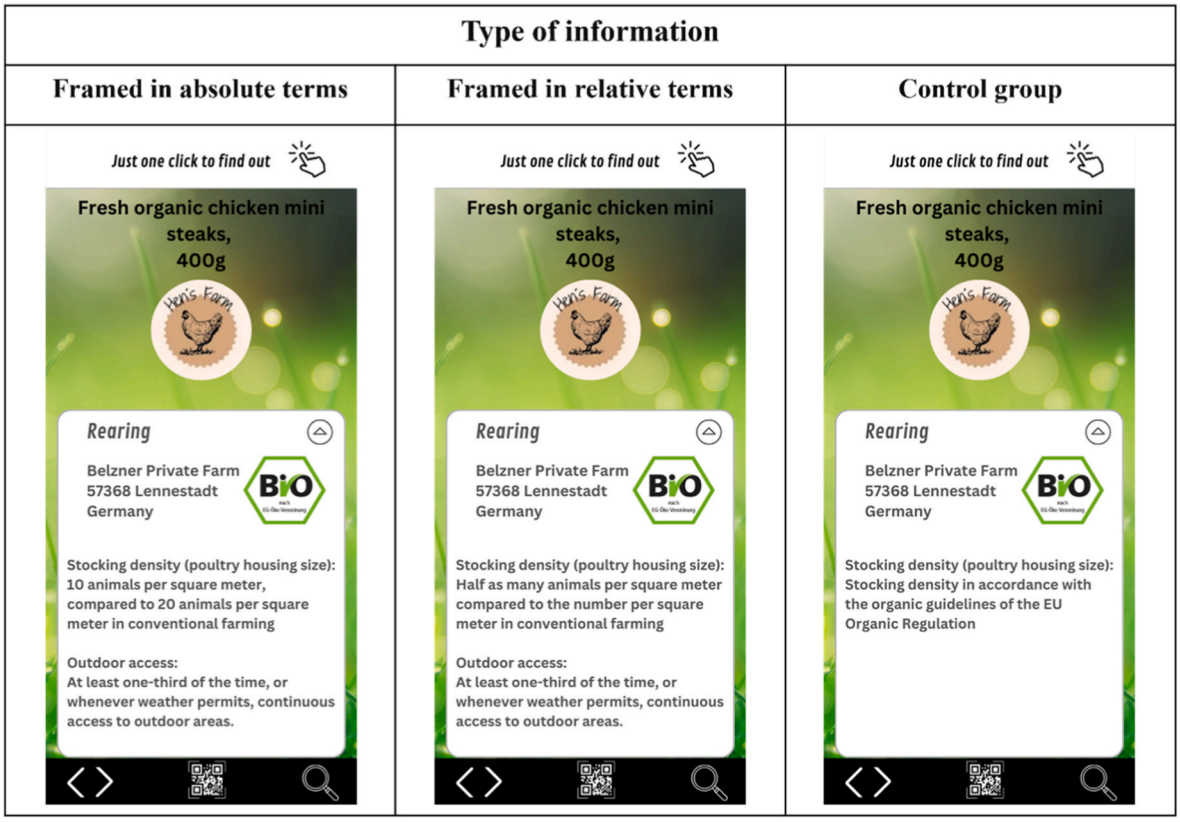

Fig. 2. Stimulus material study 2
Note: English translations are provided in the figures for illustrative purposes only.

revealed a significant positive serial indirect effect of the type of information (0 = framed in absolute terms; 1 = framed in relative terms) on anticipated overall meat quality via sobering realization (M1) and psychological discomfort (M2) (b = .067, *SE* = .029, *95% CI* [.017, .131]), as zero was not included in the confidence interval. The direct effect of the type of information on anticipated overall meat quality was not significant (p = .562). Thus, H2 is confirmed.

However, the direct effect of the experimental manipulation on psychological discomfort remained significant, suggesting that the type of information affected psychological discomfort both directly and indirectly via sobering realization. Fig. 3 illustrates the serial mediation model, Table 1 summarizes the corresponding statistical results, and Table 2 presents the descriptive statistics (including the control group) and pairwise contrasts.

