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Influencing consumer intention with the VBN Framework:

**Analyzing the effects of value framing on consumers' intentions to
eat red meat & plant-based alternatives**

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Abstract

Global red meat consumption has been increasing rapidly in recent decades, being the major cause of environmental damage, including deforestation, land use, and water depletion. Red meat has also been linked to various health risks such as cardiovascular disease, cancer, and diabetes. Plant-based alternatives (PBAs) have been mentioned as a healthier, low-impact option, yet consumer adaptation is slow. This study applied the Value-Belief-Norm (VBN) framework to assess if young adults (18–25) from the Netherlands can be persuaded to reduce their intentions to consume red meat and increase their intentions to consume PBAs by the use of value-framed, 1-minute videos. In a between-subjects online experiment ($N = 162$), participants viewed one of five video conditions (biospheric, altruistic, egocentric, hedonic, control) before reporting intentions to consume red meat and PBAs. Manipulation checks and hypothesis tests revealed no significant effects of value framing influencing either value orientation or the intention to consume both red meat and PBA. Based on the findings we suggest that using value framing in single video exposures may be insufficient to shift dietary intentions. Future research should aim to explore value frame combinations, repeat stimulus exposures, and adjust shown value framing based on participant-dominant values.

Introduction

Global dietary patterns have shifted in recent decades toward higher consumption of animal products, especially red meat, increasing demand amongst the growing populations of nations (Godfray et al., 2018). The global production of meat has been rising, driven largely by economic growth and urbanization globally. Western diets are filled and rich with red and processed meats, this form of meat consumption has also started to spread worldwide, increasing meat demand in emerging economies (Miller et al., 2022). The consumption of meat worldwide is projected to double between 2005 and 2050 (Tilman et al., 2011). Even though some countries like the Netherlands have seen a total decline in red meat consumption in recent years, a majority of the population still overconsumes and fails to reach guidelines set out by governmental agencies (Brink et al., 2019).

Recent research on red meat's impact on health has found evidence linking diets high in red meat to elevated risks of chronic diseases. Regular consumption of red meat (especially processed forms like bacon and sausages) has been linked to an increased risk of developing cardiovascular disease, colorectal cancer, type II diabetes, and obesity (Battaglia Richi et al., 2015; Pan et al., 2012). Consequently, processed meats have been classified as “carcinogenic” to humans, and unprocessed red meat as “probably carcinogenic” by international agencies (Bouvard et al., 2015; González et al., 2020; Shi et al., 2023). Concluding that each 50-gram daily portion of processed meat raises the risk of colorectal cancer by about 18%.

The production of red meat also negatively impacts the environment through excessive land use and excessive consumption of water. Research has shown that pastures for cattle and growing food crops for livestock collectively account for 80% of land used by humans worldwide (Pendrill et al., 2019; Stehfest et al., 2009). Cattle ranching is a primary driver of large-scale deforestation (41% of tropical deforestation globally), and the ongoing expansion of pastures is contributing to major losses in biodiversity. For example, in Brazil most of the Amazon forest loss (70%) has been attributed to cattle ranching. Research has also shown that water use per calorie of beef is twenty times higher compared to agriculturally grown cereal. Showing that excessive water usage was linked to soil degradation, river pollution, and groundwater contamination (Mekonnen & Hoekstra, 2012).

Adopting plant-based alternatives (PBAs) has been identified as an essential step towards addressing health and environmental concerns associated with red meat consumption. PBAs such as legumes, soy-based products, and plant-derived meat substitutes are healthier compared to traditional meat products, making them beneficial in mitigating chronic health

risks (Curtain & Grafenauer, 2019; Qian et al., 2019). From an environmental perspective, PBAs require substantially fewer natural resources, including water and land (Poore & Nemecek, 2018). Even though consumers are being educated about the positive effects of PBAs, consumer acceptance of PBAs remains dependent upon familiarity, taste satisfaction, and perceived convenience (Monaco et al., 2024; Onwezen et al., 2021).

Thus far literature has shown that the consumption of red meat should be decreased, recommending PBAs as a more sustainable alternative. While efforts have been made to change consumer behaviour, so far this has yielded only modest results. Therefore, it is important to understand what is necessary to achieve long-term behavioural change. Targeting young adults may be a possible solution, the study of Arnett (2000) indicated that young adults (i.e., aged 18 - 25) are characterized by openness to experimentation, identity exploration, and a greater likelihood of forming long-lasting health habits. Moreover, young adults have demonstrated a higher receptivity to sustainability and ethical issues, which makes this demographic an ideal candidate for achieving long-term behavioural change regarding food consumption (Menozzi et al., 2017; Monaco et al., 2024). Therefore, this study aims to reduce red meat consumption and increase the consumption of plant-based alternatives among young adults.

VBN Theory & Theoretical framework

For predicting environmental behaviour, the value-belief-norm (VBN) theory, first proposed by Stern et al. (1999) and further evaluated and improved by subsequent research (De Groot & Steg, 2008; Steg et al., 2014; Stern, 2000) has provided a comprehensive framework to understand and analyze environmental behaviour through a causal chain of three psychological constructs, namely values, beliefs, and norms. Applying VBN theory to the context of red meat consumption, the theory suggests that individuals' environmental behaviours, such as reducing red meat intake and increasing PBA intake, are shaped by their underlying values, which influence their beliefs, and subsequently activate their personal norms which influence their behavioural intentions towards reducing environmental impacts (Stern, 2000; Stern et al., 1999).

Systematic reviews and meta-analyses have described the VBN theory being successfully used and implemented across various environmental disciplines and seeing global use since its introduction (Canlas et al., 2022; Jebarajakirthy et al., 2024; Klöckner, 2013). This is evident and the theory has been applied across a wide variety of environmental behavioural studies researching energy policies, product choices, application in different cultural contexts, and more (e.g., Angeles, 2016; Hwang et al., 2019; Lai et al., 2020; Li et al., 2018; Lima et al., 2024; Liu et al., 2018; Onel, 2024; Steg et al., 2005). The broad application of the VBN theory

thus suggests it may be useful as a framework for changing consumer behavioural intention of red meat and PBA consumption. Although this research will primarily focus on the value aspect of VBN theory, it is important to briefly describe the conventional context wherein the norm and belief components are used alongside the value aspect.

