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The Influence of Labelling and Dietary Preferences on Consumers' Willingness to Buy Plant-Based Meat-Alternatives

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Abstract

The plant-based meat alternatives (PBMAs) market has grown tremendously, driven by increasing consumer demand. Eating plant-based has been associated with several benefits, including environmental benefits. Considering these benefits in light of the current climate crisis emphasizes the importance to shift away from meat consumption towards a more plant-based diet. Many PBMAs were developed to resemble meat products and have been marketed under similar denominations (Domke, 2018). However, this meat-based labelling of PBMAs has sparked a debate. For instance, meat producers argue against this labelling, stating that PBMAs cannot be confused with meat products (Demartini et al., 2022). This study aimed to contribute to this debate and build upon Demartini et al. (2022) by examining the impact of PBMAs' labelling on consumers' willingness to buy these products. Participants' willingness to buy PBMAs was assessed using a 2 (Label: Meat-based, Plant-based) x 3 (Dietary preference: Meat-eaters, Flexitarians, Vegetarians/vegans) repeated measures ANOVA design. The findings indicated that PBMAs with a meat-based label, compared to a plant-based label, elicited a higher willingness to buy. Moreover, vegetarians/vegans exhibited the highest willingness to buy PBMAs, followed by flexitarians, while meat-eaters displayed the lowest willingness. An interaction effect revealed that the impact of labelling on willingness to buy PBMAs varied across these dietary preference groups. These results have implications for both the meat and PBMA industries, providing insights into food labelling and consumer preferences. Additionally, this study highlights the need for further research in this area, and alternative explanations and suggestions for future research are discussed.

Keywords: plant-based meat alternatives, food labelling, dietary preference, meat-based labelling, halo effect

Introduction

The plant-based meat alternatives (PBMAs) market has grown tremendously in the past few years, with 4965 products released worldwide between 2019-2021 (Andreani et al., 2023). This growth was a response to the increasing demand for plant-based foods. Plant-based diets are associated with several benefits, including reduced risks of chronic diseases, improved satisfaction and well-being, and ethical and environmental benefits (Fehér et al., 2020). Regarding environmental benefits, Hirt et al. (2023) suggest that adopting plant-based diets is an efficient strategy for addressing the climate crisis as it reduces greenhouse gas emissions. This is confirmed by research stating that excessive meat production and consumption harm the environment (Fehér et al., 2020). Increasingly shifting away from meat consumption towards a more plant-based diet is therefore important and beneficial for numerous reasons. One way to reduce meat consumption is by replacing it with PBMAs. Many PBMAs were developed to resemble meat products, which is why they have been marketed under similar denominations, such as “vegetarian sausage” (Domke, 2018). This kind of labelling had not faced criticism until PBMAs made their way into mainstream supermarkets, growing their sales figures accordingly (Domke, 2018). This growth has led to questions and issues related to the labelling of PBMAs.

The debate around the meat-based labelling of PBMAs raises important considerations regarding the protection of the social and economic role of the meat industry, as well as the promotion of greener diets with the aforementioned benefits (Demartini et al., 2022). On the one hand, meat-based labelling is considered an issue, as some consumers may not want to be reminded of meat, and consumers who are trying to avoid animal products prefer their food not to be linked to meat (Weinrich, 2018). Furthermore, meat producers have called for a ban on the use of meat-sounding labels on PBMAs, arguing that plant-based foods cannot be confused with proper meat products (Demartini et al., 2022). In contrast, meat-based labels can provide useful information to consumers about what to expect from a product (Domke, 2018). It can help guide purchase decisions provided that the PBMA strongly resembles the product it is named after, and the vegetarian characteristics are clearly communicated on the packaging (European Vegetarian Union, 2021).

Until a definitive solution is reached on the labelling of PBMAs, the current uncertain legal status of PBMA labelling may continue to pose an artificial barrier to the growth of the PBMA industry (Crosser et al., 2019). However, implementing new regulations would entail costs associated with their introduction, implementation and management (Sunstein, 2021). Therefore, the resolution of this debate is crucial for both the meat and PBMA industries. A

first study that addressed this debate, was conducted by Demartini et al. (2022). They provided experimental evidence of the impact of PBMAs labelling on consumers' willingness to buy PBMAs. By expanding on their research, the current study aimed to investigate the impact of PBMAs labelling, providing a deeper understanding, and contributing to the resolution of this debate. The findings can have implications for both the meat and PBMA industries. This study experimentally investigated whether the labelling of PBMAs influences consumers' willingness to buy these products. Two types of labels were examined: meat-based labels (e.g., vegetarian meatballs) and plant-based labels (e.g., seasoned balls). Before proceeding with the hypotheses, it is crucial to gain insight into consumers' perceptions and preferences concerning PBMA labelling.

Label

The label of a product provides consumers with information on what to expect and allows them to make inferences about the product's properties. This is related to the *halo effect*, a perceptual bias initially developed in the context of person perception (Thorndike, 1920). The halo effect suggests that the evaluation of one attribute, such as a label, can influence the evaluation of other attributes, thereby impacting the overall target evaluation (Nisbett & Wilson, 1977). This effect has been researched in the context of food products, specifically their labels. For instance, Besson et al. (2020) researched the influence of a vegetarian label and found that a vegetarian labelled burger was perceived as being less caloric than the non-vegetarian labelled equivalent. A label can therefore lead consumers to form favourable overall evaluations of a product, which are used to guide inferences about other attributes of a product, such as caloric content (Schuldt et al., 2012). This can be underlined by research from Gonzales et al. (2022), who provided evidence of the halo effect associated with PBMAs, as the average consumer tends to believe PBMAs are healthier than they objectively are. This halo effect may have implications for consumers' purchase intentions, most likely making them more inclined to buy a specific product.