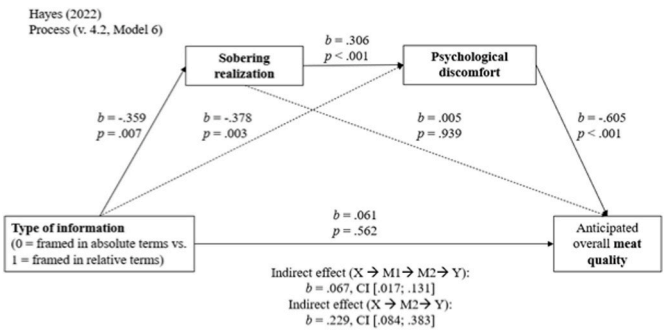

Fig. 3. Serial mediation analysis (study 2). Standardized regression coefficients are displayed. The serial indirect effect of type of information on anticipated overall meat quality via sobering realization and psychological discomfort was significant (b = .067, 95% bootstrap CI [.017, .131], 5.000 bootstraps). In addition, the specific indirect effect via psychological discomfort (X → M2 → Y) was significant (b = .229, bootstrap CI [.084; .383], 5.000 bootstraps). The specific indirect effect via sobering realization (X → M1 → Y) was not significant. The direct effect was not significant (b = .061, SE = .136, p = .562). N = 226.

Table 1
Summary of results from serial mediation analysis (study 2).

H2: Serial mediation analysis (Model 6)	Standardized coefficient (β)	Standard error HC4	*t* value	*p*
Outcome: Sobering realization (M1)				
Type of information (X) (framed in absolute vs. relative terms)	−.359	.264	−2.740	**0.007**
Outcome: Psychological discomfort (M2)				
Type of information (X) (framed in absolute vs. relative terms)	−.378	.16	−3.028	**0.003**
Sobering realization	.306	.042	4.696	**< 0.001**
Outcome: Anticipated overall meat quality (Y)				
Type of information (X) (framed in absolute vs. relative terms)	.061	.136	.581	.562
Sobering realization	.005	.039	.077	.939
Psychological discomfort	−.605	.066	−9.200	**< 0.001**
Indirect effects	**Standardized coefficient b**	**BootSE**	**BootLLCI**	**BootULCI**
X → M1 → Y	−.002	.023	−.048	.044
X → M2 → Y	.229	.076	.084	.383
X → M1 → M2 → Y	.067	.029	.017	.131

Table 2
Descriptive statistics and pairwise contrasts (study 2).

Dependent variable	Contrast	$M_1(SD)$	$M_2(SD)$	t	df	p	Cohen's d
Sobering realization	Relative vs. Absolute	3.56 (1.988)	4.28 (1.978)	−2.740	223.790	.007	.363
	Absolute vs. Control	4.28 (1.978)	3.87 (1.755)	1.648	217.924	.101	.219
	Relative vs. Control	3.56 (1.988)	3.87 (1.755)	−1.252	223.476	.212	.165
Psychological discomfort	Relative vs. Absolute	3.26 (1.180)	3.88 (1.309)	−3.830	336	<.001	.498
	Absolute vs. Control	3.88 (1.309)	3.16 (1.192)	4.412	336	<.001	.575
	Relative vs. Control	3.26 (1.180)	3.16 (1.192)	.603	336	.547	.084
Anticipated overall meat quality	Relative vs. Absolute	4.69 (1.264)	4.24 (1.262)	2.715	336	.007	.356
	Absolute vs. Control	4.24 (1.262)	4.76 (1.253)	−3.099	336	.002	.414
	Relative vs. Control	4.69 (1.264)	4.76 (1.253)	−.399	336	.690	.056
Purchase intention	Relative vs. Absolute	73.65 (20.025)	66.50 (23.964)	2.446	336	.015	.324
	Absolute vs. Control	66.50 (23.964)	68.84 (21.792)	−.796	336	.427	.102
	Relative vs. Control	73.65 (20.025)	68.84 (21.792)	1.654	336	.099	.230

Note: M_1 represents the first group listed in the contrast column. Cohen's d values represent absolute standardized mean differences (|d|). Group sizes: Framed in relative terms (n = 115), Framed in absolute terms (n = 111), Control group (n = 113).

In line with H3, there was a significant effect of additional information framed in relative (vs. absolute) terms about organic animal husbandry on purchase intention (t (214,307) = −2.429, p = .016, see Fig. 4; Cohen's d = .324; small-to-medium effect; Cohen (1988)), thereby supporting H3.

As the experimental groups did not differ on any demographic or control variables (all $p_s > .05$), the primary hypothesis tests were conducted without covariates. To examine robustness, we conducted analogous robustness checks for both the main effects and the mediation analyses, applying the same inclusion criteria as in Study 1. For H1, we re-estimated the model including frequency of poultry consumption, urban versus rural residence, and pet ownership as covariates. The framing effect remained significant when controlling for these variables (see Table A7 in the Appendix). For H2, the same covariates were included in the serial mediation model. The indirect effects remained significant. For H3, no variables met the predefined inclusion criteria; therefore, no covariates were included.

Across all analyses, variables were only included when they met the predefined empirical and conceptual criteria. All other measured variables were excluded if they were unrelated to the dependent variable, conceptually unrelated to the framing mechanism, or assessed post-treatment. Correlation matrices are provided in the Appendix (Table A5: control variables; Table A6: including demographic variables) to ensure full transparency.

