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# Resolving the Dairy Paradox: Driving Change through Visual Communication.

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## **Abstract**

To make our diets more sustainable it is necessary to reduce our consumption of animal products. This study aimed to investigate the potential of visual communication in increasing intentions of individuals to lower their dairy consumption. We explored this question by comparing reactions to three messages about welfare concerns for dairy calves, prepared in either [text-only], [text + images], or [text + video] modality. While the text message mainly educates, the visual conditions are expected to induce stronger feelings of disgust, which is linked to stronger intentions to change behaviour. A sample of 284 participants took part in a questionnaire study, in which the modality of the message was experimentally manipulated. Our analyses showed that the [text + video] modality was most effective in increasing intentions to reduce dairy consumption, demonstrating an effect of the modality on reduction intention. Based on a follow-up questionnaire, which was completed by 49 participants, a strong positive correlation was found between reduction intention and actual reduction in dairy consumption. The study's findings have implications for the development of interventions aimed at reducing dairy consumption, suggesting that video material should be included in these interventions. This addition can elicit stronger emotions, which can lead to higher intentions to reduce dairy consumption. Ultimately, this can result in behavioural change and make these campaigns more effective in reaching their goal.

## **Introduction**

There is an urgent need to reduce global consumption of animal products, as the current high consumption levels of animal products have major negative effects on the environment, human health, and animal welfare (Aleksandrowicz et al., 2016; Bonnet et al., 2020). The environmental impacts of meat are numerous and include greenhouse gas emissions, deforestation, worldwide biodiversity loss, and pollution of water, soil and air (Steinfeld et al., 2006). Health impacts include increased risk of various chronic diseases and global threats like antibiotics resistance and zoonosis (O'Neill & Grace, 2019). The current human diet is unsustainable and we should reduce our consumption of animal products to minimise destructive effects on our health, the environment and animal welfare (Godfray et al., 2018; Willett et al., 2019; McMichael et al., 2007). Western diets are particularly characterised by high consumption of animal products. In the European Union, a significant reduction in nitrogen and greenhouse gas emissions, approximately 40%, can be achieved by halving the consumption of animal products (e.g. meat, dairy products, and eggs) (Westhoek et al., 2014). Moreover, a study focusing on the Dutch population revealed that transitioning to a diet with reduced animal-based foods and increased plant-based foods would yield positive effects on both health and the environment (Biesbroek et al., 2018).

### **Meat related cognitive dissonance**

While it's evident that we need to cut back on animal product consumption, figuring out how to do it effectively presents a more challenging task. Most people in the Western world eat meat, even though most of them express moral concern for animals. The fact that people care for animals and eat them at the same time is called the meat paradox (Gradidge et al., 2021). Meat-related cognitive dissonance (MRCD), based on the cognitive dissonance theory (Festinger, 1957), can be used to explain the inconsistency between beliefs and behaviours related to meat consumption. A framework by Rothgerber (2020) based on this

concept of MRCD involves three successive components: an inconsistency, aversive arousal (the cognitive dissonance state), and the motivation to reduce the inconsistency. MRCD arises when a person acknowledges one's behaviour as a meat-eater and becomes aware of the fact that meat could cause some form of harm to either animals, the environment, and/or their own health.

This notion of an inconsistency between beliefs and behaviours is supported by a study on the attitude towards the protein transition of individuals in the Netherlands. The ethical concern regarding animal welfare is a prominent motivation for a reduction in the consumption of animal products, with 80% of the respondents expressing discomfort when confronted with the utilisation of animals within the food industry. Yet, only 7% of people in The Netherlands consider themselves vegetarian and only 1,4% vegan (Vrije Universiteit van Amsterdam & Kieskompas, 2022). This research therefore highlights a significant disparity between the beliefs and behaviours of Dutch individuals concerning the consumption of animal products. While a majority of people recognize the animal welfare issues in the factory farming industry and agree that the consumption of animal products should decrease, a substantial proportion continues to consume such products.

A study by Rothgerber & Rosenfeld, (2021) argues that a reason for these findings could be that people do not experience a feeling of cognitive dissonance every time they eat meat, as this is a ritualised and habitualized behaviour which is not accompanied by a conscious reflection. In the absence of triggers to remind people of issues related to their food choices, chronic consumption of meat will result in a decrease in the experience of MRCD. The MRCD framework furthermore suggests that people are motivated to prevent MRCD from arising, because of the uncomfortable psychological consequences of experiencing it. Three strategies that are used for this are: avoidance, wilful ignorance, and dissociation. People avoid information that increases the dissonance. It has even become a cultural norm to

avoid information about issues with meat production, which is strengthened by powerful institutions (Bastian & Loughnan, 2017). Avoidance is reinforced by physical isolation of factory farms and institutional barriers to accessing information on farm animal welfare. Wilful ignorance can be seen as an individual-level defence mechanism that complements the structural forces facilitating the avoidance of information regarding farm animal welfare. Multiple studies found that individuals choose to remain uninformed of farming practices, underestimating the suffering of livestock, due to their desire to stay ignorant. Interviewees even explicitly state that they deliberately ignore information of farming practices because they know that gaining more knowledge will cause them to feel more negative emotions when buying meat (Knight & Barnett, 2008; Onwezen & van der Weele, 2016). Moreover, individuals employ a dissociation strategy where they mentally separate the animal from the food product they consume, effectively pretending that there is no animal involvement. One way to achieve this dissociation is through a shift in language when we talk about our food, with terms like "bacon" and "hamburger" replacing direct references to the animal sources such as "pig" and "cow".

In summary, the meat paradox and MRCD describe the inconsistency between people's moral concern for animals and their continued consumption of meat. Despite recognizing the ethical issues, individuals employ strategies such as avoidance, wilful ignorance, and dissociation to prevent MRCD from arising. This leads to a significant gap between beliefs and behaviours, where many individuals express concern for animal welfare but most of them do not reduce their consumption of meat. In light of the urgency to reduce global consumption of animal products for environmental, health, and animal welfare reasons, understanding and addressing the meat paradox and MRCD are of great importance. Failure to resolve this paradox poses a significant barrier to achieving a substantial reduction in meat

consumption, hindering progress toward a more environmentally conscious and ethical food system.

### **Dairy related cognitive dissonance**

When it comes to dairy consumption, the disparity between beliefs and behaviours might be even more pronounced. Dutch individuals are becoming more aware of animal welfare issues in the animal farming industry and many are willing to reduce their meat consumption, leading to a substantial rise in the number of flexitarians in the Netherlands. However, the number of people reducing their consumption of dairy remains small (Kloosterman, 2021), even though both types of animal foods cause similar issues regarding their contribution to climate change, negative effects on human health, risk of pandemics, animal welfare, land use, water use, and water pollution (FAO, 2017). A significant part of GHG emissions from the agricultural sector is caused by the dairy industry. Certain dairy products like cheese even emit more CO<sub>2</sub> per kilogram of the product than some meat products like pork or chicken (Poore & Nemecek, 2018).