Building on this reasoning, the labelling of PBMAs with meat- or plant-based labels could lead consumers to form biased perceptions, relying on the mental associations evoked by the label rather than evaluating the product based on its actual characteristics and the direct experience with it (Demartini et al., 2022). Meat-based labels increase the perceived healthiness of PBMAs but no other characteristics of the product, whereas the explicit use of vegan labels exerted a negative effect on consumers' willingness to buy PBMAs (Demartini et al., 2022). Based on this study, the first hypothesis was stated as: there is a main effect of

labelling on willingness to buy PBMAs (H1). The expectation was that willingness to buy would be higher for meat-based compared to plant-based labelled PBMAs.

Dietary preference

Related to whether one is willing to buy PBMAs is the dietary preference of the consumer. Individuals can identify as a meat-eater, flexitarian, vegetarian or vegan (Szenderák et al., 2022). Meat-eaters regularly consume meat along with other food groups. Second, flexitarians consume a higher proportion of plant-based foods. They do consume meat but aim to decrease their meat intake. Third, vegetarians consume animal-based products such as eggs, but avoid meat. Lastly, vegans refrain from consuming any animal-based products. As being vegetarian or vegan involves avoiding meat, this could increase their inclination towards buying PBMAs. Meat-eaters, on the other hand, may show a lower willingness to buy PBMAs. Research by Krings et al. (2022) supports this, as both vegetarians and vegans evaluated PBMAs more favourably than meat-eaters.

Regarding flexitarians, little is known about them concerning the objectives of this study. Van Dijk et al. (2023) emphasize that flexitarians are an important target population for promoting meat alternatives, highlighting the need to further investigate this dietary preference. Rosenfeld et al. (2020) suggest that flexitarians' dietary inclinations, attitudes, and moral judgments towards meat fall between those of vegetarians and meat-eaters. Based on this insight, it was expected that the willingness to buy PBMAs among flexitarians would fall between the ratings of meat-eaters and vegetarians or vegans.

Dietary preferences can explain consumers' choices, for instance via the halo effect. This effect highlights the influence of personal values on consumer behaviour (Schuldt et al., 2012). Schuldt and Schwarz (2010) discovered that people judged "organic" cookies as having lower calories than regular cookies. This halo effect was more pronounced for participants who held pro-environmental attitudes. This suggests that when a focal attribute is positive for an individual, it can activate positive concepts upon encountering the attribute, which is likely to exert an effect on subsequent judgments (Fernan et al., 2018). Individuals with positive attitudes and behaviours towards PBMAs, such as vegetarians, are likely to be sensitive to the halo effect. This implies that the mere presence of a PBMA, regardless of the label, can activate an individual's personal values and ethics, reinforcing one's positive attitudes and behaviours towards PBMAs, thereby increasing the likelihood of purchasing these products. As a result, vegetarians and vegans may exhibit a higher willingness to buy PBMAs.

Another theory relevant to understanding the impact of dietary preferences on willingness to buy PBMAs is the *system justification theory* (Jost & Banaji, 1994). According to this theory, individuals are motivated to defend and justify aspects of existing political, economic and social systems. They perceive these systems as fair, stable and beneficial, leading to a desire to protect and maintain the status quo (Feygina et al., 2010). For example, the fact that meat-eating is so widespread is often used as evidence to support its moral acceptability (Bryant et al., 2022). Related to this, is the *status quo bias*, which is a strong tendency of people to remain at the status quo (Kahneman et al., 1991; Samuelson & Zeckhauser, 1988). For individuals who do not identify as vegetarian or vegan, consuming meat could be considered the status quo, and anything different represents a departure from that (Bryant et al., 2022). When something is perceived as a threat to the status quo, it can lead to denial and reduced willingness to engage in behaviour aimed at changing it (Feygina et al., 2010). As meat-eaters may view a shift in their meat consumption as a threat to the status quo, it might result in a reduced willingness to buy PBMAs.

Based on these theories, the second hypothesis was stated as: there is a main effect of dietary preference on willingness to buy PBMAs (H2). Specifically, vegetarians and vegans were expected to exhibit a higher willingness to buy PBMAs than meat-eaters, and flexitarians were anticipated to fall between the two groups.

Label and Dietary preference

Lastly, differences were expected in willingness to buy PBMAs between the dietary preferences. Meat-eaters were expected to exhibit a greater willingness to buy PBMAs containing a meat- rather than a plant-based label. This expectation can be supported by Demartini et al. (2022), who reported a negative effect of vegan labels on consumers' willingness to buy PBMAs. Additionally, this expectation can be explained by the halo effect. Meat-eaters have likely had positive experiences with meat, and the presence of meat-based labels on PBMAs could trigger a halo effect, leading to an increased willingness to buy such products. However, overall, meat-eaters were likely to be the least willing to buy PBMAs compared to other dietary preferences due to their preference for meat and potential resistance to deviate from the status quo.

In the case of vegetarians and vegans, it is expected that both types of labels would have similar effects. This expectation is based on the understanding that both dietary preferences involve avoiding meat, which may increase their inclination to buy PBMAs. The halo effect can also account for this expectation. As mentioned earlier, when a focal attribute is positive for an individual, it can activate positive concepts upon encountering the attribute,

influencing subsequent judgments (Fernan et al., 2018). Given that both labels represent plant-based products, which are in line with the personal values and behaviours of vegetarians and vegans, it is expected that both groups would experience the halo effect. Consequently, it was expected that vegetarians and vegans would exhibit a comparable willingness to buy PBMAs, regardless of their label.

As for flexitarians, their preferences were investigated in an exploratory manner, as it was uncertain which labelled PBMAs they would be more or less willing to buy. Therefore, the third hypothesis was: there is an interaction between PBMA labelling and dietary preference on the willingness to buy PBMAs (H3), where meat-eaters were expected to show a higher willingness to buy meat-based labelled PBMAs and vegetarians and vegans demonstrated a similar willingness to buy for both types of labels.

Method

Participants

This study recruited participants who were at least 18 years old through SurveyCircle and social media platforms, such as LinkedIn. Participants were excluded from the study if they provided no informed consent, did not answer all experiment questions, answered the attention-check incorrectly, or deviated more than two standard deviations from the average time to complete the experiment ($N = 151$). After exclusion, a convenience sample remained of 285 participants. The majority of participants fell within the 18-25 age range (49.8%). Most of the sample identified as female ($N = 198$), followed by male ($N = 83$). Three participants identified as other, and one participant preferred not to say. The demographic characteristics of the sample are presented in Appendix E.