Comparing the results of the respective experimental groups with the control group revealed significant differences in anticipated overall meat quality (F (2, 336) = 5.683, p = .004), psychological discomfort (F (2, 336) = 11.443, p < .001), and sobering realization (F (2, 336) = 4.064, p = .018). Descriptive means and standard deviations for all variables by groups are reported in Table 2. Planned pairwise contrasts contrasts (see Table 2) indicated that, compared to information framed in absolute terms, the control group reported higher anticipated overall meat quality and lower psychological discomfort. In terms of sobering realization, there was no significant difference. No significant differences emerged between the control group and the information framed in relative terms condition. The corresponding statistical results are shown in Table 2.

Only for purchase intention did the information framed in relative terms condition show an effect at the 10% significance level (p = .099) compared to the control condition (Fig. 4).

Lastly, the confounding check showed no significant differences between the groups in terms of trust in the information provided via BCT (all mean values above the scale mean of 4; F (2, 336) = .184, p = .832).

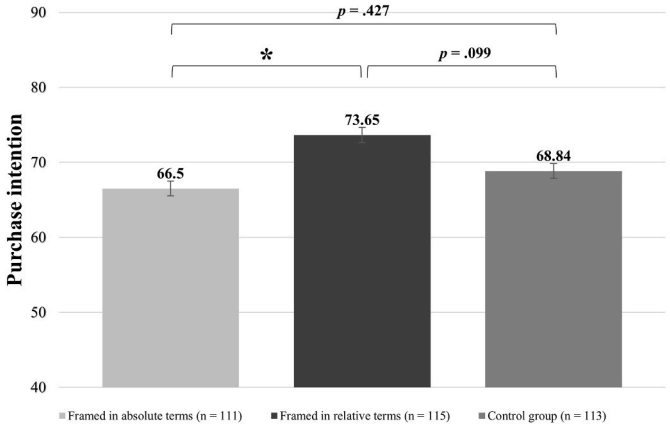

Fig. 4. Purchase intention by type of information and the control group.
Note: Error bars represent ±1 SE. Framing in relative terms resulted in significantly higher purchase intention than framing in absolute terms (p = .015). The comparison between framing in relative terms and the control group was not significant (p = .099). The comparison between framing in absolute terms and the control group was not significant (p = .427). *$p \leq .05$, **$p < .01$, ***$p < .001$.

5.3. Discussion

The main effect of additional information about organic animal husbandry on anticipated overall meat quality framed in relative compared to absolute terms was replicated. Importantly, this replication extends the findings of Study 1 by demonstrating the effect in the context of a different husbandry practice (stocking density instead of rearing period). Together, these results strengthen confidence in the robustness of the effect across different contexts of organic animal husbandry. This is consistent with the results of Perneger and Agoritsas (2011), who show that patients evaluate a drug (medical field) significantly more positively when its effects are presented as a relative rather than an absolute mortality reduction. In addition, information framed in relative (vs. absolute) terms leads to a higher purchase intention.

Moreover, we examined the explanatory processes underlying the effect of type of information on anticipated overall meat quality. Specifically, information framed in relative (vs. absolute) terms was associated with a lower level of sobering realization, which in turn was linked to lower psychological discomfort, and ultimately higher anticipated overall meat quality. This confirmed our assumption that the type of information is particularly important for communicating the benefits of AW to ensure these benefits are actually perceived by consumers. Interestingly, the direct effect of the type of information on psychological discomfort remained significant even when sobering realization was accounted for. This suggests that psychological discomfort may not only occur as an affective response to a cognitive discrepancy (sobering realization) but may also arise more directly in response to the information type itself. In other words, the results are consistent with two potential pathways: via the cognitive discrepancy reflected in sobering realization and directly via the type of information. The former was

hypothesized; the latter was not. This pattern indicates that additional mechanisms may be involved. For instance, concrete numerical information may evoke vivid mental imagery of crowded housing conditions, potentially eliciting affective reactions independent of deliberate cognitive appraisal. Relatedly, disgust may represent a relevant affective mechanism in this context (Kunst & Hohle, 2016; Mathur et al., 2021). Prior research shows that even subtle verbal cues can activate aversive responses in meat-related settings. For example, replacing the term "pork" with "pig" on restaurant menus has been found to increase feelings of disgust (Kunst & Hohle, 2016). Similarly, information framed in absolute terms about housing density may heighten the salience of potentially aversive aspects of production conditions.

In addition, psychological reactance may represent a further explanatory pathway. Reactance has been observed in the context of meat-related interventions aimed at reducing consumption (Graça et al., 2025). Although our study did not explicitly promote meat reduction, information in absolute terms may nonetheless be perceived as implicitly normative or confrontational, thereby eliciting defensive reactions in some consumers.