The norm component is the end stage of the VBN theory, it is described through the norm activation model (NAM), which describes that (personal) norms influence individual attitudes towards pro-environmental behaviour and intentions (Schwartz, 1977; Stern, 2000; Stern et al., 1999). Personal norms are influenced by the ascription of consequences (AC) and ascription of responsibility (AR). AC is the notion that individuals are aware of environmental consequences which influence their personal norms and AR is where individuals try to reduce these consequences by taking personal responsibility (Stern, 2000; Stern et al., 1999; Zhang et al., 2013). The relevance and validity of the norm activation model has been confirmed in the study of Steg & De Groot (2010). The research conducted three independent experimental studies, wherein the results statistically confirmed the NAM's power in explaining pro-environmental behaviour and intentions.

The belief component of the VBN theory is influenced by values, acting as a link between personal norms and values. The beliefs consist out of the new environmental paradigm (NEP), awareness of consequences (AC), and awareness of responsibility (AR) (Stern 1999; Stern, 2000). The NEP describes how individuals recognize humanity's interconnectedness with nature and the fragility of ecological systems (Dunlap et al., 2008). These also act as a causal chain, with the NEP influencing AC, which influences AR. (Stern, 2000; Stern et al., 1999; Zhang et al., 2013).

The value component of the VBN theory is the starting point of the behavioural chain. Initially, three value orientations were described: biospheric, altruistic and egocentric (Stern 1999; Stern, 2000). These three value orientations play distinct roles in shaping consumption intentions. Biospheric values focus on the welfare of the biosphere and ecosystems. Altruistic values focus on the welfare of other people. Egocentric values focus on personal benefits. The study of Steg et al. (2014) suggested the addition of hedonic as a value orientation to the VBN theory. Arguing its usefulness for environmental studies to better understand individual attitudes, preferences, and choices. Hedonic values emphasize immediate sensory satisfaction, comfort, and personal enjoyment, resulting in dietary behaviours that prioritize pleasure over environmental considerations. This was proven by conducting four studies with the results revealing that hedonic values are related to environmental topics and are distinctive for use among the other three values. The addition of the hedonic value trait has also been verified in

the study of Bouman et al. (2018) confirming the hedonic value orientation as a distinct addition for the measurement of environmental behaviour and beliefs.

For this study, we want to apply the VBN theory to influence behavioural intentions, specifically by reducing individual intention to consume red meat and increasing the intention to eat PBAs through the use of value framing in an experimental design.

Current literature has explored the influence of value frames on intention. The study of Steg et al. (2005) argued that the VBN theory could be applied to different environmental behavioural cases. Furthermore, showing the importance of targeting the value orientations for changing personal norms, in this case, mainly influenced by the biospheric value frame. Liu et al. (2018) suggested that personal norms about willingness to engage in environmental protection were predictive in a broader context. Additionally, the results showed that altruistic values positively influence pro-environmental behaviour, while egocentric values negatively influence it. Contrastingly, the study of Lai et al. (2020) showed that egocentric value concerns had a direct impact on reducing meat intake while biospheric concerns only played an indirect role. When aiming to reduce meat consumption, the study suggested the use of multiple-frame messages when communicating both pro-environmental and health consequences. Similarly, the study by Verain et al. (2022) showed that the intention of meat consumption was mainly driven by egocentric motivations, while only a minority was mainly driven by altruistic or biospheric motivations. Suggesting the development of a targeted approach in shifting dietary patterns. Contrastingly, the study of Begho (2024) found a minor difference, noting that egocentric and biospheric value frames were both related to being the main drivers of accepting meat alternatives.

In general, pro-environmental behaviour is usually more prominent in individuals who have strong biospheric and altruistic values, whereas individuals who endorse egocentric and hedonic values are less likely to do so (Bouman et al., 2018). However, regarding the consumption of red meat and PBAs, this remains inconclusive, as to which value orientations most strongly shape individual intention. For example, the effect of the egocentric value is still debated (Begho, 2024; Lai et al., 2020; Liu et al., 2018; Verain et al., 2022). This makes it important to understand which value frames are the most influential in driving the intention to eat meat and PBA. Adequate value framing would involve highlighting specific value orientations. For instance, biospheric framing would highlight ecological benefits. Similarly, altruistic framing would emphasize the societal or animal welfare benefits. Whereas egocentric framing would underscore personal benefits such as health improvements (De Groot & Steg,

2008; Stern, 2000). With hedonic framing emphasizing sensory pleasure, taste, and culinary enjoyment of sustainable alternatives (Stegh et al., 2014).

Some research related to value frames stimulating value orientations has been done. The study of (Vainio et al., 2018) showed that value framing can be used to influence behavioural intentions of consuming red meat and PBAs. The experiment, employing a between-subject design, manipulated the egocentric (health) value frame with the intent to change consumer behavioural intentions by mentioning the negative effects of red meat and the positive effects of PBAs on health. Suggesting that future research employ targeted communication forms that are familiar to the target group. This is in line with earlier research of Cordts et al. (2014) which also mentioned that focusing on showing altruistic and egocentric frames was most effective in describing the negative impact of red meat. The study design using newspaper articles was largely successful in influencing red meat intention, only noting that men were the exception. This difference between demographics suggests that targeted approaches should be used when attempting to stimulate individuals towards shifting their diet in a pro-environmental direction (Verain et al., 2022). Likewise, the study of Vainio (2019) also suggested carefully designing messaging about red meat and PBA. The results showed a negative association between red meat messaging and scientific sources, whilst showing a positive association between red meat messaging and commercial sources. Conversely, the results showed a negative association between PBA messaging and commercial sources, whilst showing a positive association between PBA messaging and scientific sources. Furthermore, the results also revealed that an egocentric health motive was associated with consuming more PBAs while a biospheric environment motive was associated with consuming less red meat.