The sample size was larger than the minimum required sample size. Power calculations conducted using G*Power indicated that a sample of 270 participants needed to be collected, based on a 2 (Label: Meat-based, Plant-based) x 3 (Dietary preference: Meat-eaters, Flexitarians, Vegetarians/vegans) repeated measures ANOVA design with an alpha of .05, a power of .80 and an effect size f of .095. The effect size was based on Demartini et al. (2022) as our research questions are very similar. Demartini et al. (2022) found that the more participants are concerned about animal welfare, the more they liked the considered PBMAs ($0.12 <$ Cohen's $d < 0.19$). For the power calculations, the effect size of Cohen's $d = 0.19$ was used.

Ethics and informed consent

This study was reviewed and approved by the Faculty Ethics Assessment Committee from Utrecht University's social sciences faculty (Approval number: 23-0306). Before participants started participating, they were required to read the information letter and provide informed consent by checking a checkbox.

Measures

Independent variables

This study included two independent variables, one within factor and one between factor. The first independent variable was label (meat-based, plant-based) and was measured within subjects. There were six different products, each presented twice – once with a meat-based label and once with a plant-based label – resulting in a total of 12 products (see Appendix C). An example of one of the products that was labelled either meat- or plant-based is provided in Figure 1.

Figure 1

Plant-based Meat Alternative with a Meat- or Plant-based label

Meat-based label Plant-based label

Note. The labels in this figure are in Dutch. The translations are "Vegetarian meatballs" for the meat-based label and "Seasoned balls" for the plant-based label.

The second independent variable was dietary preference, which was measured between subjects and had three levels. Participants' dietary preference was determined based on their response to the question: "I identify as…" which had three answer options: meat-eater, flexitarian, or vegetarian/vegan. This question was asked at the end of the experiment to reduce any potential priming effects. The sample consisted of 126 meat-eaters, 122 flexitarians, and 37 vegetarians/vegans.

Dependent variable

The dependent variable was willingness to buy. In the experiment, a product was shown with either a meat- or plant-based label. For each product, the participant was asked to indicate their willingness to buy ("I would buy this product") on a Visual Analogue Scale (VAS), ranging from 0 (*never*) to 100 (*very often*). Afterwards, this allowed for computing a mean score for willingness to buy meat- or plant-based labelled PBMAs, indicating the willingness to buy per label type.

Procedure

Between March 9th and April 20th, 2023, individuals were recruited to participate in an online experiment using Qualtrics. This study was conducted in conjunction with E. Matser's research to increase the number of participants. Participants were able to access the study through a link provided by Qualtrics, which could be accessed on any device. Before starting the experiment, participants were provided with an information letter (Appendix A), which outlined, among other things, that participation was voluntary, and participants were free to withdraw from the study at any time. Next, participants were required to provide informed consent (Appendix B). Participants who gave no consent were redirected to the end of the experiment.

After providing consent, participants started with E. Matsers' experiment. This experiment contained an attention-check and 24 questions on coffee and tea products with varying climate labels and prices. These questions were not related to the current study and are therefore not discussed. After completing the first experiment, participants were introduced to the current study, which involved evaluating 12 products. Half of the products contained a meat-based label and the other half a plant-based label. The order of the products was randomly determined, ensuring that the same product with a different label would never appear after or before the other (e.g., a meat-based labelled burger would not appear before or after a plant-based labelled burger). All participants viewed the products in the same order. At the end of the experiment, participants were asked if they had any allergies to the products shown, and if so, to specify their allergy.

After completing the experiment, participants were asked to complete a demographic questionnaire (Appendix D). Thereafter, participants were given a debriefing, which encompassed an explanation of the research objectives, along with an expression of gratitude for their participation (Appendix F). The average time taken to complete the experiment was 11.6 minutes.

Statistical analysis

Prior to conducting the analyses, two new variables were created: M-PBMA and P-PBMA. The first represents the mean score of participants' willingness to buy ratings on the six products with meat-based labels. P-PBMA represents the mean score of willingness to buy ratings on the six products with a plant-based label. Assumptions for the analyses were checked, with the assumption homogeneity of variances being violated. To address this violation, as well as the unequal sample size, a Games-Howell test was employed (Games & Howell, 1976).

A repeated measures ANOVA[1] was conducted to analyse the hypotheses, using a 2 (Label: meat-based, plant-based) x 3 (Dietary preference: Meat-eater, Flexitarian, Vegetarian/vegan) design. The analyses were conducted using the program Statistical Package for the Social Sciences (SPSS, Version 28.0; IBM Corp., Armonk, NY, United States). First, it was analysed whether there was a main effect of PBMAs-labelling on willingness to buy (H1). This was followed by analysing whether there was a main effect of dietary preference on willingness to buy PBMAs (H2). Lastly, it was analysed whether there was an interaction between PBMAs labelling and dietary preference on willingness to buy (H3). Thereafter, pairwise comparisons and post hoc tests were investigated to examine the differences among label types, dietary preferences, and the interaction between label and dietary preferences. The significance levels for all analyses were set at $\alpha = .05$.

Results

To analyse the hypotheses, a repeated measures ANOVA with a 2 (Label: Meat-based, Plant-based) x 3 (Dietary preference: Meat-eaters, Flexitarians, Vegetarians/vegans) design was conducted. The mean ratings of willingness to buy meat- and plant-based labelled PBMAs, categorized by dietary preference, are presented in Table 1.

Label

The analysis revealed a significant main effect of labelling of PBMAs on willingness to buy, $F(1, 282) = 89$, $p < .001$, $\eta_p^2 = .24$. This indicates that the type of labelling has an impact on participants' willingness to buy PBMAs. Pairwise comparisons, using a Bonferroni correction, demonstrated a significant difference in willingness to buy between meat-based and plant-based labelled PBMAs ($p < .001$). Participants exhibited a higher willingness to buy

[1] The main analysis was also computed without the detected outliers. As the analysis without the outliers provided the same results, the entire data set – including the outliers – was used.

meat-based labelled PBMAs (M = 44.99) compared to plant-based labelled PBMAs (M = 36.94). These results provide support for hypothesis 1, which posited that willingness to buy would be higher for meat-based labelled PBMAs than for plant-based labelled PBMAs.