Nevertheless, the results also showed that the control group (without additional information about the poultry housing size) performed similarly to the group receiving additional information framed in relative terms. This contradicts prior findings that additional information leads to more positive assessments of AW or higher purchase intentions (Cornish et al., 2020; Schütz et al., 2023). Prior studies indicate that consumers tend to hold an idealized image of, and a generally positive attitude toward, organic products (Bayer & Kühl, 2024a; Crawford, 2022; Ingenbleek & Krampe, 2022), which is a possible explanation for this effect. If no additional information is provided, this positive image might remain unaffected. This interpretation may also help explain why the control group performed significantly better on various different dependent variables than the group receiving additional information framed in absolute terms. When confronted with information framed in absolute terms about the reality of husbandry practices, heightened expectations may clash with actual conditions (Ingenbleek & Krampe, 2022; Kühl et al., 2023).

6. Limitations and future research

Our study is not without limitations. First, data were collected through online surveys under controlled conditions. Future research should examine whether the observed effects also hold in real-world retail settings at the POS. It remains unclear whether consumers would actually scan QR codes, particularly when under time pressure (Groeppel-Klein & Kirsch, 2023), and, if so, how they would process the information under real shopping conditions. However, the studies presented in this paper did not focus on whether consumers actually scan a QR code but rather examined how they would react to the information if they had. Nevertheless, the question of whether consumers actually scan QR codes to obtain further information is important. In Study 2, we asked participants about their intention to scan. In all groups, this was below the scale mean, meaning that further studies are needed to examine why consumers scan at the POS. Eye tracking could be a valuable tool in follow-up studies to assess whether, and for how long, consumers attend to different types of information at the POS.

Second, we measured purchase intentions rather than actual purchase behavior. This is an important limitation, as organic products are typically more expensive, and price remains a significant barrier to purchasing (e.g., Schipmann-Schwarze & Hamm, 2020). Importantly, purchase intentions were assessed in isolation and did not require respondents to choose between higher-welfare and conventional alternatives. The design therefore does not permit conclusions about actual substitution patterns or market-level transitions. Future experimental and field studies should therefore capture real purchasing behavior and scanner data in order to validate and extend our findings.

Third, our study is situated within the specific context of German consumers evaluating organic poultry products, where expectations regarding animal welfare are comparatively high (Kühl et al., 2023). It is therefore important to examine whether the sobering effect observed in our studies generalizes to production systems positioned between conventional and organic standards, or to contexts characterized by lower baseline expectations. On the one hand, the sobering effect may be weaker when consumers compare moderately improved systems to conventional production. On the other hand, it may be amplified if consumers perceive only marginal differences between conventional and "slightly" higher-welfare systems. Future research should disentangle these possibilities.

Fourth, sobering realization was operationalized as a single self-developed observed item in the present context, reflecting the perceived discrepancy between idealized expectations and presented production realities. Although conceptually informed by the belief disconfirmation paradigm of cognitive dissonance (Harmon-Jones & Harmon-Jones, 2007), this single-item operationalization limits the assessment of construct reliability and warrants cautious interpretation of the mediation findings. Future research should therefore develop and validate a multi-item scale to more comprehensively capture this cognitive component and to strengthen the robustness of mediation analyses.

Fifth, our results showed that the direct effect of the type of information remained significant even when the sobering realization item was included as a mediator. This suggests that the information itself may evoke psychological discomfort. Future research should therefore examine further mechanisms that might account for this effect. Qualitative studies would be useful, for example, where consumers are confronted with different types of information and asked about their initial reactions. It is possible, for instance, that when consumers are confronted with concrete information such as "10 chickens per square meter in a poultry house," automatic vivid mental imagery may be triggered (Elder & Krishna, 2021), leading to psychological discomfort. This could be investigated in an additional (projective) study. Moreover, the role of pre-existing expectations warrants further investigation. The direct effect of information on psychological discomfort may depend on whether consumers hold prior (positive) beliefs about organic animal husbandry practices (Kühl et al., 2023). For consumers with positive and high expectations, framing in absolute terms may induce a sobering realization by disconfirming those beliefs, which subsequently may elicit psychological discomfort. In contrast, for consumers without clear expectations, framing in absolute terms with numerical information may function primarily as an imagery trigger, eliciting discomfort through a more-immediate affective route.

Sixth, our study focused exclusively on poultry. Future research should investigate whether the effects are replicated in other meat categories.

Seventh, perceptions of AW are not universal but vary across cultural contexts (Mata et al., 2023; Nocella et al., 2010). Cross-cultural research is thus needed to explore whether and how types of information interact with cultural norms, values, and expectations whether the framing effects observed here generalize beyond the European context.