As discussed above, influencing dietary intention requires a targeted approach and careful consideration of how the messaging is constructed. In addition, past studies have mainly used text-based stimuli in the few experimental studies that have taken place. Despite this the research of Moskell & Turner (2022) is promising, implying that video-based messaging may be more effective in influencing pro-environmental behaviour than just text, especially among individuals who are not pro-environmental. The experimental design used a between-subject design, with one half only viewing text and the other half only viewing videos. Initially, the results showed that some effects were small but significant, however, this was not enough for a conclusion about the whole sample. Interestingly this was different when they solely analyzed respondents who were not already pro-environmental before the experiment, results showed that all effects were significant.

Although current literature has demonstrated the robustness and predictive capacity of the VBN theory in explaining and predicting pro-environmental behaviours (Steg et al., 2005; Klöckner, 2013; Jebarajakirthy et al., 2021), still a research gap remains in effectively applying the VBN theory to influence dietary behaviour. More specifically, less is directly known about influencing the behavioural intentions of red meat and PBA consumption with value frames. Previous study designs mainly used surveys for measuring intentions to consume red meat and PBAs rather than attempting to directly manipulate this in an experimental design. The few experimental designs mainly used text-based stimuli instead of videos. Moreover, all four value frames have yet to be integrated simultaneously in an experimental design.

Therefore, this study aims to address these gaps by investigating to what degree value framing can decrease intentions to consume red meat and simultaneously increase intentions to consume PBAs. By conducting an online experiment, four value frames plus a control condition were represented as five separate videos that showed content specifically related to that value frame. Through measuring the intentions of young adults to eat red meat and PBAs, we attempted to answer the following research question and set of hypotheses:

RQ: Can the use of value framing in videos decrease the intention to consume red meat and increase the intention to consume plant-based alternatives?

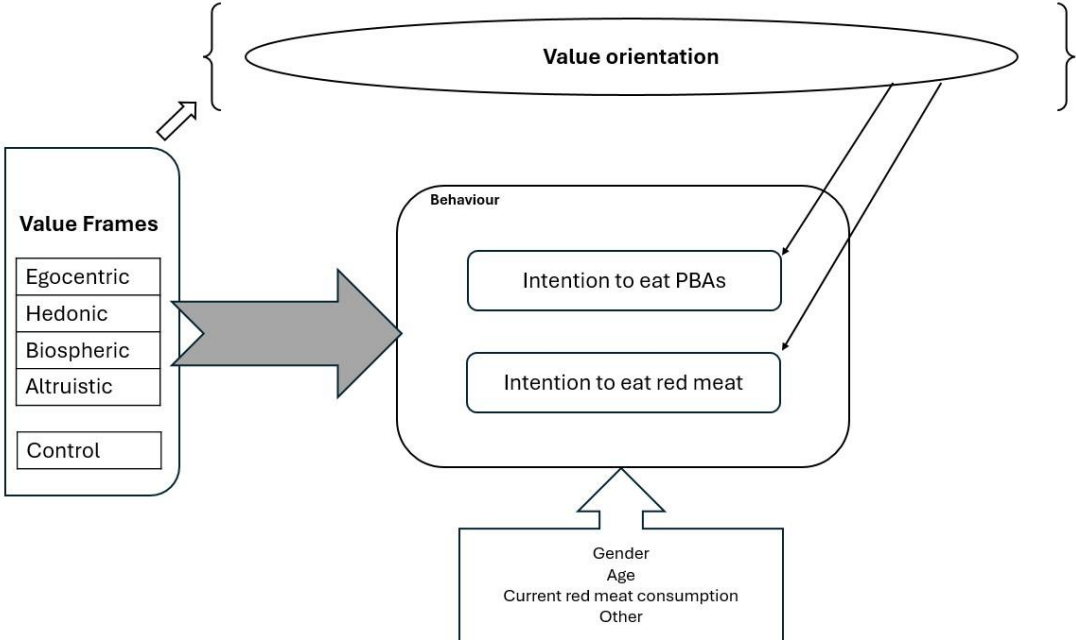
H1a: Participants exposed to a video with value framing will show a lower intention to consume red meat compared to participants who are not exposed to a video with value framing.

H1b: Participants exposed to a video with value framing will show a higher intention to consume plant-based alternatives compared to participants who are not exposed to a video with value framing.

H2a: Participants exposed specifically to a biospheric value frame will show a lower intention to consume red meat compared to participants exposed to egocentric, altruistic, or hedonic frames.

H2b: Participants exposed specifically to an egocentric value frame will show a higher intention to consume plant-based alternatives compared to participants exposed to biospheric, altruistic, or hedonic frames.

Methods



Design

The experiment used a between-subjects design. The independent variables (nominal) were randomly exposed to each participant in one of four value-frame conditions: biospheric, altruistic, egocentric, hedonic, or the control condition. After viewing participants filled in the questionnaire. This design allows us to assess the effect of value-framing on the participants’ behavioural intentions. No further ethical approval was required after filling in the form from the Ethical Committee of Humanities (see appendix).

Materials

The independent variable in our study was the framing of values, wherein the stimulus material was a 1-minute video. Operationalization was conducted by producing five video versions: four experimental versions that, each emphasized one specific value frame and one control version without any specific value framing. All videos were identical in terms of production quality, duration (one minute), and the format of the script shown as subtitles. The only difference was that the chosen video imagery and the content of the subtitles were related to each value frame (see Appendix A). The biospheric version highlighted ecological impact (e.g., loss of animal life). The altruistic version highlighted societal impact (e.g., world hunger). The egocentric version highlighted health impact (e.g., developing cancer). The hedonic version highlighted possible guilt (e.g., mistreatment of animals). The control version did not contain any value frame related message content, it only showed a recipe for fried rice. To ensure successful

manipulation of the value framing, a pre-test was conducted. Per value frame, four students of different studies were shown all videos. Afterward, the four value orientations were explained, and instructions were given to link each video to one of four frames. All videos and their value frames were perceived as intended, thus the pre-test was successful.