Dietary preference

Furthermore, there was a significant main effect of dietary preference on willingness to buy, $F(2, 282) = 68.30$, $p < .001$, $\eta_p^2 = .326$. This indicates that participants' dietary preference influences their willingness to buy PBMAs. Games-Howell post hoc tests revealed significant differences in willingness to buy between meat-eaters and flexitarians ($p < .001$), as well as between meat-eaters and vegetarians/vegans ($p < .001$). Additionally, there was a significant difference in willingness to buy between flexitarians and vegetarians/vegans ($p < .049$). Regardless of the label type, vegetarians/vegans reported the highest willingness to buy PBMAs ($M_{\text{Meat-label}} = 68.31$, $M_{\text{Plant-label}} = 50.73$), followed by flexitarians ($M_{\text{Meat-label}} = 55.62$, $M_{\text{Plant-label}} = 45.50$). Meat-eaters exhibited the lowest willingness to buy PBMAs ($M_{\text{Meat-label}} = 27.86$, $M_{\text{Plant-label}} = 24.60$). These results support hypothesis 2, which expected that willingness to buy would vary based on dietary preference. It aligns with the expectation that vegetarians/vegans exhibit a higher willingness to buy PBMAs than meat-eaters, with flexitarians' willingness falling between the ratings of vegetarians/vegans and meat-eaters.

Table 1

Ratings of Willingness to buy per Meat- or Plant-based labelled PBMA categorized by Dietary preference

	Meat-based labelled PBMAs				Plant-based labelled PBMAs		
Dietary preference	Meat-eaters	Flexitarians	Vegetarians/vegans		Meat-eaters	Flexitarians	Vegetarians/vegans
Label	*M (SD)*	*M (SD)*	*M (SD)*	Label	*M (SD)*	*M (SD)*	*M (SD)*
1. Vegetarian chicken pieces	21.40 (25.40)	55.56 (30.56)	72.22 (23.94)	1. Soy chunks	14.98 (18.27)	39.04 (29.28)	50.54 (31.19)
2. Vegetarian minced meat	30.58 (28.88)	63.99 (26.91)	70.95 (27.01)	2. Soy crumbles	23.43 (24.73)	55.03 (26.80)	63.19 (28.93)
3. Vegetarian hamburger	30.52 (26.94)	54.39 (28.80)	64.76 (30.04)	3. Soybean burger	20.33 (23.34)	42.35 (29.67)	47.62 (31.21)
4. Vegetarian meatballs	37.09 (31.23)	64.54 (29.39)	72.76 (26.86)	4. Seasoned balls	51.30 (26.94)	56.35 (28.51)	46.84 (34.02)
5. Vegetarian bacon	20.13 (22.58)	41.61 (28.98)	60.70 (29.65)	5. Soy strips	16.59 (20.40)	36.74 (27.40)	44.08 (33.21)
6. Vegetarian shawarma	27.42 (27.33)	53.64 (32.14)	68.46 (32.00)	6. Seasoned soy strips	20.94 (23.34)	43.48 (29.53)	52.11 (29.80)
Total	27.86 (22.27)	55.62 (21.50)	68.31 (22.92)	Total	24.60 (17.40)	45.50 (21.17)	50.73 (22.51)
Total		44.99 (27.04)		Total		36.94 (22.64)	

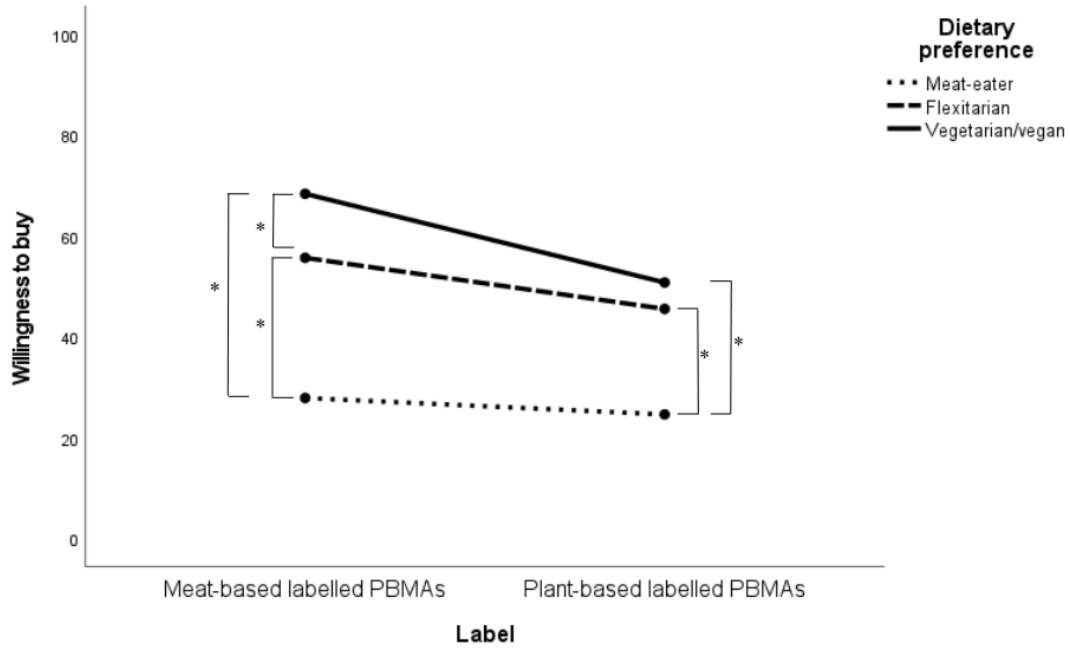
Note. The labels in this table are translations of the original Dutch labels used in the study.