The fact that animals need to die to produce meat is common knowledge. In the case of dairy, many people still do not associate the death of animals to milk production. A Gallup poll by I&O Research looked at the knowledge and attitude of people in The Netherlands towards the Dutch dairy industry. They found that respondents generally have a positive attitude towards the Dutch dairy sector. 59% of the respondents agreed with the statement that they do not have a problem with the production of milk, because no animals are killed in the process (I&O Research, 2022). Although people might think death is not associated with dairy production, this is not the case. Cows only produce milk after giving birth to a calf. All male calves are not able to produce milk, making them unprofitable for the dairy industry. They are slaughtered directly or transported to a meat producer where they will be slaughtered in less than a year. The same happens with most female calves, because they are not all needed to

replace the milk cows. The separation of mother and calf takes place directly after birth in almost all cases, which raises a number of welfare concerns (Meagher et al., 2019). Research by Mandel et al. (2022) concluded that animals in common dairy production systems have an even higher overall likelihood of a negative welfare state than animals in common beef production systems. So although cows don't die during the production of milk, animals do need to die to make the production of milk possible. Knowledge of Dutch citizens about dairy production is lacking and incorrect, which might be causing their positive attitude.

Recognizing the similarities between meat and dairy consumption, a recent study has explored the application of MRCD to the realm of dairy. Kunze (2022) identified a dairy paradox: “many people wish to avoid harming animals, yet most people also consume dairy” (p. 11). This paradox is accompanied by various coping strategies aimed at reducing dairy-related cognitive dissonance, similar to those observed in the context of meat consumption (e.g. avoidance, wilful ignorance, and dissociation). The study by I&O Research (2022) among Dutch citizens further exemplifies this inconsistency and shows the use of these coping strategies, revealing that although many individuals disagree with dairy industry practices, they continue to purchase and consume dairy products.

Because of the detrimental effect of dairy consumption for the environment, human health, and animal welfare, it is essential to address the dairy paradox and decrease our consumption of these products. The dairy paradox might even be more difficult to solve, because of the greater lack of knowledge about detrimental effects of consumption of dairy compared to meat. Individuals must first recognize the potential harm caused by dairy consumption in order to experience cognitive dissonance. Therefore, solving this paradox requires not only confronting people with the inconsistency between their beliefs and behaviours but also providing accurate information to raise awareness about the negative impacts of dairy.

The use of coping strategies, like deliberately staying ignorant about the numerous negative impacts of dairy consumption, provides individuals with temporary relief from the dairy paradox, but fails to address the underlying conflict. It has been suggested that achieving long-term cognitive consistency requires completely eschewing the behaviour causing the inconsistency, demanding for another approach (Bastian & Loughnan, 2017).

## **Disgust**

One potential approach to achieving cognitive consistency and ultimately to resolving the dairy paradox is the experience of disgust, which is found to contribute to dietary changes. By becoming more aware of and acknowledging the ethical concerns related to dairy consumption, individuals may experience disgust, which can serve as a powerful motivator for making dietary choices that are consistent with their moral values (Buttlar & Walther, 2022).

The strategy of arousing disgust has already been employed by animal liberation activists through the use of visual communication. Graphic images and videos showcasing animal exploitation aim to induce disgust and create a subconscious motivation to avoid contributing to such harm. This approach is similar to the use of graphic warnings on cigarette packages, which has been proven to be effective in increasing disgust and strengthening behaviour change. A subconscious motivation to avoid the behaviour results from the feeling of disgust after seeing the graphic warning label (Brewer et al., 2019; Kemp, Niederdeppe, & Byrne, 2019). Research by Nabi (1998) suggests that also in the context of animal welfare, disgust is a powerful emotion that can be evoked by persuasive messages related to animal welfare, leading to strengthened attitude change among participants. Several studies (Nabi, 1998; Scudder & Mills, 2009; Melvin & Peacock, 2018) have demonstrated positive correlations between the use of shocking images and favourable changes in attitudes and behaviours concerning meat consumption. These findings support the notion that emotions



and persuasive communication can effectively capture attention and decrease the consumption of animal products (Fernández, 2020). Visual communication has the potential to disrupt the ritualized and habitual behaviour of dairy consumption by serving as a powerful trigger that prompts individuals to consciously reflect on the ethical concerns associated with dairy (Buttler & Walther, 2022). By directly exposing individuals to the consequences of their food choices, these visual stimuli make it more challenging for individuals to employ coping strategies such as avoidance, wilful ignorance, and dissociation to reduce cognitive dissonance, as they are confronted with the consequences of their food choices (Buttler & Walther, 2022).

## **Reactance**

Research by Koch et al. (2022) examined the impact of graphic health warning labels on meat packages and found that they increased participants' intention to reduce meat consumption by evoking disgust. However, the warning labels also triggered reactance, a negative arousal state that can lead to resistance and a decrease in the intention to lower meat consumption. Reactance, which is a state of negative arousal, occurs when people feel like their behavioural freedom is threatened and might motivate people to restore their freedom by doing the opposite of what is asked from them (Brehm, 1966). The graphic warning labels in the study evoked more disgust and reactance compared to warnings without the graphical images added to them. Similarly, research examining the impact of warnings on cigarette packages has indicated that graphic images on packaging may not yield the desired effectiveness due to the activation of reactance. These graphic images unintentionally elicit higher levels of reactance compared to text-only warnings by invoking a sense of threat to personal freedom. As a result, the addition of images might not be as effective as initially hoped (Noar et al., 2016; LaVoie et al., 2017).

These findings highlight the complex nature of warning labels and the need for careful design to strike a balance between evoking disgust and minimising reactance, ultimately promoting positive behavioural change.

## **Video**

Videos are found to be even more effective in evoking strong emotional responses. A study by Yadav et al. (2011) suggests that videos result in more engagement and emotional feelings compared to text. Participants stated that they experienced the video cases as more 'realistic' and 'brought to life' than the text cases, making them feel more sympathetic. Another study that looked at equivalent stories in text and video format concluded that the strength of using video is the increased engagement and interest of participants. Videos that display emotional interactions furthermore led to higher emotional engagement (Koehler et al., 2005).

These findings highlight the potential power of videos in animal activism. The immersive nature of videos, combined with their ability to evoke emotional responses and engage viewers, makes them a compelling medium for advocating for animal welfare. They have the potential to create a deeper sense of connection, empathy, and understanding among viewers, leading to increased support and action towards the cause. While text and images can provide valuable information, videos offer a dynamic and multi-dimensional storytelling platform that can communicate the complexities of animal activism in a more impactful and persuasive manner.

## **Focus of this study**

There is to date no research on the effectiveness of different message modalities in addressing animal welfare concerns and promoting a reduction in the consumption of animal products. This study aims to specifically examine how the welfare concerns for calves in the

dairy industry can be communicated effectively to the public with the result of a decrease in dairy consumption. This research will study the effectiveness of different message modalities from low to high visual intensity ([text-only], [text + images], and [text + video]) in increasing intentions of people to lower their consumption of dairy products. The main purpose of the text-only message modality is to educate individuals about the welfare concerns associated with dairy production, as there is a prevalent lack of knowledge on this topic. By providing textual information, it aims to increase awareness and potentially lead to a reduction in dairy consumption. In contrast, the image and video message modalities go beyond education and aim to evoke a stronger emotional response by vividly depicting the consequences of dairy consumption for dairy calves. The intention behind using these visual communication forms is to evoke stronger feelings of disgust, which can further motivate individuals to reconsider their dairy consumption habits.