Eighth, consumers may differ in terms of knowledge of organic husbandry practices, general attitude toward organic animal husbandry, and trust in organic animal husbandry, and can thus be divided into different clusters (Bayer & Kühl, 2024a). It would be relevant for future research to investigate whether different clusters respond differently to the types of information.

Nineth, the POS presents consumers with numerous competing stimuli, resulting in brief and limited engagement with product information. In this context, visual communication, particularly pictorial elements, may play an important role, since visual stimuli are especially effective in capturing attention (Childers & Houston, 1984; Pieters & Wedel, 2004). This raises the question of how consumers can be encouraged to scan the QR code and whether visual elements can be used to draw their attention to the BCT and the QR code, as these might

otherwise go unnoticed on the product packaging.

Furthermore, the question arises as to whether the textual information provided by the BCT, e.g., on poultry house size, should be supplemented with additional images to aid visualization of animal husbandry (Schütz et al., 2023). However, it must also be considered that indoor poultry houses, for example, can also be perceived negatively (Schröter & Mergenthaler, 2023).

Ultimately, the question arises as to how sustainable the effects of sobering realization and psychological discomfort are on consumer behavior (e.g., meat avoidance; Weingarten & Lagerkvist, 2023) – that is, whether these psychological processes influence consumption patterns in the long term. Although the present study did not constitute an intervention aimed at reducing meat consumption, the observed effects may nonetheless be short-lived. Prior research suggests that animal welfare-related informational interventions often produce primarily short-term effects (Mathur et al., 2021). Future research should therefore examine whether the cognitive and affective responses identified here persist over time or attenuate as consumers habituate to such information.

7. General discussion

This paper examines how consumers respond to different types of information about animal husbandry and AW in the context of organic poultry farming when such information is accessed via BCT. BCT enables consumers to access transparent and, as far as possible, tamper-proof information beyond what is displayed on the packaging, for example by scanning a QR code. We investigate whether additional disclosures about animal husbandry and AW (something consumers frequently demand) are associated with differences in anticipated overall meat quality and purchase intention, and which framing format appears more effective.

To our knowledge, this is one of the first studies to analyze how AW information delivered through technology-mediated systems such as BCT should be framed in order to communicate improvements without unintentionally triggering negative psychological processes. Importantly, our focus is not on consumers' adoption of BCT or their willingness to scan a QR code, but on how credence-related information should be framed once accessed through such high-transparency systems.

While previous studies suggest that providing additional information, such as further explanations about AW labels, can be a promising strategy (Cornish et al., 2020; Hoogland et al., 2007; Schütz et al., 2023), our findings show that under certain conditions, additional information may lead to lower anticipated overall meat quality and purchase intention. Hence, the type of information plays a crucial role in effective communication, thereby extending existing knowledge on how consumers respond to AW communication. The results show that the type of information has a significant influence. Additional information framed in relative terms leads to higher anticipated overall meat quality and purchase intention compared to additional information framed in absolute terms. This is consistent with evidence from the medical field showing that framing information in relative vs. absolute terms influences patients' medication preferences (Malenka et al., 1993), and that patients evaluate a drug significantly more positively when its effects are presented as a relative rather than an absolute mortality reduction (Perneger & Agoritsas, 2011).

Information framed in relative terms was associated with a lower level of sobering realization than information framed in absolute terms. This, in turn, was linked to lower psychological discomfort and ultimately to higher anticipated meat quality.

If communication is framed in absolute terms, there is a risk that genuine improvements in AW will not be recognized or valued by consumers. Instead, it may undermine the perception of progress and, consequently, reduce consumers' willingness to purchase organic products. However, from a broader AW perspective, a reduced willingness to purchase meat does not necessarily constitute an undesirable outcome (if the ethical objective is to reduce overall meat consumption irrespective of husbandry conditions). The present findings relate to how higher-welfare products are evaluated when consumers consider meat purchases, rather than to whether meat should be consumed at all. Importantly, purchase intentions were assessed in isolation and did not require respondents to choose between higher-welfare and conventional meat options. Accordingly, the results do not permit conclusions about actual substitution patterns or market-level transitions. At the same time, given that the vast majority of poultry production remains rooted in conventional (intensive) broiler systems (around 90%) (Better Chicken Commitment, n.d.), facilitating a transition from conventional to higher-welfare options represents an important pathway for improving AW within existing consumption systems. From this market-transition perspective, encouraging consumers who choose to purchase meat to opt for higher-welfare alternatives remains a relevant objective. In this context, the type of information provided plays a crucial role in shaping whether such products are perceived as attractive options.