Interaction between Label and Dietary Preference

The interaction between the labelling of PBMAs and dietary preference was significant, $F(2, 282) = 13.58$, $p < .001$ $\eta_p^2 = .088$, indicating that the impact of labelling on willingness to buy PBMAs varied across dietary preference groups. This supports hypothesis 3, which posited that there would be an interaction between PBMAs labelling and dietary preference on willingness to buy PBMAs. The interaction is visualized in Figure 2 and Figure 3. Regarding the meat-based labelled PBMAs, pairwise comparisons revealed significant differences in willingness to buy among the dietary preferences. Meat-eaters reported significantly less willingness to buy meat-based labelled PBMAs compared to flexitarians ($p < .001$) and vegetarians/vegans ($p < .001$). Vegetarians/vegans reported a significantly higher willingness to buy compared to flexitarians ($p < .007$). Similar patterns were observed for the plant-based labelled PBMAs. Meat-eaters reported significantly lower willingness to buy plant-based labelled PBMAs compared to flexitarians ($p < .001$) and vegetarians/vegans ($p < .001$). There was no significant difference between flexitarians and vegetarians/vegans ($p = .480$). These results and their significance are displayed in Figure 2.

Figure 2

Interaction Plot: Willingness to buy Meat- or Plant-based labelled PBMAs per Dietary preference



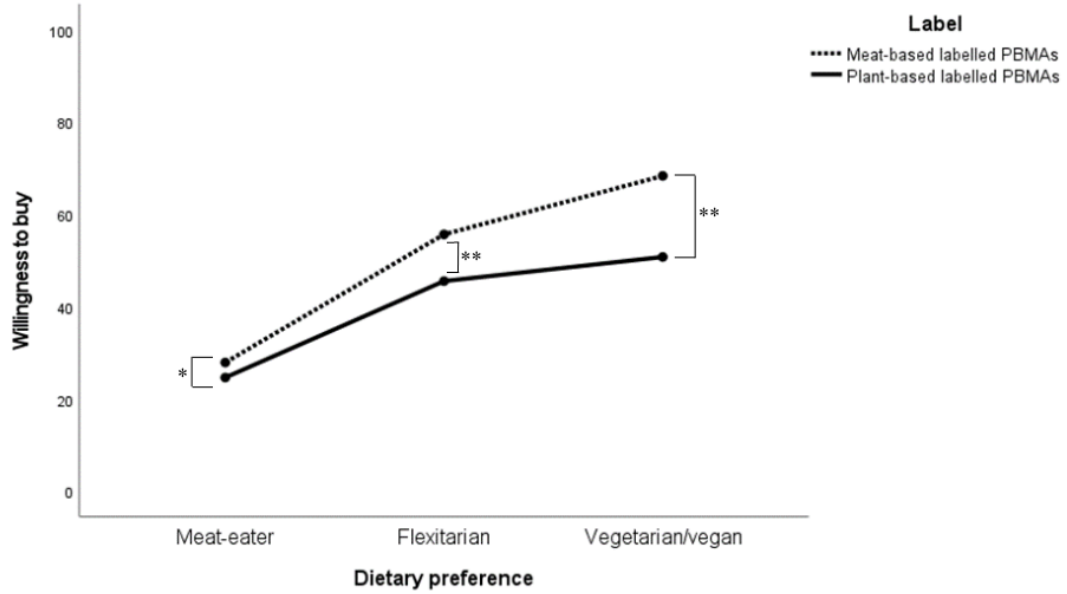
Note. * $p < .01$.

Furthermore, the effect of PBMAs-labelling on willingness to buy varied across dietary preference groups. Pairwise comparisons indicated significant differences in willingness to buy between meat- and plant-based labelled PBMAs for meat-eaters ($p < .021$),

flexitarians ($p < .001$), and vegetarians/vegans ($p < .001$). Across all dietary preference groups, a higher willingness to buy meat-based rather than plant-based labelled PBMAs was shown. These results and their significance are displayed in Figure 3.

Figure 3

Interaction Plot: Willingness to buy Meat- or Plant-based labelled PBMAs per Dietary preference



Note. * $p < .05$, ** $p < .01$.

These results partially contradict one of the expectations of hypothesis 3, namely labelling was expected to not make a difference in the willingness of vegetarians/vegans to buy PBMAs. However, the results indicate that all dietary preference groups, including vegetarians/vegans, exhibit a higher willingness to buy meat-based labelled PBMAs. Additionally, these results are consistent with the expectation that meat-eaters were more willing to buy meat-based rather than plant-based labelled PBMAs.

Discussion

In the past few years, the PBMAs market has expanded immensely (Andreani et al., 2023). Many of these products were developed to resemble meat products, which is why they have been marketed under similar denominations (Domke, 2018). However, the use of such labelling for PBMAs has been a controversial issue. To address this debate, Demartini et al. (2022) conducted a first study. Building upon their work, the current study aimed to provide a deeper understanding of the impact of PBMA labelling on consumer behaviour and contribute to the resolution of the debate. The findings of this study shed light on the influence of labelling and dietary preferences on consumers' willingness to buy PBMAs.

Continuing with the support for the first hypothesis, this study found that the type of labelling on PBMAs matters. Specifically, based on the mean ratings of willingness to buy per label in total, participants exhibited a higher willingness to buy PBMAs with meat-based labelling compared to plant-based labelling (H1). This finding is consistent with the research of Demartini et al. (2022), who found that the explicit use of vegan labels had a negative effect on consumers' willingness to buy PBMAs. However, these findings contrast with a previous study conducted by Krpan and Houtsma (2020), which suggested that vegetarian choices were more likely when vegetarian framing was absent. In their study, they found that avoiding explicit labelling with the term "vegetarian" in a menu selection-based hypothetical choice task increased the likelihood of vegetarian choices. It is important to note that while Krpan and Houtsma's (2020) study focused on menu selection-based hypothetical choice tasks, this study examined participants' willingness to buy products hypothetically available in a supermarket. Additionally, it should be noted that all the meat-based labels in this study included the word "vegetarian". Therefore, future research could explore the impact of meat-based labels without the inclusion of the term "vegetarian" on consumers' willingness to buy PBMAs. This discrepancy highlights the complexity of labelling effects on consumer behaviour and underscores the need for further investigation. Moreover, the large effect size observed in this study holds practical significance, indicating that the type of label applied to PBMAs exerts a notable influence on participants' purchasing decisions. This suggests that labelling of PBMAs can meaningfully impact consumers' willingness to buy these products and emphasizes the need to carefully consider labelling choices, as they can shape consumers' willingness to buy. Furthermore, the effect size implies that even small changes in labelling, such as the choice of wording, can have a meaningful effect on consumers' willingness to buy PBMAs.