Subjects

Dutch participants were recruited via email invitations, social media posts, personal network, and university research participation systems. We recruited 301 participants and after cleaning the data set 162 remained, aged (ratio) between 17 and 28 years ($M = 23.2$, $SD = 2.1$). Obtained educational level ranged (ordinal) from high school to master's degree, with most participants (34%) having completed higher education (bachelor's degree). Table 1 shows the randomization check of the sample. This was tested with a Chi-square test ($\chi^2(8) = 11.84$, $p = .158$), it showed that the gender (nominal) distribution (54% female, 43% male, 1% trans-man, 1% non-binary, no-comment/self-described 1%) of the whole sample across the value frames did not differ significantly from the expected split. Thus, the random distribution of the sample and of gender was successful across each experimental condition.

Table 1

Counts and percentages of the sample and gender distribution per value frame.

Value frame	Female	Male	Other	Sample
Biospheric	16	18	2	36
	10%	11%	1%	22%
Egocentric	15	9	3	27
	9%	6%	2%	17%
Altruistic	19	16	0	35
	12%	10%	0%	22%
Hedonic	20	12	0	32
	12%	7%	0%	20%
Control	17	15	0	32
	11%	9%	0%	20%
Total	87	70	5	162
	54%	43%	3%	100%

Instruments

All items used in the instruments were translated from English to Dutch to fit with the experimental design. For the purpose of illustrating the instruments, these are given in English. Participants' intention to consume PBAs in the next month ($M = 4.4$, $SD = 1.9$) was measured with three items (e.g., "I intend to eat plant-based alternatives in the coming month") based on Menozzi (2017). Participants were instructed to think of ready-to-eat meat substitutes such as plant-based burgers, ground meat, meatballs, and sausages, as well as substitutes that do not immediately make you think of meat, such as tofu, tempeh, or legumes. The reliability of 'intention to eat PBA' comprising three items was excellent: $\alpha = 0.95$. Consequently, the mean of all three items was used to calculate the compound variable 'intention to eat PBAs', which was used in further analyses. All items were answered on a seven-point Likert scale ranging from 1 (completely disagree) to 7 (completely agree).

Participants' intention to consume red meat in the next month ($M = 5.0$, $SD = 1.5$) was measured with the same items, but the words "plant-based alternatives" were altered to "red meat". The reliability of 'intention to eat red meat' comprising three items was acceptable: $\alpha = 0.81$. Consequently, the mean of all four items was used to calculate the compound variable 'intention to eat red meat', which was used in further analyses. All items were answered on a seven-point Likert scale ranging from 1 (completely disagree) to 7 (completely agree).

Participants' value orientation; biospheric ($M = 5.0$, $SD = 1.2$), altruistic ($M = 5.2$, $SD = 0.9$), egocentric ($M = 4.2$, $SD = 1.1$), hedonic ($M = 4.1$, $SD = 1.1$); were measured with four items per value frame. These items were based on De Groot & Stegh (2008) and Steg et. al (2014) (see appendix). Per value frame the following example items were shown: biospheric orientation (e.g., "I feel responsible in decreasing my ecological footprint"), altruistic orientation (e.g., "I feel responsible to make choices that contribute to improving other peoples' wellbeing"), egocentric orientation (e.g., "I buy products based on what is best for me, not what is best for the environment"), and hedonic (e.g., "I prefer products that increase my enjoyment of life, disregarding their impact on the environment"). The reliability of 'Biospheric values' comprising four items was acceptable: $\alpha = 0.84$. Consequently, the mean of all four items was used to calculate the compound variable 'Biospheric values', which was used in further analyses. The reliability of 'Egocentric values' comprising four items was acceptable: $\alpha = 0.73$. Consequently, the mean of all four items was used to calculate the compound variable 'Egocentric values', which was used in further analyses. The reliability of 'Altruistic values' comprising four items was questionable: $\alpha = 0.61$. However, improvement was not possible within my bachelor thesis, and the mean of all four items was used to calculate the compound

variable ‘Altruistic values’, which was used in the further analyses. The reliability of ‘Hedonic values’ comprising four items was acceptable: $\alpha = 0.78$. Consequently, the mean of all four items was used to calculate the compound variable ‘Hedonic values’, which was used in further analyses. All items were answered on a seven-point Likert scale ranging from 1 (completely disagree) to 7 (completely agree).

Participants’ weekly red meat consumption ($M = 2.8$, $SD = 1.6$) was measured with one item (i.e., “In an average week, how many days per week do you consume red meat?”). This item was answered on a seven-point Likert scale ranging from 1 (day per week) to 7 (days or more per week).

Participants’ weekly PBA consumption ($M = 1.3$, $SD = 1.4$) was measured with one item (i.e., “In an average week, how many days per week do you consume plant-based alternatives?”). This item was answered on a seven-point Likert scale ranging from 1 (day per week) to 7 (days or more per week).

Participants’ age ($M = 23.2$, $SD = 2.1$) was measured with one item (i.e., “What is your age?”). This item was answered by filling in a number.

Participants’ education was measured with one item (i.e., “What is currently your highest attained degree?”). This item was answered by choosing one of six options (i.e., high school, post-secondary vocational education, applied science degree, bachelor's degree, master's degree).

Participants’ gender was measured with one item (i.e., “Which description fits best with you?”). This item was answered by choosing one of seven options (i.e., woman, man, trans-woman, trans-man, non-binary, no-comment, or self-described).

Procedure

Participants were first given a general briefing about the research. After providing consent, participants were first asked how often they eat red meat in a typical week. Because the experiment aimed to decrease red meat consumption, participants who answered that they did not consume any red meat were excluded. In practice, this meant that filling in no consumption of red meat ended the questionnaire prematurely and were thanked for their efforts. Subsequently, participants were then randomly assigned to one of the five conditions and instructed to view the video. To minimize demand characteristics, participants were not informed about the specific focus on value framing. To further cover this, two unrelated decoy questions were asked at the start. Immediately after watching the video, participants were asked to complete the questionnaire about their behavioural intentions, related VBN constructs, and demographic questions. Completion of the experiment on average lasted 14. Following data

collection all participants were debriefed about the true purpose of the study, the true nature of the video manipulations and were thanked for their participation.