Based on the study by Koch et al. (2022) it can be expected that visual communication has the potential to increase intentions to lower dairy consumption compared to text-only information, but this effect is contingent on the absence of increased reactance. Specifically, when the visual condition does not trigger more reactance, the increase in disgust as a result of visual communication will positively influence intentions to change behaviour. The studies by Yadav et al. (2011) and Koehler et al. (2005) furthermore show that video messages result in more engagement and stronger emotional responses. This will likely increase people's experience of disgust and will lead to an increase in intentions to lower dairy consumption. However, the higher visual intensity will likely simultaneously result in an increase in reactance, which will lower the intention to reduce dairy consumption. If reactance is high, it could undermine the positive effect of high visual intensity on increasing intentions to lower dairy consumption

The study will also assess the actual consumption behaviour of dairy products, as intentions to change may not always result in actual behaviour change. A study by Dijk (2022) found that there is an intention-behaviour gap between intentions to lower meat consumption and actual meat consumption of Dutch consumers. The results showed that changing the behaviour is hard because it is a strong habitual and convenient behaviour. This will likely also apply to dairy consumption.

This leads to the formulation of four hypotheses, with the first three centred around intentions to reduce dairy consumption, and the fourth hypothesis addressing the intention-behaviour gap by examining actual behaviour change:

**H1:** The visual intensity of the message influences the mean score of intention to lower dairy consumption. Higher visual intensity results in higher intentions to reduce dairy consumption

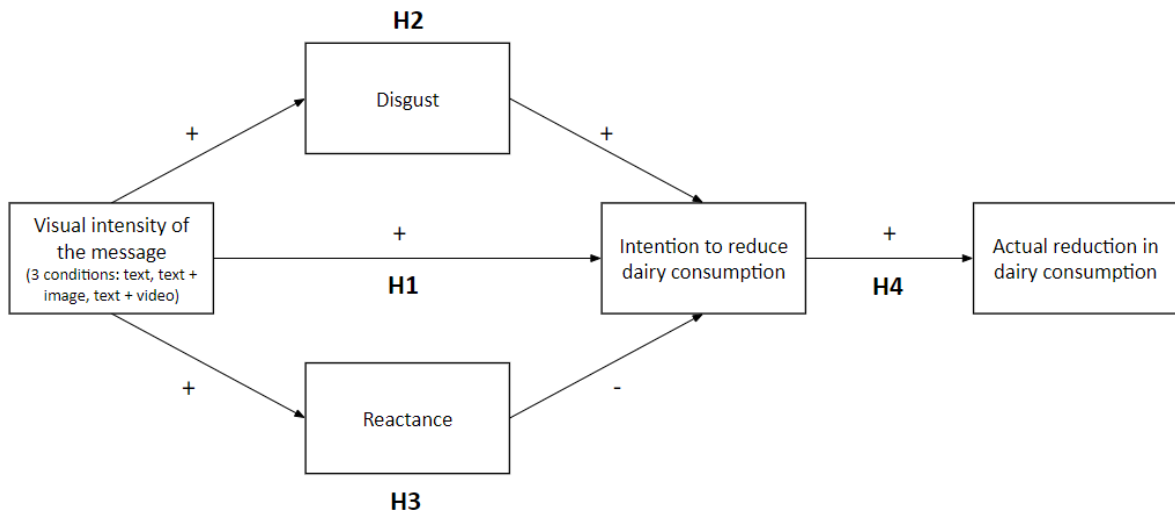
**H2:** The influence of the visual intensity of the message on intention to lower dairy consumption is mediated by disgust. Disgust increases with increasing visual intensity, which results in an increase in intentions to lower dairy consumption

**H3:** The influence of the visual intensity of the message on intention to lower dairy consumption is mediated by reactance. Reactance increases with increasing visual intensity, which results in a decrease in intentions to lower dairy consumption

**H4:** There is a positive correlation between the intention to decrease the consumption of dairy products and actual decrease in consumption.

## **Figure 1**

*Graphical representation of H1, H2 and H3, H4*



## **Method**

### **Participants**

An online questionnaire study was conducted to test the hypotheses. Participants were all Dutch individuals aged 18 years or older who reported frequent consumption of dairy (>3 times a week). They were recruited via a link to an online questionnaire, resulting in a convenience sample. A sample of 284 people completed the questionnaire (see Appendix A for information on demographics and distribution among experimental conditions). Based on a power analysis using G\*Power, for the study to have 80% power to detect an effect size of 0.20, with a significance level of  $p = .05$ , 243 participants were required. The final sample satisfied this requirement.

49 out of the 284 participants filled in the follow-up questionnaire (see Appendix A for demographics and distribution among experimental conditions). Based on a power analysis using G\*Power, for the study to have 80% power to detect an effect size of 0.50, with a significance level of  $p = .05$ , 26 participants were required. The final sample satisfied this requirement.

### **Procedure**

A link to the online questionnaire was shared through social media. Participants first received information about the study and were asked for informed consent. Next, the participant was randomly allocated to one of the three experimental conditions ([text-only], [text + images], or [text + video]), to manipulate the visual intensity of the message. This resulted in three experimental groups with increasing visual intensity as an independent variable. After the participants had been exposed to one of the three visual conditions, they answered a question about their intention to lower their consumption of dairy, which serves as the dependent variable. All participants answered questions that measured their experience of

disgust and reactance. The three experimental groups received the same questions to measure these variables, which will be studied as mediators. Next, they received questions about demographics. Lastly, the participants were asked to leave their email address to receive a short follow-up questionnaire after two weeks. This questionnaire measured self-reported behaviour change by asking the participants about their actual reduction in dairy consumption since they received the first questionnaire.

The study employed a between-subjects experimental design, utilizing independent measures as each participant was measured exclusively within one of the experimental conditions.

## **Measures**

**Intention to reduce dairy consumption.** To measure the participants' intention to reduce dairy consumption, participants indicated the extent to which they agreed with an item adapted from the Meat Attachment Questionnaire (Graça, Calheiros & Oliveira, 2015) on a scale ranging from 1 (strongly disagree) to 7 (strongly agree): 'I am willing to reduce my dairy consumption'.

**Disgust.** Four items from the Discrete Emotions Questionnaire (Harmon-Jones, Bastian & Harmon-Jones, 2016) were used to measure disgust. Participants indicated to what extent they experienced the following emotions on a scale ranging from 1 (not at all) to 7 (an extreme amount): grossed out, nausea, sickened and revulsion. The reliability of this scale was high (Cronbach's alpha = 0.93)

**Reactance.** Three items from the Reactance to Health Warnings Scale (Hall et al., 2017) were used to measure reactance. Participants indicated the extent to which they agreed with the following three statements on a scale ranging from 1 (strongly disagree) to 5 (strongly agree): 'This message is trying to manipulate me', 'The animal welfare problem in

this message is overblown', 'This message annoys me'. The reliability of this scale was high (Cronbach's alpha = 0.82).