Furthermore, the findings of the current study indicate that individuals' dietary preferences play a substantial role in their willingness to buy PBMAs (H2). Vegetarians/vegans exhibited the highest willingness to buy PBMAs, followed by flexitarians, while meat-eaters displayed the lowest willingness to buy. These results are consistent with the findings of Krings et al. (2022), who reported that vegetarians and vegans evaluated PBMAs more favourably than meat-eaters. Additionally, these findings suggest that flexitarians lie between vegetarians/vegans and meat-eaters in terms of their dietary inclinations and attitudes. This adds to the research of Rosenfeld et al. (2020), which found that flexitarians' inclinations towards meat lie between those of vegetarians and meat-eaters. The current study extends this finding, by demonstrating that this positioning is also perceived

for PBMAs. The lower willingness to buy PBMAs among meat-eaters could be explained by the system justification theory, particularly the status quo bias (Jost & Banaji, 1994; Samuelson & Zeckhauser, 1988). There could be a strong tendency to remain at the status quo for meat-eaters, which could result in a lower willingness to buy PBMAs. However, this is only the case when individuals perceive it as a threat to the status quo. Further research is needed to explore the possible influence of a perceived threat to the status quo on meat-eaters' willingness to buy PBMAs. The large effect size observed in this study has practical implications, indicating that the considered dietary preferences influenced participants' willingness to buy. This suggests that individuals' dietary preferences play a role in shaping individuals' willingness to buy PBMAs. It implies that individuals with different dietary preferences may have distinct considerations and preferences when it comes to purchasing PBMAs. These findings highlight the importance of considering the different dietary preferences when marketing PBMAs.

Moreover, the findings support the third hypothesis, indicating an interaction between the labelling of PBMAs and dietary preferences (H3), meaning that the effect of labelling on willingness to buy PBMAs varied across dietary preferences. Regarding the labelling of PBMAs, there was a higher willingness to buy meat-based labelled PBMAs across all dietary preferences, with significant differences between each dietary preference group. Concerning the plant-based labelled PBMAs, only meat-eaters differed significantly from flexitarians and vegetarians/vegans. Overall, regardless of the label, vegetarians/vegans displayed a slightly higher willingness to buy PBMAs compared to flexitarians and meat-eaters. The medium to large effect size has practical importance as it implies that the influence of labelling on consumers' willingness to buy differs depending on whether individuals have specific dietary preferences. This finding suggests that a one-size-fits-all approach to labelling may not be effective; instead, tailoring labelling to align with dietary preferences could potentially lead to better outcomes in terms of consumers' willingness to buy PBMAs. This implies that producers of PBMAs should carefully consider their target group and customize their products to them. In practical terms, this could involve implementing targeted labelling strategies that appeal to the target group.

Furthermore, these findings indicate that labelling matters for vegetarians/vegans as well, challenging the expectation that the labelling would not make a difference for them. However, the results do support the notion that vegan labelling of PBMAs exerts a negative effect on consumers' willingness to buy (Demartini et al., 2022). The lower willingness to buy plant-based labelled PBMAs could be attributed to the labelling of the current study. For

five of the six plant-based PBMAs, the label included the word ‘soy’. According to Wansink (2000), products containing a soy label negatively influence taste perceptions and attitudes of consumers. Adding to this is the research from Elzerman et al. (2015) who found that a soy flavour was indicated as a negative sensory attribute of a meat substitute. These findings, together with the halo effect, could explain the lower willingness to buy plant-based labelled PBMAs. According to the halo effect, consumers evaluate one specific attribute, which influences the evaluation of other attributes and thereby impacts the overall evaluation (Thorndike, 1920). Thus, by labelling these products with the word ‘soy’ in it, it reminded people of their taste and perceptions of soy. These were most likely negative and could have influenced the overall evaluation of the product, thereby giving a lower willingness to buy. Therefore, for future research, it is important to conduct extensive preliminary research into which labels negatively affect consumers’ perception of products.

The halo effect could also explain the preference for meat-based labelled PBMAs among meat-eaters. By including a meat-related word in the labels, people were reminded of their preference for meat, which could have led to a more positive overall evaluation. However, it is important to note that although the difference between the two types of labels is significant for meat-eaters, it is relatively small compared to the differences observed among flexitarians and vegetarians/vegans. The preference of flexitarians and vegetarians/vegans for meat-based labelled PBMAs could be explained by the *mere exposure effect*. This effect entails that the liking for a stimulus increases through repeated exposure to that stimulus (Zajonc, 1968). Since meat-based labels are currently most used in supermarkets, this could have led to increased familiarity and liking for the PBMAs in the experiment containing a meat-based label compared to the plant-based label. This is supported by van Dijk et al. (2023), who identified familiarity as an important predictor of willingness to buy meat alternatives.

Regarding the plant-based labelled PBMAs, only meat-eaters differed significantly from flexitarians and vegetarians/vegans. The non-significant difference between flexitarians and vegetarians/vegans can be interpreted as having more aligned preferences when it comes to plant-based labelled PBMAs. As mentioned before, Rosenfeld et al. (2020) stated that flexitarians’ dietary inclinations, attitudes and moral judgments towards meat fall between those of vegetarians and meat-eaters. The current study adds the finding that, when considering plant-based labelled PBMAs, flexitarians and vegetarians/vegans share similar inclinations regarding these kind of products. The larger difference observed between meat-eaters and vegetarians/vegans on plant-based labelled PBMAs compared to flexitarians and

vegetarians/vegans indicates that the latter two preferences may be closer to each other than previously thought.