Statistical Treatment

Data analyses were conducted using IBM SPSS Statistics. Continuous variable age was analyzed between groups using independent-samples t-tests. Categorical variables of education level and gender were evaluated using chi-square tests. The manipulation check consisted of four independent-samples t-tests, one per value-orientation condition. Hypotheses H1a and H1 were analyzed using independent samples t-tests, measuring consumption intentions between the experimental condition and control condition. Hypotheses H2a and H2b were analyzed using two one-way ANOVA, measuring consumption intentions between the four value frames. For any significant ANOVA result, post-hoc pairwise comparisons were performed using Bonferroni-adjusted tests. Outliers were detected by creating standardized Z-scores.

Results

Table 2

Means (and Standard Deviations) of participants' value orientation after exposure to a value frame or control frame (1 = Very Low Orientation, 7 = Very High Orientation)

Manipulation video	<i>N</i>	<i>Value orientation after exposure to value frame</i> <i>M (SD)</i>	<i>Value orientation after exposure to control frame</i> <i>M (SD)</i>
Biospheric	36	4.8 (1.3)	5.0 (1.2)
Egocentric	27	3.9 (1.0)	4.3 (1.1)
Altruistic	35	5.2 (0.9)	5.3 (0.9)
Hedonic	32	4.2 (1.2)	4.1 (1.1)

Table 2 shows the descriptives of the manipulation check, which was analyzed by carrying out four independent samples t-test on each value frame. The composite mean of biospheric values, with the biospheric value frame as between-subject factor, showed no significant difference between the biospheric group and the control group. The biospheric value orientation, -0.25, 95% CI [-0.73, 0.24], was not significant ($t(61.69) = -0.99, p = 0.326$), and represented a small effect Cohen's $d = -0.20$. The composite mean of egocentric values, with egocentric value frame as between-subject factor, showed no significant difference between the egocentric group and the control group. The egocentric value orientation, 0.34, 95% CI [-0.09, 0.78], was not significant ($t(43.21) = 1.59, p = 0.119$), and represented a small effect $d = 0.33$. The composite

mean of altruistic values, with altruistic value frame as between-subject factor, showed no significant difference between the altruistic group and the control group. The altruistic value orientation, 0.10, 95% CI [-0.27, 0.46], was not significant ($t(57.90) = 0.530, p = 0.598$), and represented a small effect $d = 0.11$. The composite mean of hedonic values, with hedonic value frame as between-subject factor, showed no significant difference between the hedonic group and the control group. The hedonic value orientation, -0.10, 95% CI [-0.56, 0.37], was not significant ($t(49.30) = -0.42, p = 0.679$), and represented a small effect $d = -0.01$.

Table 3

Means (and Standard Deviations) per value frame of intention to consume red meat and intention to consume PBA after exposure (1 = Very Low Intention, 7 = Very High Intention)

Manipulation video	<i>N</i>	<i>Intention to eat red meat</i> <i>M (SD)</i>	<i>Intention to eat PBAs</i> <i>M (SD)</i>
Experimental	130	5.0 (1.5)	4.5 (1.9)
Biospheric	36	5.2 (1.5)	4.4 (1.9)
Egocentric	27	5.0 (1.3)	4.7 (1.9)
Altruistic	35	4.8 (1.6)	4.9 (1.9)
Hedonic	32	4.9 (1.6)	4.1 (1.9)
Control	32	5.2 (1.3)	4.1 (1.9)
Total	162	5.0 (1.5)	4.4 (1.9)

Table 3 shows the results of H1a: Participants exposed to a video with value framing will show a lower intention to consume red meat compared to participants who are not exposed to a video with value framing. An independent samples t-test on intention to consume red meat, with video exposure as between-subject factor, showed no significant difference between the experimental group and the control group. The difference in the intention to eat red meat, 0.3, 95% CI [-0.32, 0.82], was not significant ($t(52.85) = 0.95, p = 0.349$), and represented a small effect $d = 0.17$. Respondents who were exposed to the manipulation video ($M = 5.0, SD = 1.5$) did not show a lower intention to eat red meat than respondents who were not exposed to the manipulation video ($M = 5.2, SD = 1.3$).

Table 3 shows the results of hypothesis H1b: Participants exposed to a video with value framing will show a higher intention to consume PBAs compared to participants who are not exposed to a video with value framing. Analysis was conducted by carrying out an independent samples t-test on intention to consume PBAs, with video exposure as between-subject factor,

showed no significant difference between the experimental group and the control group. The difference of the intention to eat red meat, -0.4 , 95% CI $[-1.15, 0.35]$, was not significant ($t(48.25) = -1.07, p = 0.289$), and represented a small effect $d = -0.21$. Respondents who were exposed to the manipulation video ($M = 4.5, SD = 1.9$) did not show a higher intention to eat PBAs than respondents who were not exposed to the manipulation video ($M = 4.1, SD = 1.9$).

Table 3 shows the results of hypothesis H2a: Participants exposed specifically to a biospheric value frame will show a lower intention to consume red meat compared to participants exposed to egocentric, altruistic, or hedonic frames. Analysis was conducted by carrying out a one-way ANOVA, which showed no significant effect of intention to consume red meat ($F(4) < 1, p = 0.764, \eta^2 = .012$) on respondents. The intention to consume red meat was not higher for the biospheric value frame ($p = 1.000$, Bonferroni-correction; $M = 5.2, SD = 1.5$) compared to the egocentric value frame ($p = 1.000$, Bonferroni-correction; $M = 5.0, SD = 1.3$); altruistic value frame ($p = 1.000$, Bonferroni-correction; $M = 4.8, SD = 1.6$); and hedonic value frame ($p = 1.000$, Bonferroni-correction; $M = 4.9, SD = 1.6$). The results did not show that participants of the biospheric frame had a lower intention to consume red meat compared to the egocentric, altruistic, or hedonic frames.