**Decrease in dairy consumption.** Participants indicated to which extent they decreased their dairy consumption, by answering the question: 'Did you reduce your consumption of dairy products since you received the first questionnaire?' Answer options were: not at all, slightly less, a lot less, and I stopped consuming dairy completely.

## **Material**

Two online questionnaires were composed for the study (see Appendix B). Since the study is aimed at the Dutch population, the questionnaires are in Dutch.

Additionally, a message of 200 words about the life of calves from the dairy industry was used in the experimental condition of the questionnaire. This text was created for this study in collaboration with Stichting Dier&Recht. The images and video material were also provided by Stichting Dier&Recht (see Appendix C).

## **Method of analysis**

The data were analysed using IBM SPSS Statistics (Version 26) (IMB Corp, 2019). The effect of the visual intensity of the message on intention to decrease dairy consumption (H1) was tested with an ANOVA, comparing the three experimental groups. The mediation effect of disgust (H2) and reactance (H3) in the effect of visual intensity of the message on intention to decrease dairy consumption was tested with a mediation analysis using PROCESS 4.0, including intention to reduce dairy consumption as the outcome variable, visual intensity of the message as the independent variable, and disgust and reactance as mediator variables. The correlation between intention to reduce dairy consumption and actual reduction in dairy consumption (H4) was tested by calculating the Spearman rank correlation coefficient.



## Results

### Hypothesis 1

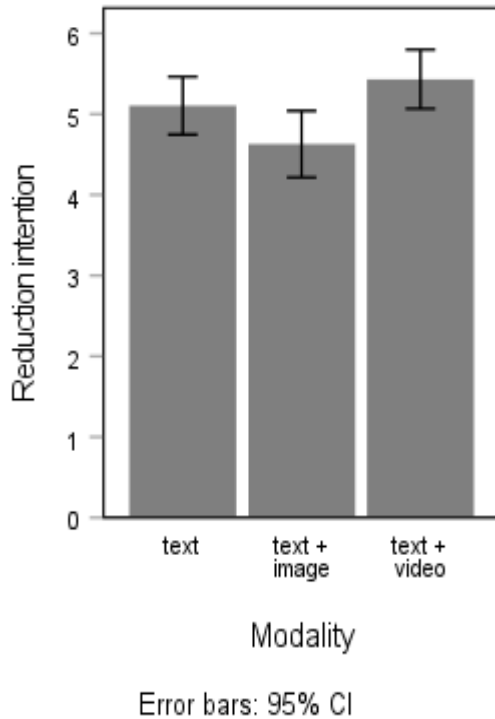
An one way analysis of variance showed that the effect of visual intensity on intention to lower dairy consumption was significant,  $F(2, 281) = 4.256, p = .015, \eta^2 = .029$ . Mean scores on intention to lower dairy consumption for the three different message modalities are presented in Figure 2.

The results of the Bonferroni post hoc test indicated that the mean score for the [video + text] modality ( $M = 5.34, SD = 1.68$ ) was significantly higher than the mean score for the [text + images] modality ( $M = 4.36, SD = 2.04$ ) ( $p = .013, 95\% CI [0.13, 1.48]$ ). However, the [text-only] modality ( $M = 5.11, SD = 1.84$ ) did not significantly differ from the video and images modalities (see Appendix D).

The results of the analysis support the hypothesis that the visual intensity of the message influences the mean score of intention to lower dairy consumption. Participants exposed to the video condition demonstrated significantly higher intention scores compared to the images condition, indicating that higher visual intensity resulted in higher intentions to reduce dairy consumption. However, counter to the hypothesis, the text condition did not significantly differ from either the video or images conditions.

**Figure 2**

*Mean scores of reduction intention across the experimental conditions.*



### **Hypotheses 2 and 3**

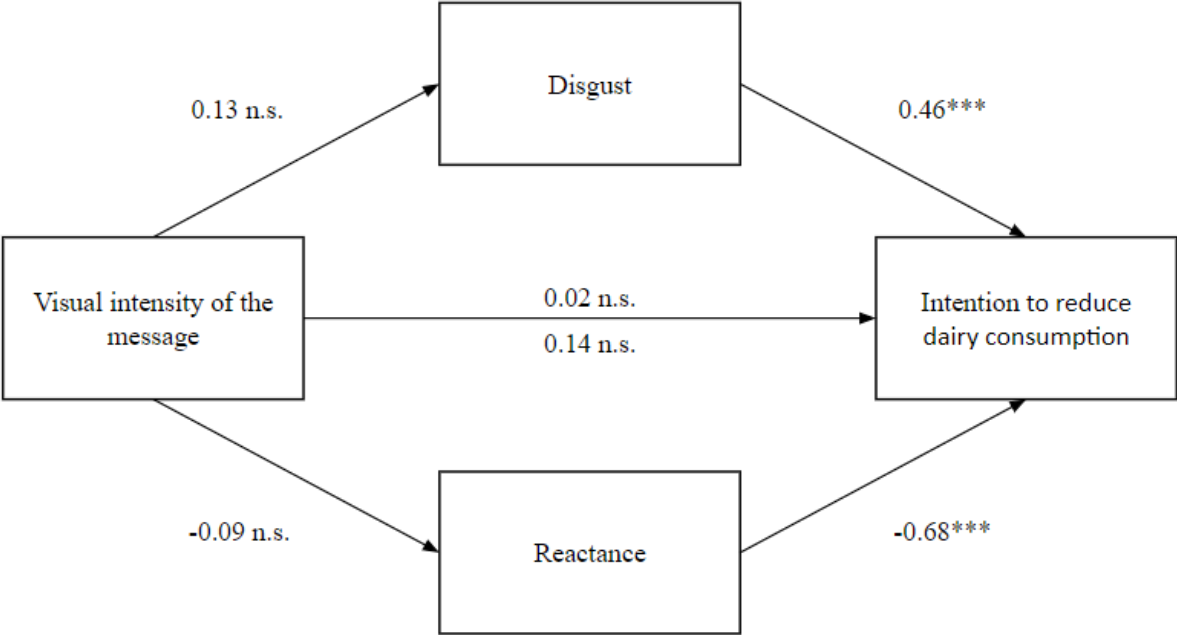
A mediation analysis was conducted, using PROCESS 4.0, to study the mediation effect of disgust and reactance in the effect of the message modality on intention to decrease dairy consumption. Intention to reduce dairy consumption was included as outcome variable, modality as independent variable, and disgust and reactance as mediator variables (see Appendix D for mean scores of these variables for the three modalities).

The results, presented in Figure 3, showed that modality did not have a significant effect on disgust and reactance. The effect of disgust on intention was found to be significant ( $b = 0.46$ ,  $t = 8.19$ ,  $p < .001$ , 95% CI [0.35, 0.57]), with higher levels of disgust resulting in an increase in intention to lower dairy consumption. The effect of reactance on intention was also significant ( $b = -0.68$ ,  $t = -7.40$ ,  $p < .001$ , 95% CI [-0.86, -0.50]), with higher levels of

reactance having a negative effect on intention to lower dairy consumption. The direct and total effect of modality on intention were both nonsignificant. Indirect effects of disgust and reactance were also nonsignificant. These results are not in line with the second and third hypotheses, suggesting that both disgust and reactance mediate the effect of the message modality on intention to decrease dairy consumption.