Limitations

Despite the valuable insights provided by this study, it is important to acknowledge its limitations. One limitation is the inclusion of only 12 products in the experiment, which may have influenced participants to make direct comparisons between the two types of labelling. Given the aforementioned reasoning on 'soy' labelling, this might have influenced participants to give higher ratings of willingness to buy meat-based labelled PBMAs.

Additionally, while labels provide consumers with important information that can guide their behaviour, it should be noted that consumers receive a vast amount of information in the marketplace, and only the information they consider important regarding the product will have an impact on consumers' behaviour (Akdeniz et al., 2013, cited in Apostolidis & McLeay, 2016). Since this study only provided the product, containing a label and its content (weight), it is possible that in a real-life setting, there would be differences in consumers' willingness to buy these PBMAs.

Furthermore, this study assessed consumers' willingness to buy, reflecting their intention rather than their actual behaviour. Research suggests that intentions are translated into action approximately half of the time (Sheeran & Webb, 2016). Thus, considering the limitations and the intention-behaviour gap, it is crucial to interpret the findings and their implications for real-life cautiously, emphasizing the need for further research to explore the influence of PBMAs labelling on consumer behaviour.

Future research

Although this study has provided valuable insights, several areas warrant further research. Firstly, it would be beneficial to investigate the underlying mechanisms that possibly contribute to the observed effects. For example, the system justification theory, status quo bias, halo effect, and mere exposure effect have been proposed as potential mechanisms influencing consumers' perceptions and intentions related to PBMA labelling. Therefore, it would be interesting to conduct further research to examine the extent to which these mechanisms play a role and the implications of their influence. Understanding the underlying psychological processes involved can provide practical implications for marketing strategies in the PBMA market and can promote the consumption of PBMAs.

Furthermore, future research should consider conducting studies in real-life settings to investigate actual purchasing behaviour and analyse how different labelling strategies influence consumer choices. This could involve tracking consumer decisions and quantitative

sales data in real-life settings to understand the impact of labelling on the purchasing of PBMAs.

In addition, it would be valuable to explore the role of cultural, social and environmental factors in shaping consumer perceptions of PBMA labelling. Investigating how these factors interact with labelling strategies can offer insights into broader societal implications and acceptance of these products. Understanding the influence of cultural norms, social influence, and environmental concerns on consumer behaviour can inform marketing strategies and product positioning in different regions or target markets.

Moreover, exploring the long-term effects of labelling on consumer purchasing behaviour, such as repeated purchases and brand loyalty, would provide valuable insights for developing effective marketing strategies in the PBMA market. It would be interesting to explore whether consumers who initially tried PBMAs due to specific labelling continue to purchase these products over time or switch to other alternatives and the factors influencing their decision. This can yield important findings regarding consumers' loyalty and the effectiveness of labelling in sustaining consumer interest in PBMA products.

In addition, future research could explore alternative labelling strategies for PBMAs, such as comparing the effectiveness of descriptive versus more creative labels. This could determine which types of labels resonate most with different consumer segments. Addressing these research gaps and investigating the underlying mechanisms, real-life behaviour, cultural factors, long-term effects, and alternative labelling strategies can enhance the understanding of the role of labelling and dietary preferences in consumers' willingness to buy PBMAs.

Conclusion

In conclusion, the findings of this study have implications for the ongoing debate between the meat industry and the PBMA industry. It adds to the evidence presented by Demartini et al. (2022) that the arguments used by the PBMA industry to continue using meat-based labels on PBMAs are more effective in attracting consumers, including meat-eaters. Based on these findings, their arguments are more valid than the arguments used by the meat industry. From an ecological perspective, it is encouraging to see that meat-based rather than plant-based labels get meat-eaters a bit more on board, suggesting a potential reduction in meat consumption. The plant-based labels seem the best protection for the meat sector, as the use of these labels negatively influenced consumers' willingness to buy, meaning that meat consumers would probably be less likely to substitute meat with PBMAs. Perhaps this is one of the underlying reasons for the debate, as the growth of the PBMA industry most likely results in revenue loss for the meat industry. Overall, these findings

highlight the importance of using meat-based labels for PBMAs to maximize the PBMAs industry's success and promote the adoption of PBMAs. This should, however, be interpreted cautiously, as further research is still necessary.

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Appendix A

Information letter

Producten beoordelen

Beste deelnemer,

Graag willen wij je vragen of je deel zou willen nemen aan ons thesisonderzoek van de Universiteit Utrecht, welke volledig online plaatsvindt. Dit onderzoek is getoetst en goedgekeurd door de Facultaire Ethische Toetsingscommissie (FETC) van de Faculteit Sociale Wetenschappen van de Universiteit Utrecht en voldoet aan de ethische richtlijnen. Dit onderzoek staat onder supervisie van Dr. L. M. J. Swinkels.

Meedoen is vrijwillig en je kunt ten allen tijden stoppen zonder dat je hiervoor een reden hoeft op te geven. Voordat je beslist of je mee wilt doen aan dit onderzoek, willen we je informeren over wat het onderzoek inhoudt en welke vragen je kunt verwachten. Lees deze informatie rustig door. Neem gerust contact op via het e-mailadres onderaan deze pagina als je vragen hebt.

In dit experiment willen wij te weten komen hoe bereid je bent om bepaalde producten te kopen. Er worden verschillende producten getoond en voor elk product word je gevraagd aan te geven in hoeverre je bereid bent het te kopen. Het experiment eindigt met een korte vragenlijst. In totaal zal dit ongeveer 10 minuten duren. Wij willen je vragen dit onderzoek naar waarheid in te vullen, zonder tussendoor een pauze te nemen.

Je zult geen voor- of nadelen ondervinden van deelname aan dit onderzoek, maar je zult bijdragen tot een beter begrip van hoe consumenten productkeuzes maken.