Ultimately, the results also show that, somewhat surprisingly, the control group (without additional information) performed similarly to the group that received additional information framed in relative terms. In contrast, the control group performed much better than the condition with information framed in absolute terms. This constitutes an important practical contribution. For retailers and suppliers, complying with consumers' desire for more transparency (as shown in the pre-study) carries the risk that products with information framed in absolute terms may be evaluated more negatively than when only a general statement, such as, "In accordance with organic regulations," is provided. If additional information is communicated, information framed in relative terms proves to be more effective. At the same time, the finding that framing in relative terms appears to be more effective raises an important ethical tension. If the goal of transparency is to provide consumers with detailed information, omitting absolute figures in favor of comparative statements may be seen as strategically selective. From a strict transparency perspective, information framed in absolute terms arguably represents the most complete form of disclosure. However, this dilemma should be considered in context. Compared to highly generic statements such as "in accordance with organic regulations," or unspecific claims such as "Higher Welfare Promise – Our chickens have more room to peck, perch, and play in spacious poultry houses" (Tesco, 2025), framing in relative terms still provides concrete and quantifiable information. In this sense, it may constitute a step toward greater transparency even if it does not represent full numerical disclosure. Importantly, relational formulations are not factually misleading; rather, they present information in a comparative format that contains less numerical detail than absolute figures. Moreover, framing in relative terms did not appear to reduce trust in the information provided, suggesting that the format was not experienced as less trustworthy than absolute disclosure. Notably, similar relational descriptions have frequently been used in prior research on AW communication, for example when referring to "increased space per bird" without specifying exact stocking densities (e.g., Cornish et al., 2020), or "Animal friendly stables" in organic husbandry (Hoogland et al., 2007). This indicates that comparative framing is a common communicative practice in both academic and practical contexts.

As such, comparative framing differs conceptually from forms of "welfare washing," defined as "disinformation disseminated by an organization so as to present a public image in which the organization appears to take responsibility for animal welfare" (Bjørkdahl & Syse, 2021, p. 3), or from greenwashing, more broadly understood as "labels that promise more environmental benefit than they deliver" (Dahl, 2010, A247). It therefore remains an open question whether relative framing in the present context would constitute such practices or be perceived as such by consumers. Nevertheless, a tension remains between maximizing informational completeness and ensuring that

communicated improvements are not counterproductively undermined. Ultimately, the findings underscore that communication about animal husbandry and animal welfare is highly sensitive and can produce double-edged effects. Careful consideration of both ethical and strategic implications is therefore essential.

CRediT authorship contribution statement

Marcel Nicolas Grub: Writing – original draft, Methodology, Investigation, Formal analysis. **Andrea Groeppel-Klein:** Writing – review & editing, Supervision, Resources, Funding acquisition.

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. Written informed consent was obtained electronically from all participants prior to participation. Personal data (e.g., IP addresses) were collected only with participants' consent and analyzed in pseudonymized form. According to institutional regulations, formal ethical approval was not required for this type of online survey research. This exemption was confirmed by the independent ethics committee of the Faculty of Human and Business Sciences at Saarland University; the corresponding confirmation letter has been provided as a separate ethics document during submission.

Declaration of generative AI and AI-assisted technologies in the manuscript preparation process

During the preparation of this work, the authors used ChatGPT (OpenAI) to improve the clarity and readability of the text. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

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Declaration of competing interest

The authors have no conflicts of interest to declare.