**Figure 3**

*Mediation analysis with unstandardized regression coefficients for the relationship between the visual intensity of the message and the intention to reduce the consumption of dairy with disgust and reactance as mediators*



\*\*\* p < 0.001. \*\* p < 0.01, \* p < 0.05

In an exploratory analysis, a mediation analysis was conducted using only the two modalities [text + images] and [text + video]. The analysis that was conducted to test the first hypothesis showed that these two modalities were the only two modalities that differed significantly in reduction intention. This exploratory mediation analysis was performed to study if the difference between these two groups is mediated by disgust and reactance.

The results, presented in Figure 4, showed that higher visual intensity had a positive, significant effect on disgust ( $b = 0.57, t = 2.20, p = .029, 95\% \text{ CI } [0.06, 1.09]$ ), but a negative, significant effect on reactance ( $b = -0.32, t = -2.03, p = .044, 95\% \text{ CI } [-0.64, -0.01]$ ). While disgust had a positive, significant effect on intention to reduce dairy consumption ( $b = 0.43, t = 5.40, p < .001, 95\% \text{ CI } [0.27, 0.58]$ ), reactance had a negative, significant effect on intention to reduce dairy consumption ( $b = -0.59, t = -4.61, p < .001, 95\% \text{ CI } [-0.85, -0.34]$ ).

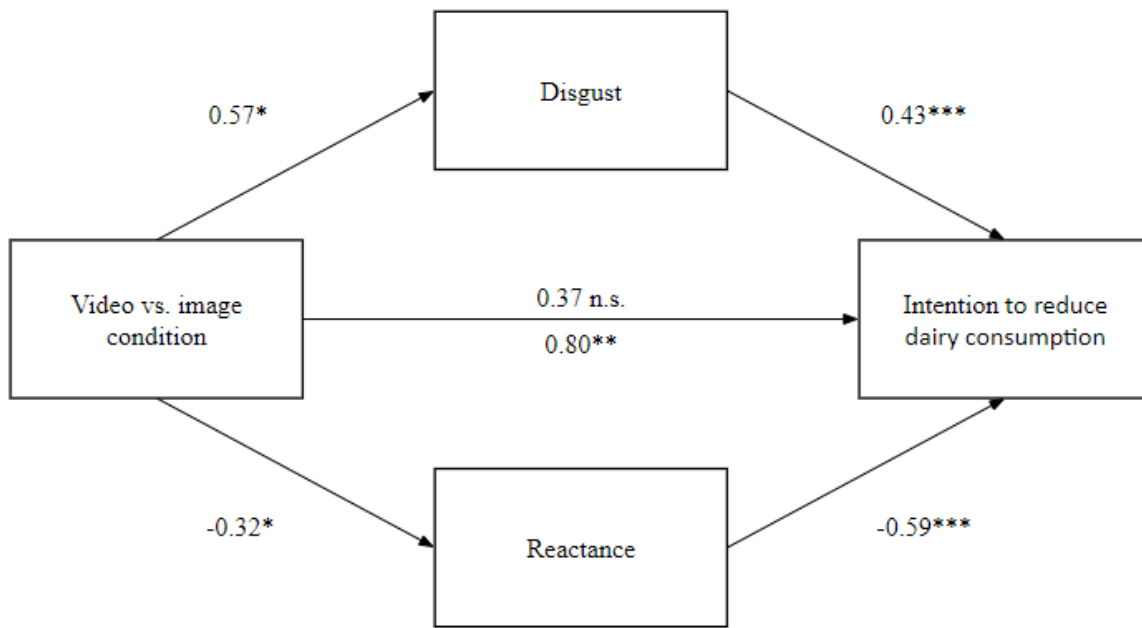
There was a significant total effect between visual intensity and intention to reduce dairy consumption ( $b = 0.80, t = 2.86, p = .005, 95\% \text{ CI } [0.25, 1.36]$ ). The indirect effect of the visual intensity on intention through disgust was also found to be significant ( $b = 0.24, 95\% \text{ CI } [0.03, 0.50]$ ). The study furthermore found a significant indirect effect of the visual intensity on intention through reactance ( $b = 0.19, 95\% \text{ CI } [0.01, 0.43]$ ).

In other words, higher levels of disgust were experienced by participants in the [text + video] modality ( $M = 4.86, SD = 1.49$ ) compared to participants in the [text + images] modality ( $M = 4.29, SD = 1.93$ ), resulting in higher reduction intentions. The increase in disgust for the [text + video] modality is in line with the second hypothesis. Additionally, lower levels of reactance were experienced by participants in the [text + video] modality ( $M = 2.25, SD = 0.92$ ) compared to participants in the [text + images] modality ( $M = 2.57, SD = 1.18$ ), also resulting in higher reduction intentions. This contradicts the third hypothesis that reactance should increase with increasing visual intensity of the message.

Furthermore, the direct effect of the visual condition on intention in presence of the mediators was found to be not significant. Hence, both disgust and reactance fully mediated the relationship between the visual intensity of the message and intention to reduce dairy consumption (see Figure 4).

**Figure 4**

*Exploratory mediation analysis with unstandardized regression coefficients for the relationship between the modality of the message ([text + video] vs. [text + images]) and the intention to reduce the consumption of dairy with disgust and reactance as mediators.*



\*\*\*  $p < 0.001$ . \*\*  $p < 0.01$ , \*  $p < 0.05$

Overall, the complete mediation analysis did not yield significant effects for the total, direct, and indirect effects. No mediation effect was found for disgust and reactance in the effect of the visual intensity of the message on the intention to reduce dairy consumption. The exploratory analysis focusing on the two significantly different experimental groups ([text + video] modality vs. [text + images] modality) revealed a significant mediation effect, demonstrating that the relationship between the message modality and intention to reduce dairy consumption was mediated by both disgust and reactance.

#### **Hypothesis 4**

To study the intention-behaviour gap, Spearman's rank correlation was computed to assess the relationship between intention to reduce dairy consumption and actual reduction in dairy consumption. Intention was measured in the first questionnaire, while the second questionnaire, administered two weeks later, measured actual reduction in dairy consumption in the two weeks after the participants filled in the first questionnaire.

The results indicated that there was a strong positive correlation between the two variables,  $r(47) = 0.56, p < .001$ . This suggests that, in line with the fourth hypothesis, individuals who expressed a greater intention to reduce their dairy consumption were more likely to follow through with their intentions and exhibit a higher degree of actual reduction in dairy consumption two weeks later.

## Discussion

The aim of this study was to compare the effectiveness of different message modalities, varying in visual intensity, in addressing animal welfare concerns and promoting a reduction in the consumption of animal products.

The analysis partly supported the first hypothesis. As expected the [text + video] modality was the most effective in increasing intentions to reduce dairy consumption, significantly differing from the [text + images] modality. However, counter to the prediction of the first hypothesis, neither the addition of images nor video material were found to be effective in increasing reduction intentions compared to the [text-only] modality.