Table 3 shows the results of hypothesis H2b: Participants exposed specifically to an egocentric value frame will show a higher intention to consume PBAs compared to participants exposed to biospheric, altruistic, or hedonic frames. Analysis was conducted by carrying out a one-way ANOVA, which showed no significant effect of intention to consume PBAs ($F(4) = 1.25, p = 0.294, \eta^2 = .031$) on respondents. The intention to consume PBAs of the egocentric value frame ($p = 1.000$, Bonferroni-correction; $M = 5.0, SD = 1.3$) was not higher than the altruistic value frame ($p = 1.000$, Bonferroni-correction; $M = 4.94, SD = 1.90$), egocentric value frame ($p = 1.000$, Bonferroni-correction; $M = 5.0, SD = 1.3$); biospheric value frame ($p = 1.000$, Bonferroni-correction; $M = 4.4, SD = 1.9$); and hedonic value frame ($p = 1.000$, Bonferroni-correction; $M = 4.1, SD = 2.0$). The results did not show that participants of the egocentric value frame had a higher intention to consume PBAs than biospheric, altruistic, or hedonic frames.

Conclusion

The study has attempted to prove whether the use of value frames can change the intention to consume red meat and PBAs. By means of an online experiment, we measured the influence of value framing on consumption intentions. Four hypotheses, split into H1a, H1b, H2a, and H2b, were used in an attempt to answer if the use of value framing in videos can decrease the intention to consume red meat and increase the intention to consume plant-based alternatives.

The manipulation check showed that the value orientation of participants was not significantly influenced after viewing the four value frames of biospheric, altruistic, egocentric, and hedonic. Participants exposed to a video with value framing did not show a lower intention to consume red meat compared to participants who were not exposed to a video with value framing (H1a), Participants exposed to a video with value framing did not show a higher intention to consume plant-based alternatives compared to participants that were not exposed to a video with value framing (H1b). Participants exposed specifically to a biospheric value frame did not show a lower intention to consume red meat compared to participants exposed to egocentric, altruistic, or hedonic frames (H2a). Participants exposed specifically to an egocentric value frame did not show a higher intention to consume plant-based alternatives compared to participants exposed to biospheric, altruistic, or hedonic frames (H2b). In short, the aim was to decrease the intention to consume red meat and increase the intention to consume plant-based alternatives. Contrary to our expectations, using value framing to manipulate these consumption intentions did not yield a significant effect on value orientation. These results thus show that the use of value framing in videos did not decrease the intention to consume red meat and increase the intention to consume plant-based alternatives.

Discussion

The scientific relevance of the study was the application of the VBN theory into an experimental framework. While yielding no significant results, the current design can form as a base that can be improved on and serve as inspiration for developing similar experiments or researching comparable topics. The current form of the study may indicate the implementation of the VBN theory was not sufficient for making predictions. This may explain why only a few studies have effectively applied the VBN theory in experimental designs that aimed to encourage pro-environmental behaviour, which may indicate its limited usefulness in applying it in the context of influencing consumption intention of red meat and PBAs (Canlas et al., 2022). However, this does not necessarily suggest that the VBN theory is not suitable for experimental application. Multiple factors may have influenced the outcome of the results.

The study of de Boer et al. (2013) mentioned that careful consideration of messaging behavioural change is important. Suggesting that combining multiple values together, that consider the personal motivations of individuals, is more effective. This may imply that combining value frames could have been more effective in significantly influencing intentions.

Furthermore, the study of Vainio et al. (2018) suggested that studies should aim to employ repeated exposure in their experimental designs. Arguing that understanding individuals' prior

beliefs is important before attempting to change these in the direction of consuming PBAs. Similarly, the study of Syropoulos et al. (2023) mentioned that VBN value framing implementations were more effective when repeated. This may explain why the use of 1-minute videos does not significantly affect consumption intention in our study due to its short experience and it only being viewed once. The experimental design could have had an option that assesses participants' current dominating value frame, which would adjust condition distribution accordingly to a different value frame condition. This could potentially synergize with the effect that less pro-environmental people are more likely to be significantly influenced by videos. Placing participants accordingly could thus significantly improve results (Moskell & Turner, 2022).

Limitations

This study was not without its limitations. The lack of meaningful results may indicate a general lack of internal validity; instrumentation may not have been specific enough to gather the needed data for confirming the hypotheses. The study could have benefited from distinguishing between types of PBAs, whole foods (e.g., beans, lentils), and meat substitutes (e.g., vegan hamburger, vegan sausage). Constructing questions that explicitly integrate the names of food types that belong to the food groups rather than just giving general examples of what the food group could contain. For example, consumption intentions would then have been measured with more specific questions (e.g., "My intention to eat a hamburger is..." instead of "My intention to eat red meat...") and (e.g., "My intention to eat tofu is..." instead of "my intention to eat plant-based alternatives is..."). However, using more specific questions requires careful pretesting to ensure reliability and may also increase the time to fill in the questionnaire which currently already clocks in at 13 minutes, which could further decrease the number of valid responses.

Another possible limitation was that a sizeable portion of initial respondents did not continue after viewing the video, which led to a lower overall sample size. Experimental conditions did not contain more than thirty participants, thus lowering its generalizability. This could have been prevented by utilizing incentives for completing the questionnaire. A possible incentive would have been the possibility of winning gift cards to stimulate completion.

Strengths

The study had a few strengths, namely the experimental manipulation of value frames, integration of VBN theory into an experimental context, and the use of short-form video stimuli. Firstly, by presenting four distinct value-oriented videos plus control, the study directly tested

theoretical predictions about message framing's impact on consumption intentions. Secondly, this work explored the useability of the VBN theory in an applied experimental design, laying the groundwork for future experimental tests using the theory for influencing and assessing the intentions of consuming red meat and PBAs. Lastly, the use of short-form video stimuli that resemble contemporary media environments (e.g., social media like YouTube shorts, TikTok, or Instagram) that participants usually encounter, improves the ecological validity of this study and the use of these insights for future implementation.