Appendix

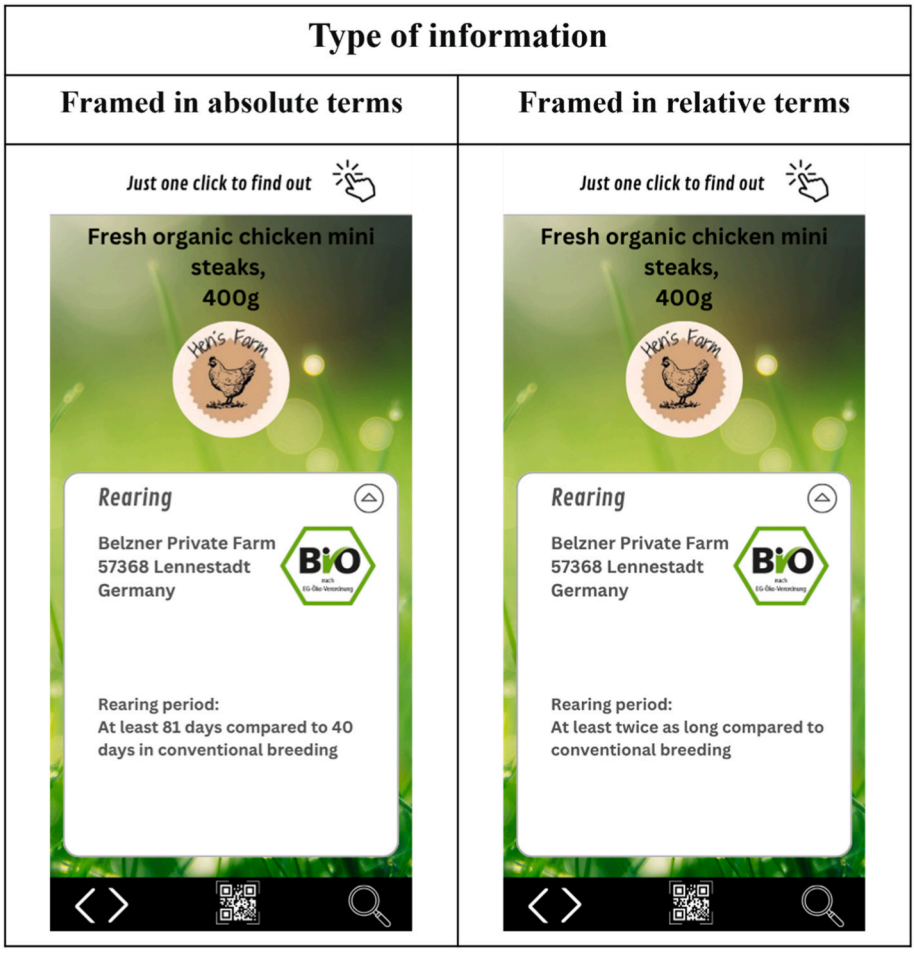

Fig. A1. Stimulus materials used in the experiment (Study 1)
Note: English translations are provided in the figures for illustrative purposes only.

Table A2
Measure (Study 1 and 2).

	Items	Sources
Anticipated overall meat quality (Study 1 and 2)	1. The poultry meat from this brand is probably of good quality 2. The poultry meat from this brand is probably healthy. 3. The poultry meat from this brand is probably free from additives. 4. The product shown comes from animals that were well cared for. 5. The product shown comes from animals that were kept in a manner appropriate to their species. 6. The animals were in good health. 7. I believe that animal welfare was very high for this poultry product. Seven-point scales (1 = strongly disagree, 7 = strongly agree)	Based on Brunsø et al. (2002) and adapted from Groeppel-Klein and Kirsch (2023)
Sobering realization (Study 2)	To be honest, I had a completely different and more positive idea about the rearing conditions (poultry housing size) of organic poultry products. Seven-point scales (1 = strongly disagree, 7 = strongly agree)	Self-developed (conceptual basis draws on findings by Kühl et al. (2023))
Psychological discomfort (Study 2)	How do you feel after reading the information about raising the animal (poultry housing size)? 1. Relaxed-distressed 2. Easy-uneasy 3. Comfortable-uncomfortable 4. Pleased-bothered 5. Calm-upset Seven-point semantic bipolar scale	Weingarten and Lagerkvist (2023)
Purchase intention (Study 2)	How likely is it that you would buy this product? 100-point scale	
Trust in the information provided via blockchain technology (Study 1 and 2)	1. The information about poultry rearing provided via blockchain is very trustworthy. 2. The information about poultry rearing provided via blockchain is very credible. 3. The information about poultry rearing provided via blockchain delivers what it promises Seven-point scales (1 = strongly disagree, 7 = strongly agree)	Adapted from Groeppel-Klein and Kirsch (2023)

Table A3
Correlations (Study 1)

Variables	M	SD	1	2	3	4	5	6
1. Anticipated overall meat quality	4.52	1.210	–					
2. Trust in the information provided via BCT	4.59	1.263	.537**	–				
3. Attitude toward BCT	4.16	1.294	.238**	.461**	–			
4. Deficits in animal welfare	5.72	1.014	−.111	−.101	−.167	–		
5. Technology affinity	5.29	1.460	−.222**	.145	.185*	.107	–	
6. Pre-existing knowledge of animal husbandry	3.08	1.346	.146	.040	.001	.013	.203*	–

Note: Values below the diagonal represent Pearson correlations. *$p \leq .05$, **$p < .01$. N = 135.

Table A4
Correlation coefficients (r, r_s) and eta (η) as appropriate (Study 1).