Counter to the predictions of the second and third hypotheses, no mediation effect was found of disgust and reactance on the effect of visual intensity on reduction intention. However, the exploratory analysis, comparing the [text + images] and [text + video] modality showed that the difference between these two modalities was mediated by disgust and reactance. The [text + video] modality did evoke more disgust than the [text + images] condition, resulting in higher reduction intentions, as suggested in the second hypothesis. The exploratory analysis furthermore found that the [text + video] modality evoked less reactance than the [text + images] modality, making it even more effective in increasing reduction intentions, which is the opposite of what was suggested by the third hypothesis.

In line with the fourth hypothesis, there was a positive correlation between dairy reduction intention and behaviour, suggesting that individuals expressing high reduction intentions are found to be more inclined to translate their intentions into action.

The unexpected findings in this study call for further exploration and explanation. The initial hypothesis predicted that the addition of images to textual information would evoke more disgust and increase intentions to reduce dairy consumption compared to text-only

messages. However, the results did not support this hypothesis. The lack of an increase in disgust is probably the reason for not finding an increase in reduction intention for the [text + images] modality, since evoking disgust is the path through which images are found to be effective in increasing intentions to change behaviour in the study by Koch et al. (2022). One possible explanation for this unexpected result could be the fact that the text that was used in this study was already highly effective in evoking disgust, resulting in high mean scores for reduction intention. This could be the result of the lack of knowledge of Dutch citizens about dairy production. The images used in this study, which visually represented the text information, may not have been impactful enough to elicit additional disgust compared to the [text-only] modality. Furthermore it should be noted that the study by Koch et al. (2022) focussed on health behaviour, as well as the studies on the effectiveness of graphic health warnings on cigarette packaging that were used for the formulation of our hypotheses. Our study did, however, focus on animal welfare. It might be that the effect of adding images is different for health related warnings than for ethical warnings. This notion is supported by a meta-analysis by Seo (2020), that studied if adding images to textual information influences persuasive outcomes. The results showed that only for health messages the addition of images enhanced persuasion. In other message topics (e.g. advertisement, news, information), adding images to textual information was not found to be effective in influencing persuasion outcomes. The study furthermore stated that there is not sufficient research on the effectiveness of the addition of images to textual information and that more research is needed to increase our knowledge on this topic.

Furthermore, the unexpected finding that the [text + video] modality did not differ significantly from the [text-only] modality also requires explanation. Similar to the [text + images] condition, the lack of significant differences in disgust and reactance between the [text-only] and [text + video] modalities could suggest that the already high levels of disgust



and reduction intention in the [text-only] modality posed a challenge for the [text + video] modality to surpass these scores. The video, like the images, might not have been sufficiently shocking or impactful to evoke greater disgust than the text alone.

It is also worth considering that the design of the study, with the images placed directly below the text, may have distracted participants from fully processing the information, potentially affecting their response. In contrast, the video condition required participants to actively click and engage with the content, potentially reducing distractions and facilitating better information processing. This could be an explanation for the finding that the [text + video] modality was more effective in increasing reduction intention than the [text + images] condition.

The proposed idea of a distraction effect of the images might be explained by the Cognitive Load Theory, which could provide a valuable framework for understanding the differences in effectiveness between the modalities. According to Cognitive Load Theory by Sweller et al. (1998), when individuals are presented with multiple sources of information that can be understood in isolation, the integration of these sources can increase cognitive load instead of facilitating understanding. In the context of this study, the addition of images alongside the text, which depict the same information as explained in the text, may have introduced extraneous cognitive load. This additional load could have diverted cognitive resources away from fully processing the text, potentially reducing the impact on participants' intention to change their behaviour. This may explain why the addition of images did not lead to a significant increase in reduction intention compared to the [text-only] modality.

Furthermore, Cognitive Load Theory highlights the importance of utilizing both visual and auditory working memory to enhance effective working memory capacity. It suggests that the combination of visual and auditory information can lead to a more substantial increase in processing capacity compared to relying on a single modality alone. Therefore, the [text +

video] modality in this study might have been more effective because it engaged both visual and auditory working memory, facilitating better information processing and potentially influencing participants' intention to reduce dairy consumption.

Additionally, the findings on the mediation effect of reactance did not align with the composed hypothesis. The indirect effect of the visual condition on reduction intention through reactance as a mediator was found to be positive, which was the opposite of what was expected based on previous research. It is important to note that the hypothesis was formulated based on research conducted in the health domain, no studies were found that compared reactance to messages, varying in visual intensity, addressing animal welfare concerns. Previous studies examining reactance in relation to message formats compared [text-only] and [text + image] modalities, while the current study included [text + video] as a higher visually intense modality. The assumption was that reactance would be even higher in the [text + video] modality compared to the [text + images] modality. However, the results did not align with this expectation. A possible alternative explanation for the lower reactance in the [text + video] modality compared to the [text + images] modality could be attributed to the relational nature of videos, which promote a sense of intimacy and connection. Research by Lee and Cameron (2017) examined reactance in the context of weight management messages. The study found that participants exhibited higher levels of reactance when exposed to text-based messages compared to video messages. This finding suggests that video modalities may trigger automatic processing of information, leading to mitigated reactance compared to text-based messages. The heuristic processing of videos is likely to occur unconsciously or automatically, without the recipients being able to attribute specific reasons for finding the message persuasive. As a result, the video condition in this study may have induced a higher level of trust and acceptance, potentially reducing reactance. Furthermore, the realism heuristic, which posits that people are more likely to trust and find persuasive those things

they can see rather than merely read about, may have influenced the lower reactance in the video condition. Videos, with their life-like depiction, require less decoding or translation, promoting a sense of transparency and realism (Sundar, 2008). Consequently, the trustworthiness and credibility of the video content may have mitigated reactance compared to the image condition.

It is essential to note that this study's unexpected findings related to reactance were observed in exploratory analyses, comparing only two of the three message modalities that were studied in this research, and should therefore be interpreted with caution.

Lastly, the findings of our study did support the fourth hypothesis. However, the correlation that is found between reduction intention and actual reduction in dairy consumption is somewhat higher than correlations between intentions and behaviours found in a meta-analysis by Armitage & Conner (2001) ( $r = .47$ , 185 studies) and one by Randall & Wolff (1994) ( $r = .45$ , 98 studies). A reason for the high correlation could be that this study measured self-reported behaviour, which has a higher correlation with intention than observed behaviour (Armitage & Conner, 2001).

### **Implications**

The study's findings have implications for the development of interventions aimed at reducing dairy consumption. Based on the results, policy-makers and animal welfare organisations should consider including video material in the design of their campaigns. This addition can elicit stronger emotions and higher level of trust and acceptance, which can lead to higher intentions to reduce dairy consumption. Ultimately, this can result in behavioural change and make these campaigns more effective in reaching their goal. By incorporating such strategies, we can contribute to a more compassionate and sustainable food system.

### **Limitations and direction for future research**

While this study provides valuable insights into the effectiveness of visual communication in reducing dairy consumption and addressing cognitive dissonance, there are several limitations that should be acknowledged. These limitations open up avenues for further research to expand upon and improve the findings of this study.