Future research

The study in its current form can be useful for future research that wishes to examine current findings and potentially address its limitations. It is highly recommended to employ the VBN theory for researching environmental behaviour, especially in the context of influencing red meat and PBA consumption. To improve upon the experimental design, we recommend the following. Firstly, future studies could explore combining value frames (e.g., biospheric + egocentric) in a similar experimental design. This is to test if value framing is truly unusable for influencing behavioural intentions. Secondly, for similar research it is advisable to expose participants multiple times to the stimulus design over a longer period when assessing behavioural intention change. Thirdly, incorporate pre-screening questions that identify participants' dominant values, this to adjust their condition placement and assign them accordingly. Possible ceiling effects may prevent the consistent measurement of significant change of consumption intentions because the participant already strongly endorses a specific value frame. This could be prevented by placing the participants in value frames which they scored lower on, improving the odds of a successful experimental manipulation. Thus, this matching approach could yield stronger persuasive effects than one-size-fits-all message approach. Lastly, this is also interesting for further exploring the ecological validity due to the current delivery of persuasive messaging through algorithm-driven messaging. The current design only allows participants to see value frames A or B. While in practice social media platforms use algorithms to inject messages between news items, notifications, and more. This could be simulated in an experimental form that makes the value frames appear in an environment similar to an interactive social-media feed. For example, the stimulus would be a scrollable social media page with different forms of content, with the value frames integrated into the feed and the order shown to participants randomized. To summarize the design suggestions for future researchers, aim to combine value frames, repeat exposure of stimulus material, pre-screen dominant values, and mimic real-life environments.

The societal relevance of the study was to improve our understanding of influencing dietary consumption patterns. Even though the results were not usable and using value frames to change consumer behaviour may not be the best strategy for potential use by NGOs and governmental organisations, we received feedback from participants that they were not fully aware of the consequences of their meat consumption. While small and anecdotal, this shows that challenging the relationship between society and its food consumption remains relevant.

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Appendix

1. Instruments: Measurement questions of value orientations by De Groot & Steg, 2008 & Steg et al., 2014)

	Value cluster			
	Hedonic	Egoistic	Altruistic	Biospheric
Hedonic values				
1. Pleasure	.53	.29	.19	.25
2. Enjoying life	.54	.24	.15	.21
3. Gratification for oneself	.61	.45	.19	.14
Cronbach's alpha = .73				
Egoistic values				
4. Social power	.18	.57	-.26	-.16
5. Wealth	.43	.55	-.11	-.14
6. Authority	.16	.47	-.06	.02
7. Influential	.28	.57	.05	.16
8. Ambitious	.42	.48	-.06	.02
Cronbach's alpha = .76				
Altruistic values				
9. Equality	.14	-.12	.58	.48
10. A world at peace	.32	-.15	.55	.53
11. Social justice	.13	-.06	.73	.54
12. Helpful	.11	-.00	.57	.45
Cronbach's alpha = .79				
Biospheric values				
13. Respecting the earth	.16	-.15	.67	.85
14. Unity with nature	.16	-.08	.50	.77
15. Protecting the environment	.38	-.01	.58	.83
16. Preventing pollution	.27	.05	.57	.75
Cronbach's alpha = .91				

Note: Correlation coefficients are corrected for self-correlations. Highest correlations for each value item are in bold.

1. Instruments: Measurement questions of NEP by (Dunlap & Van Liere, 2008)

TABLE I. Revised NEP Statements

-
1. We are approaching the limit of the number of people the Earth can support.
 2. Humans have the right to modify the natural environment to suit their needs.
 3. When humans interfere with nature it often produces disastrous consequences.
 4. Human ingenuity will insure that we do not make the Earth unlivable.
 5. Humans are seriously abusing the environment.
 6. The Earth has plenty of natural resources if we just learn how to develop them.
 7. Plants and animals have as much right as humans to exist.
 8. The balance of nature is strong enough to cope with the impacts of modern industrial nations.
 9. Despite our special abilities, humans are still subject to the laws of nature.
 10. The so-called "ecological crisis" facing humankind has been greatly exaggerated.
 11. The Earth is like a spaceship with very limited room and resources.
 12. Humans were meant to rule over the rest of nature.
 13. The balance of nature is very delicate and easily upset.
 14. Humans will eventually learn enough about how nature works to be able to control it.
 15. If things continue on their present course, we will soon experience a major ecological catastrophe.
-

Source: Dunlap et al. (2000).

The seven even numbered items, if agreed to by a respondent, are meant to represent statements endorsed by the dominant social paradigm (DSP). The eight odd items, if agreed to by a respondent, are meant to reflect endorsement of the new environmental paradigm (NEP).

2. Instruments: Measurement questions of AC + AR + Personal norms by Hwang et al. (2019)

Ascribed responsibility

I believe that consumers are partly responsible for environmental problems potentially caused by current delivery means (e.g. motorcycle or car)	0.935
I feel that consumers are jointly responsible for the environmental deterioration potentially caused by current delivery means (e.g. motorcycle or car)	0.960
I believe that every consumer is partly responsible for the environmental problems caused by current delivery means (e.g. motorcycle or car)	0.902

Sense of obligation to take pro-environmental actions

I feel an obligation to choose an environmentally friendly mode of delivery such as drone food delivery services when ordering food	0.915
Regardless of what other people do because of my own values/principles, I feel that I should behave in an environmentally friendly manner when ordering food	0.930
I feel it is important that consumers behave in a sustainable manner when ordering food	0.941

Sense of obligation to take pro-environmental actions

I feel an obligation to choose an environmentally friendly mode of delivery such as drone food delivery services when ordering food	0.915
Regardless of what other people do because of my own values/principles, I feel that I should behave in an environmentally friendly manner when ordering food	0.930
I feel it is important that consumers behave in a sustainable manner when ordering food	0.941

3. Stimulus scripts (Dutch)

Biospheric

Wil jij helpen de planeet te redden? Stap één: blokkeer je steak.
De rood vleesindustrie is een van de grootste aandrijvers van ontbossing.
De steak op jouw bord bedreigt 135 soorten planten en dieren met uitsterven.
Hiernaast vervuult rood vlees productie ook het grondwater.
Slachthuizen verontreinigen grondwater met gedumpte bloed, vet en chemicaliën.
Wil jij nou echt jouw eigen afval drinken?