Voor dit onderzoek gebruiken we het softwareprogramma Qualtrics. Dit programma verzamelt gegevens op anonieme wijze en er worden geen IP-adressen verzameld. Verder worden er geen direct identificeerbare gegevens gevraagd. Omdat het onderzoek anoniem wordt uitgevoerd, betekent dit ook dat je je gegevens niet kunt laten verwijderen. Wel kun je ten alle tijden stoppen met je deelname aan dit onderzoek.

De onderzoeksgegevens zullen voor minimaal 10 jaar bewaard worden. Dit is volgens de richtlijnen van de VSNU. Voor informatie over de contactgegevens van de Functionaris

Gegevensbescherming kan je terecht op de volgende website: **https://www.uu.nl/organisatie/praktische-zaken/privacy/functionaris-voor-gegevensbescherming** of via het e-mailadres: **privacy@uu.nl**. De enige die toegang hebben tot de data zijn de onderzoekers van huidig onderzoek en de supervisie. Daarnaast kan de geanonimiseerde data van dit onderzoek op termijn opgenomen worden in een open access database. Dit betekent dat ook andere onderzoekers deze data kunnen opvragen voor hun eigen onderzoek.

Deelname aan dit onderzoek is vrijwillig. Je kunt op elk gewenst moment, zonder opgave van reden en zonder voor jou nadelige gevolgen, stoppen met het onderzoek. De tot dan toe verzamelde gegevens worden wel gebruikt voor het onderzoek.

Als je na het lezen van deze informatie besluit om deel te nemen ga je akkoord door middel van het aanvinken van eerste vakje. Daarna word je automatisch naar de online omgeving geleid voor het invullen van het onderzoek.

Bij voorbaat willen wij, Eveliene en Merel, je hartelijk bedanken voor je deelname!

Voor vragen kun je terecht bij: **m.swartjes@students.uu.nl**

Mocht je klachten hebben, dan kun je contact opnemen met de klachtenfunctionaris van de Universiteit Utrecht: **klachtenfunctionaris-fetcsocwet@uu.nl**

Appendix B

Informed consent

[checkbox] Ik verklaar hierbij dat ik de informatiebrief heb gelezen en deze informatie begrijp. Ik ga hierbij akkoord met deelname aan dit onderzoek.

[checkbox] Ik wil niet deelnemen aan dit onderzoek.

Appendix C

Experiment product designs

Plant-based meat alternatives with a meat-based label

M1

M2

M3

M4

M5

M6

Plant-based meat alternatives with a plant-based label

P1

P2

P3


Gekruide
soja reepjes
Inhoud:
175 g

P4


Soja
reepjes
200 g

P5


Gekruide
balletjes
Inhoud:
350 g

P6

Appendix D
Demographic questionnaire

Question 1 - Wat is je leeftijd?

- …

Question 2 - Ik identificeer mijzelf als...

- Man
- Vrouw
- Anders, namelijk…
- Dat zeg ik liever niet

Question 3 - Ik identificeer mijzelf als…

- Een vleeseter
- Flexitariër
- Vegetarïer/veganist

Question 4 - Hoe vaak ben je verantwoordelijk voor de boodschappen?

- Altijd
- Ongeveer de helft van de tijd
- Minder dan de helft van de tijd
- Nooit

Question 5 - Wat is het hoogste niveau van onderwijs dat je hebt voltooid?

- Middelbare school
- MBO
- HBO
- WO
- Master
- PhD of hoger
- Dat zeg ik liever niet

Question 6 - Wat is de grootte van je huishouden? (Inclusief jezelf)

- 1
- 2
- 3
- 4
- 5
- 5+

Question 7 - Wie is of zijn je gezinsleden?

- Kind(eren)
- Partner(s)
- Partner(s) en kind(eren)
- Andere volwassenen
- Alleen ik

Question 8 - Wat is je postcode in cijfers zonder letters? (bijvoorbeeld 1233)

- …

Question 9 - Wat is je netto gezinsinkomen per maand?

- Minder dan 1000
- 1000-2000
- 2000-4000
- 4000-6000
- Meer dan 600
- Dat zeg ik liever niet

Appendix E
Demographic characteristics of the sample

Table 1
Demographic characteristics of the sample

	N	%		*N*	%
Age			**Responsible for daily meal purchase**		
18-25 years	142	49.8	Always	110	38.6
26-35 years	53	18.9	Around half of the time	102	35.8
36-45 years	20	7.2	Less than half of the time	57	20.0
Over 45 years	70	24.8	Never	16	5.6
Gender			**Place of residence**		
Male	83	29.1	City	172	60.4
Female	198	69.5	Village	102	35.8
Other	3	1.1	Missing value	11	3.9
Prefer not to say	1	.4			
Education			**Household members**		
High school	40	14	Child(ren)	4	1.4
MBO	24	8.4	Partner(s)	82	28.8
University of applied sciences	94	33	Partner(s) and child(ren)	56	19.6
University	59	20.7	Other adults	102	35.8
Master	59	20.7	Alone	40	14
PhD or higher	7	2.5	Missing value	1	.4
Prefer not to say	1	.4			
Missing value	1	.4			
Household size			**Household net income**		
1	39	13.7	< €1000	39	13.7
2	99	34.7	€1000 – €2000	26	9.1
3	48	16.8	€2000 – €4000	67	23.5
4	67	23.5	€4000 – €6000	65	22.8
5	21	7.4	> €6000	41	14.4
5+	10	3.5	Prefer not to say	45	15.8
Missing value	1	.4	Missing value	2	.7

N = 285

Appendix F

Debriefing

Bedankt voor je deelname aan ons onderzoek. We hebben nuttige informatie verkregen door je bereidheid om bepaalde producten te kopen aan te geven. Het belangrijkste doel van deze studie was om te zien of de klimaatscore, de prijs of de productnaam je koopbereidheid beïnvloeden.

Als je vragen hebt over dit onderzoek, neem dan gerust contact op met Merel via m.swartjes@students.uu.nl.

Bedankt voor je tijd en medewerking!