Firstly, one limitation of this study is the use of a convenience sample. To recruit participants for the questionnaire, an online link was shared through social media by the researcher and by an animal welfare organization. This sampling method may introduce bias, as the sample primarily consists of individuals who are already aware of animal welfare issues and many of them reported only consuming dairy a few days per week. This could furthermore explain the high reduction intentions that are reported in the questionnaire. A more representative sample will probably result in people reporting less disgust, more reactance, and less willingness to reduce their consumption of dairy, since individuals that consume more animal products are less willing to reduce their consumption (Malek et al., 2019). This pattern was also found in this study, as individuals who reported consuming less dairy exhibited higher levels of disgust, lower levels of reactance, and stronger intentions to reduce dairy intake compared to those who consumed dairy daily (see Appendix E). Hence, the relatively high percentage of dairy reducers in the sample of this study will have influenced the mean scores of these variables. Frequency of dairy consumption was similar in the three experimental conditions, making the implications for the conclusions about the differences between the three message modalities minor (see Appendix E). Future research should aim to collect a more representative sample to study if the results remain consistent when applied to a broader population to ensure external validity of the results.

Another limitation is the limited number of respondents who completed the follow-up questionnaire, which hindered the ability to conduct a statistical analysis comparing behaviour change among the three experimental groups. It would be beneficial for future research to

address this limitation by ensuring a sufficient sample size to enable a more robust analysis of behaviour change. Additionally, the inclusion of objective measures of behaviour, such as observing actual dairy consumption instead of relying solely on self-reported data, would contribute to a more accurate understanding of behaviour change. This approach has the potential to provide a better estimate of the magnitude of the intention-behaviour gap.

In addition to tackling the limitations mentioned above, there are other interesting directions for future research. One area of interest could be investigating the long-term effects of visual communication interventions on dairy consumption. It would be valuable to assess if the observed intention to reduce dairy consumption translates into sustained behaviour change over an extended period. Longitudinal studies on this specific subject, and on interventions to reduce consumption of animal products by appealing to animal welfare in general, are lacking (Mathur et al., 2021). Such studies could provide insights into the durability and effectiveness of visual communication strategies in promoting long-term dietary shifts and should be incorporated in the design of future research.

Furthermore, future research could investigate the impact of utilizing more graphic and shocking images and video compared to those employed in this study. It can be expected that more shocking visual stimuli would evoke stronger emotional responses and potentially yield greater effectiveness in increasing reduction intention when reactance can be controlled.

Moreover, exploring the potential interaction between visual intensity and reactance is another direction for future research. Understanding how different levels of visual intensity influence reactance and subsequent intentions to reduce dairy consumption would enhance our understanding of the complex psychological processes involved in cognitive dissonance reduction.

## **Conclusion**

Overall, our study has provided initial insights into the effectiveness of different message modalities, varying in visual intensity, in addressing cognitive dissonance and reducing dairy consumption. Our analysis showed that message modality has a significant impact on reduction intentions. The [text + video] modality was most effective, significantly differing from the [text + images] modality. However, the [text + video] modality was not significantly more effective than the [text-only] modality. Furthermore the study found that individuals expressing high reduction intentions are more inclined to translate their intentions into action. However, the unexpected findings regarding the effectiveness of the different message modalities highlight the complex nature of visual communication and its impact on behavioural intentions. Cognitive Load Theory could potentially offer insights into how utilization of multiple modalities can influence cognitive load and information processing, determining the effectiveness of the persuasive message. The findings have implications for the development of interventions aimed at reducing the consumption of dairy, suggesting the inclusion of video material to increase the effectiveness of the interventions by enlarging the emotional engagement. However, it is important to acknowledge certain limitations of this study. The use of a convenience sample has implications for the external validity of the findings. Furthermore, the limited number of respondents that reported actual behaviour change in the follow-up questionnaire make it difficult to draw conclusions on the effect of the modalities on actual behaviour change. Future research should address these limitations and explore new directions to further refine and expand our understanding of how visual communication can effectively promote a change in dietary choices, contributing to the broader goal of a more ethical and sustainable diet.

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## Appendix A

### Demographics of participants and distribution amongst experimental conditions

Tables A1, A2 and A3 present demographics of participants in the first questionnaire and their distribution across the three experimental conditions. Information on demographics and distribution of participants in the follow-up questionnaire are shown in tables A4 and A5.

**Table A1**

*Demographics of participants in the first questionnaire*

		Frequency	Percent
Gender	Man	88	31,0
	Woman	193	68,0
	Prefer not to say	3	1,1
	Total	284	100,0
Age	< 25	110	38,7
	25-45	94	33,1
	46-65	68	23,9
	> 65	12	4,2
	Total	284	100,0

**Table A2**

*Distribution of participants in the first questionnaire across the three modalities*

	Frequency	Percent
Text	104	36,6
Text + images	97	34,2
Text + video	83	29,2
Total	284	100,0

**Table A3**

*Distribution of demographics across the three modalities in the first questionnaire*

			Frequency	Percent	
Text	Gender	Man	32	30,8	
		Woman	72	69,2	
		Total	104	100,0	
	Age	< 25	38	36,5	
		25-45	32	30,8	
		46-65	29	27,9	
		> 65	5	4,8	
		Total	104	100,0	
	Text + images	Gender	Man	36	37,1
			Woman	58	59,8
Prefer not to say			3	3,1	
Total			97	100,0	
Age		< 25	37	38,1	
		25-45	30	30,9	
		46-65	26	26,8	
		> 65	4	4,1	
		Total	97	100,0	
Text + video		Gender	Man	20	24,1
	Woman		63	75,9	
	Total		83	100,0	
	Age	< 25	35	42,2	
		25-45	32	38,6	
		46-65	13	15,7	
		> 65	3	3,6	
		Total	83	100,0	

**Table A4**

*Demographics of participants in the follow-up questionnaire*

		Frequency	Percent
Gender	Man	16	32,7
	Woman	33	67,3
	Total	49	100
Age	< 25	7	14,3
	25-45	19	38,8
	46-65	19	38,8
	> 65	4	8,2
	Total	49	100

**Table A5**

*Distribution across the three modalities in the follow-up questionnaire*

	Frequency	Percent
Text	19	38,8
Text + images	16	32,7
Text + video	14	28,6
Total	49	100

## **Appendix B**

### **Questionnaires used in the study**

This appendix contains the questions that were used in the first and follow-up questionnaires.

#### **First questionnaire**

De eerste vraag gaat over uw huidige zuivelconsumptie. Als u momenteel minder dan 3 dagen per week dierlijke zuivelproducten consumeert, kunt u niet deelnemen aan het onderzoek

1. Hoe vaak consumeert u dierlijke zuivelproducten?
  - 3-4 dagen per week
  - 5-6 dagen per week
  - Iedere dag

#### **[EXPERIMENTAL CONDITION]**

De volgende vraag gaat over uw bereidheid om minder dierlijke zuivel te consumeren.