	Dependent variables
(Demographic) variables	Anticipated overall meat quality
Gender (nominal)	r = .006
Age (metric)	r = .093
Net household income (ordinal)	r_S = .082
Educational attainment (ordinal)	r_S = −.015
Profession (nominal)	η = .098
Urban vs. rural population (nominal)	r = −.028
Frequency of poultry consumption (ordinal)	r_S = −.261**
Pet ownership (nominal)	r = .032
Previous visit poultry farm (nominal)	r = −.338**

Note: r = Pearson correlation (point-biserial for dichotomous variable (dummy coded)); r_S = Spearman rank correlation; η = Eta coefficient; Gender (0 = female, 1 = male); Urban vs. rural population (0 = urban, 1 = rural); Pet ownership (0 = no, 1 = yes); Previous visit poultry farm (0 = no, 1 = yes). *$p \leq .05$, **$p < .01$. N = 135 (except age: n = 134 (1 missing value); except net household income: n = 133 (2 missing values)).

Table A5
Correlations (Study 2).

Variables	M	SD	1	2	3	4	5	6	7	8	9
1. Anticipated overall meat quality	4.4709	1.28056	–								
2. Purchase intention	70.1416	22.28796	.258**	–							
3. Sobering realization	3.91	2.011	−.207**	−.163*	–						
4. Psychological discomfort	3.5664	1.28094	−.611**	−.296**	.340**	–					
5. Trust in the information provided via BCT	4.3378	1.18904	.436**	.106	−.003	−.205**	–				
6. Attitude toward BCT	4.3031	1.38482	.219**	.134*	−.021	−.137*	.451**	–			
7. Deficits in animal welfare	5.4978	1.33291	−.308**	−.040	.232**	.337**	−.120	−.116	–		
8. Technology affinity	5.24	1.563	−.024	.139*	−.004	.012	.117	.154*	.227**	–	
9. Pre-existing knowledge of animal husbandry	3.1150	1.36139	−.004	−.034	.000	.054	.234**	.034	.050	.181**	–

Note: Values below the diagonal represent Pearson correlations. *$p \leq .05$, **$p < .01$. N = 226 (experimental groups).

Table A6
Correlation coefficients (r, r_s) and eta (η) as appropriate (Study 2).

	Dependent variables			
(Demographic) Variables	Anticipated overall meat quality	Purchase intention	Sobering realization	Psychological discomfort
Gender (nominal)	r = .132	r = −.126	r = −.147*	r = −.159*
Age (metric)	r = .015	r = .105	r = .084	r = −.057
Net household income (ordinal)	r_S = −.012	r_S = .157*	r_S = .009	r_S = −.095
Educational attainment (ordinal)	r_S = −.017	r_S = .041	r_S = −.122	r_S = −.153*
Profession (nominal)	η = .131	η = .209*	η = .090	η = .082
Urban vs. rural population (nominal)	r = −.216**	r = .043	r = .043	r = .072
Frequency of poultry consumption (ordinal)	r_S = −.255**	r_S = .019	r_S = .043	r_S = .175**
Pet ownership (nominal)	r = −.233**	r = −.074	r = .169*	r = .190**
Previous visit poultry farm (nominal)	r = .008	r = −.032	r = −.032	r = .064

Note: r = Pearson correlation (point-biserial for dichotomous variable (dummy coded)); r_S = Spearman rank correlation; η = Eta coefficient; Gender (0 = female, 1 = male); Urban vs. rural population (0 = urban, 1 = rural); Pet ownership (0 = no, 1 = yes); Previous visit poultry farm (0 = no, 1 = yes). *$p \leq .05$, **$p < .01$. N = 226 (experimental groups; except gender: n = 220 (6 missing values); except net household income: n = 222 (4 missing values)).

Table A7
Robustness checks including relevant covariates

Dependent Variables (DV)	Covariates included Significant correlation with DV and effect size >.20)	Robustness results	*p*-Value	Results changed?
Study 1: Anticipated overall meat quality *(H1)*	Frequency of poultry consumption; Previous farm visit	*F(1, 131)= 3.93*	.049	Effect remains significant
Study 2: Anticipated overall meat quality *(H1)*	Frequency of poultry consumption; Urban vs. rural; Pet ownership	*F(1, 221)= 6.47*	.012	Effect remains significant
Study 2: Anticipated overall meat quality; sobering realization; psychological discomfort (M1 = Sobering realization; M2 = Psychological discomfort) *(H2)*	Frequency of poultry consumption; Urban vs. rural; Pet ownership	Serial indirect effect (X → M1 → M2 → Y): *b* = .053, 95% bootstrap CI [.012, .112], 5.000 bootstraps. Specific indirect effect (X → M2 → Y): *b* = .198, bootstrap CI [.066; .334], 5.000 bootstraps). Specific indirect effect (X → M1 → Y): *b* = −.006, 95% bootstrap CI [-.054, .037], 5.000 bootstraps. The direct effect was not significant (*b* = .066, *p* = .514)	-	Effects remain significant
Study 2: Purchase intention *(H3)*	No covariates included	-	-	

Data availability

Data will be made available on request.

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