Maar maak je geen zorgen; er is een manier waarop jij kan helpen.
Consumeer minder rood vlees en verminder de invloed van de vleesindustrie op het milieu!
Vervang rood vlees met plant-gebaseerde alternatieven, de opties zijn eindeloos. Plantburgers, seitan, tempeh, tofu en meer.
Vervang rood vlees slechts één maand voor plant-gebaseerde alternatieven & hierdoor kan jij ook een steentje bijdragen aan het redden van onze planeet.

Egocentric

Laat je leven niet in de steak! Dump rood vlees: het is een giftige ex met een dure smaak.
Eet jij regelmatig rood vlees? Pas op!
Het eten van rood vlees, met name bewerkte vormen zoals burgers en worstjes, vergroot de kans op kanker, diabetes en hartproblemen.
Dit wordt veroorzaakt door verzadigde vetten en andere gevaarlijke stoffen die vrijkomen bij de productie.
Iets wat serieuze gevolgen kan hebben voor jouw gezondheid, met ziekte of dood tot gevolg!
Pijnlijke gevolgen heeft vlees ook voor jouw portemonnee, het is beperkt houdbaar, duurer en stijgt sneller qua prijs in verhouding tot alternatieven.

Maar maak je geen zorgen; er is een manier waarop jij kan helpen.
Consumeer minder rood vlees, bespaar geld en leef gezonder.
Vervang rood vlees met plant-gebaseerde alternatieven, de opties zijn eindeloos. Plantburgers, seitan, tempeh, tofu en meer
Vervang rood vlees slechts één maand voor plant-gebaseerde alternatieven, en bewijs dat jij kan zorgen voor jouw financiën en gezondheid.

Altruistic

Die entrecote? Die had al een heel buffet op voordat jij één hap nam.
1 op de 11 mensen ervaart honger
733 miljoen hongerige mensen, tegenover de 1200 miljoen mensen met obesitas.
Een kwart van de etensvoorraad van de wereld eindigt als afval.
Rood vlees heeft 18 keer meer land, 10 keer meer water en 9 keer meer brandstof nodig, om hetzelfde aantal proteïnen te creëren als bruine bonen.
Verminderen van rood vleesconsumptie geeft dus ruimte om efficiënter, en meer voedsel te produceren.

Maar maak je geen zorgen; er is een manier waarop jij kan helpen.
Consumeer minder rood vlees en draag bij aan het verminderen van >> honger in de wereld door de druk op de landbouw te verlagen.
Vervang jouw rood vlees met plant-gebaseerde alternatieven, de opties zijn eindeloos.
Plantburgers, seitan, tempeh, tofu en meer

Vervang rood vlees slechts één maand voor plant-gebaseerde alternatieven
& hierdoor kan jij ook helpen in de wereldwijde strijd tegen hongersnood.

Hedonic

Je danst door het leven, blij en zacht... Terwijl je biefstuk net is afgeslacht.

Geniet jij van balkende koeien die worden ingeslacht?

Dat geluid komt met schuld, of je het nu toegeeft of niet.

In het wild leven ze vaak wel 20 jaar - in de vleesindustrie hebben ze geluk als ze 2 jaar halen.

Geniet jij van krijsende biggetjes die smeken voor hun moeders?

Ze worden na 20 dagen samen leven, al uit elkaar gehaald.

Er is schuld gebakken in elke hap - je hoeft er alleen maar naar te luisteren.

Als dit je oncomfortabel maakt, is dat misschien een teken.

Het consumeren van rood vlees maakt jou indirect verantwoordelijk voor de vroege dood van koeien en het scheiden van kind en moeder.

Koeien worden geslacht, zonder ooit de zon te hebben gezien.

Stel je voor om te sterven, zonder de lucht te zien, fris te ademen en door het gras te lopen?

Maar maak je geen zorgen; er is een manier waarop jij kan helpen.

Consumeer minder rood vlees en verminder dit schuldgevoel.

Vervang jouw rood vlees met plant-gebaseerde alternatieven, de opties zijn eindeloos.

Plantburgers, seitan, tempeh, tofu en meer

Vervang rood vlees slechts één maand voor plant-gebaseerde alternatieven

& hierdoor kan jij ook van het leven genieten zonder een slecht gevoel.

4. Ethical Committee of Humanities form

CHECKLIST ETHICS ASSESSMENT THESIS PROJECTS

Name	Wessels, C.G.B.J. (Christian)
Email	christian.wessels@ru.nl
Course Name	Bachelor's thesis
Programme	Bachelor
Thesis Theme	RED MEAT AND PBA CONSUMPTION IN NL
Radboud Supervisor	Dr. Thabo van Woudenberg
Which situation applies to you?	I will collect new data
Is use of the existing data set allowed?	
Will you collect data from social media platforms and/or newspapers/news sites?	No
Will you collect data from participants?	Yes
Do patient/clients of a health care facility (e.g., a hospital or a nursing home) participate in the study?	No
Does the research include medical-scientific research that might carry risks for the participant?	No
Will the research be conducted on vulnerable or non-healthy participants?	No
Will the research be conducted amongst minors (<16 years of age) or (legally) incapable persons?	No
Is participation in the study voluntary?	Yes
Does the study use material/images/information that could be perceived as shocking or offensive?	Yes
Can participation in the study cause physical and/or mental harm to the participant?	
Is compensation for participants in line with the EACH guidelines?	
Does deception take place?	
Do you make audio and/or video recordings (photo/video) of your participants?	
Are participants recruited via the Radboud Research Participation System (SONA) and/or is the research conducted in the CLS Lab?	
I declare that I have answered the questions truthfully.	

UITKOMST

CHECKLIST RESULT: Review by the Ethics Assessment Committee Humanities is not necessary. If applicable: the next step is to draft an information document, consent form and Data Management Plan. For further explanation, see https://www.radboudnet.nl/facultyofarts/research/ethics-assessment-committee-humanities/student-thesis-research/	
CHECKLIST RESULT: Review by the Ethics Assessment Committee Humanities is necessary. Contact your thesis supervisor for the assessment procedure.	I understand (end of checklist)
CHECKLIST RESULT: This application may have to be reviewed by a recognised Medical Institutional Review Board, for example the METC Oost-Nederland. Contact your thesis supervisor for the assessment procedure.	