Geef aan in hoeverre u het eens bent met de volgende stelling

2. Ik ben bereid om mijn dierlijke zuivelconsumptie te verminderen
  - 1 (helemaal niet mee eens) tot 7 (helemaal mee eens)

De volgende vragen gaan over emoties die u zou kunnen ervaren na het zien van de informatie over kalfjes in de zuivelindustrie. Geef van de onderstaande emoties aan in hoeverre u deze ervaart op dit moment.



3. Walging
  4. Afkeer
  5. Misselijkheid
  6. Afschuw
- 1 (helemaal niet) tot 7 (extreem erg)

De volgende vragen gaan over hoe u de informatie over kalfjes in de zuivelindustrie hebt ervaren. Geef aan in hoeverre u het eens bent met de volgende stellingen over de informatie die u zojuist gezien heeft over kalfjes in de zuivelindustrie.

7. De informatie probeert mij te manipuleren
  8. De informatie is overdreven
  9. De informatie irriteert mij
- 1 (helemaal niet mee eens) tot 5 (helemaal mee eens)

Als laatste wil ik u nog enkele demografische vragen stellen.

10. Wat is uw geslacht?
- Man
  - Vrouw
  - Anders
  - Zeg ik liever niet
11. Wat is uw leeftijd?
- Jonger dan 25 jaar
  - 25-45 jaar
  - 46-65 jaar
  - Ouder dan 65 jaar

12. Wat is het hoogste opleidingsniveau dat u hebt voltooid?

- Basisschool
- Middelbare school
- MBO
- HBO
- Bachelor universiteit
- Master universiteit
- PHD

### **Follow-up questionnaire**

De eerste vraag gaat over uw huidige consumptie van dierlijke zuivelproducten.

Kies bij de onderstaande stelling de optie die het beste bij u past.

1. Ik ben minder dierlijke zuivelproducten gaan consumeren na het invullen van de vorige vragenlijst?
- Niet gaan minderen
  - Een beetje
  - Veel minder
  - Helemaal mee gestopt

## **Appendix C**

### **Additional materials used in the experimental conditions of the first questionnaire**

This appendix contains the text that was used in all of the three experimental conditions to inform the participants about welfare concerns for calves from the dairy industry. Furthermore, the images that were used in the [text + images] modality are presented in figure B1. Both images were shown to all of the participants in the [text + image] condition. Lastly, a link to the video that was used in the [text + video] modality is included.

### **Text that was used in the experimental conditions**

Zuivel veroorzaakt dierenleed

Een koe geeft pas melk als zij een kalf krijgt. Koeien worden elk jaar zwanger gemaakt zodat ze melk blijven geven. Het kalfje wordt vlak na de geboorte weggehaald bij de moeder, want de moedermelk is voor menselijke consumptie. Er worden veel meer kalfjes geboren dan er nodig zijn om de plaats van oudere melkkoeien in te nemen. Het gevolg hiervan is dat zeventig procent van alle kalfjes uit de zuivelindustrie een restproduct is en binnen een jaar als kalfsvlees eindigt.

Zo'n jong restkalfje gaat op een leeftijd van twee weken in de vrachtwagen naar het vleeskalverbedrijf. Daar wordt hij vetgemest voor de slacht. Het kalfje staat hier wekenlang alleen in een kooi en zal nooit buiten komen. Het gebrek aan beweging en de beperkte ruimte veroorzaken stress en gezondheidsproblemen bij het kalfje. Hij krijgt twee keer per dag een emmertje kunstmelk en wat vast voer. Gras krijgt het jonge kalfje nooit. Dit ongeschikte dieet veroorzaakt maag- en darmaandoeningen en (lichte) bloedarmoede

Het leed van deze kalfjes is het indirecte gevolg van onze consumptie van zuivelproducten.

Door het kopen en consumeren van zuivelproducten stimuleren we de productie van melk en de daaruit voortvloeiende geboorte en het leed van kalfjes. Door te kiezen voor plantaardige

zuivelproducten, kunnen we bijdragen aan het verminderen van het leed van kalfjes in de zuivelindustrie.

### **Figure B1**

*Images that are used in the [text + images] experimental condition*



### **Video link**

The link to the video used in the [text + video] modality can be accessed below.

<https://youtu.be/QIRgM98su7o>

## Appendix D

### Tables of the results

Table D1 shows the ANOVA table of the effect of visual intensity on intention to lower dairy consumption. The Bonferroni post hoc test is presented in table D2. Lastly, mean scores on disgust, reactance, and reduction intention for the three experimental conditions are included in table D3.

**Table D1**

*ANOVA*

Reduction intention

	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Between Groups	29,713	2	14,856	4,256	0,015	0,029
Within Groups	980,861	281	3,491			
Total	1010,574	283				

**Table D2**

*Multiple Comparisons*

Dependent Variable: Reduction intention

Bonferroni

(I) Modality		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Text	Text + images	0,477	0,264	0,215	-0,16	1,11
	Text + video	-0,328	0,275	0,702	-0,99	0,33
Text + images	Text	-0,477	0,264	0,215	-1,11	0,16
	Text + video	-,805*	0,279	0,013	-1,48	-0,13
Text + video	Text	0,328	0,275	0,702	-0,33	0,99
	Text + images	,805*	0,279	0,013	0,13	1,48

\*. The mean difference is significant at the 0.05 level.

**Table D3**

*Mean scores on disgust, reactance, and reduction intention for the three experimental conditions*

		Mean	Std. Deviation
Text-only	Reduction intention	5,11	1,84
	Disgust	4,56	1,69
	Reactance	2,44	1,00
Text + images	Reduction intention	4,63	2,04
	Disgust	4,29	1,93
	Reactance	2,57	1,18
Text + video	Reduction intention	5,43	1,68
	Disgust	4,86	1,49
	Reactance	2,25	0,92

## Appendix E

### Tables on frequency of dairy consumption

Table E1 presents the mean scores on reduction intention, disgust, and reactance for the three different frequencies of dairy consumption, based on what participants reported at the start of the first questionnaire. Table E2 presents the distribution of frequency of dairy consumption across the three experimental conditions. Although there are some small differences, the percentages are quite similar across the experimental conditions.

**Table E1**

*Mean scores on reduction intention, disgust, and reactance for the three different frequencies of dairy consumption*

Frequency of dairy consumption		N	Mean	Std. Deviation
3-4 times days p/w	Reduction intention	106	5,88	1,37
	Disgust	106	5,06	1,52
	Reactance	106	2,19	0,85
5-6 times days p/w	Reduction intention	77	5,32	1,58
	Disgust	77	4,69	1,63
	Reactance	77	2,23	0,86
daily	Reduction intention	101	3,94	2,05
	Disgust	101	3,93	1,83
	Reactance	101	2,83	1,24

**Table E2**

*Distribution of frequency of dairy consumption across the three experimental conditions*

		Frequenc y	Percent
text	3-4 times days p/w	43	41,30
	5-6 times days p/w	27	26,00
	daily	34	32,70
text + images	3-4 times days p/w	32	33,00
	5-6 times days p/w	23	23,70
	daily	42	43,30
text + video	3-4 times days p/w	31	37,30
	5-6 times days p/w	27	32,50
	daily	25	30,10