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Every step you take: Nudging animal welfare product purchases in a virtual supermarket

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EVERY STEP YOU TAKE: NUDGING ANIMAL WELFARE PRODUCT PURCHASES IN A VIRTUAL SUPERMARKET

1. Introduction

The welfare of farmed animals is an important concern for consumers in Germany (Christoph-Schulz et al., 2018, Klink-Lehmann & Langen, 2019) and worldwide (Boaitey & Minegishi, 2020). A great number of experimental and meta-analytical studies have shown that consumers are willing to pay a price premium for animal welfare (AW) products (Yeh & Hartmann, 2021; Lagerkvist & Hess, 2011; Clark et al., 2017). In order to identify AW products, several labels exist on the German market. Some labels mark only specific animal-based products, like the legally required EU marking for eggs (EU, 2008). Other labels are attached to different animal-based products, such as the 4-stages animal-husbandry label that was implemented by retailers (Initiative Tierwohl, 2019).

Nevertheless, not all consumers regularly purchase animal welfare products (AMI, 2022). One explanation for the discrepancy between consumers' desire for more AW on the one hand and their purchasing behaviour on the other hand might be low availability and visibility of AW products. In Germany, the share of AW products is rather low, in fact, only 13% of meat products were classified as AW products (Verbraucherzentrale, 2022). In addition, AW labels might not be noticed at the point of sale (Bartels et al., 2018), due to the high cognitive load that consumers experience in purchasing situations. As one method to align consumers' AW related attitude and behaviour, nudging is a promising strategy (Vigors et al. 2018). Therefore, the goal of the present study is to investigate the effect of nudging on AW product purchases. The aim of the nudge is to increase the availability and visibility of AW products, thereby facilitating ease of finding AW products and reducing the cognitive load. The second goal of this study is to investigate the mechanism that underlies the effectiveness of the nudge and the circumstances under which this effectiveness might decrease.

1.1 Nudging

Nudging refers to changing elements in the choice environment in order to facilitate the selection of specific items (i.e. animal welfare products), without limiting consumers' freedom of choice or changing economic incentives (Thaler & Sunstein, 2008). The effectiveness of nudging to influence consumers' food choice behaviour has been demonstrated by different meta-analyses (e.g. Cadario & Chandon, 2020), yet the effectiveness of nudging depends also on the kind of nudge that is applied. Ten different forms of nudging have been classified by Sunstein (2014) and the present study is focusing on the fourth type: Increases in ease and convenience. The nudge should help to reduce any barriers to the desired behaviour. Sunstein

rephrased this nudge category also as ‘make it easy’ (p.5, 2014) nudge. Nudges that focus on changing the decision structure, for example through regrouping the available options, were identified as more effective, compared to nudges that aim to provide information (Broers et al., 2017; Mertens et al., 2021). When implementing a nudge, one can adjust only single elements in the choice architecture or several elements. An example of the former would be changing the location of food items in a supermarket or at a buffet. By making healthy food items more accessible, different studies have shown that the selection of these items increased (Rozin et al., 2011; Kroese et al., 2016). In contrast, a multilayered nudge consists of several changes to the environment. An example of such a nudge is provided by van Nieuw-Amerongen et al., (2011). In this study, the authors sought to make stairway use more accessible and visible, through introducing constantly open glass doors, as well as through implementing footsteps on the floor that led participants towards the stairway. More examples of multilayered nudges can be found in the work of Bauer et al. (2021, 2022). Building up on the previous literature, the present study investigates the effect of a multilayered nudge that increases the availability and visibility of AW products.

While the number of experimental research on the effect of nudges is constantly growing, less than one quarter of all studies investigated the underlying mediators and moderator of nudging (Szaszzi et al., 2018). Mediators explain the causal mechanism that underlies an intervention, whereas moderators describe the circumstances under which the effectiveness of an intervention varies (Hayes, 2018). Dolgoplova et al., (2021) provide an example of a moderation analysis, by analyzing individual characteristics that influence the effectiveness of a fast-food order nudge. The results show that participants with a higher BMI are more susceptible for nudges, which is an important insight as these groups experience a higher risk for non-communicable disease (Meier et al., 2020). The underlying mechanism of a nudge that increases the visibility and availability of AW products should be an increased ease of finding AW products in the store. To best of our knowledge, this underlying mechanism was not empirically tested so far. With regards to the moderators of an availability and visibility nudge, consumers’ price sensitivity might play an important role. Since AW products are usually more expensive than standard products, several studies linked participants price sensitivity to the purchase frequency of AW products (Simons et al., 2018; Yeh & Hartmann, 2021). Hence, consumers with a high price sensitivity are most likely less affected by the nudge.

1.2. Virtual supermarket

Since the implementation of multilayered nudges is associated with logistical difficulties for a real supermarket, we test the effect of the multilayered nudge in a virtual supermarket (VS). The main argument for the application of a VS is that it combines the advantages of field and lab studies: It creates a realistic shopping situation which increases the external validity and simultaneously allows for a high degree of control about third variables that could reduce the internal validity. The external validity has been empirically tested by different researchers and although small differences between shopping behaviour in the VS and real supermarkets could be observed, it shows overall a good validity (De-Magistris et al., 2021; van Herpen et al., 2016). Consequently, the effect of different interventions has been tested in VS settings, including nudging (Blom et al. 2021; Goedegebure et al. 2020), pricing strategies (Poelman et al. 2017; Waterlander et al. 2012, 2019) and combinations of nudging and pricing (Hoenink et al. 2020; Stuber et al. 2021; van der Molen et al. 2021).

Different sustainability dimensions have been investigated with a VS such as healthy food (Meijers et al. 2022; Blitstein et al., 2020) and beverage selection (Eykelboom et al., 2021), as well as environmentally friendly purchase behaviour (Arrazat et al. 2023). In contrast, increasing AW purchase behaviour with a VS, has received little empirical attention. To the best of our knowledge, only one example is provided by Bach et al. (in press). The authors tested the effect of making AW labels more salient through banners and on-shelf labels in a VS. Although animal welfare sales marginally increased in response to the salience nudge, this effect did not reach statistical significance (Bach et al., in press).

1.3. The present study

The main goal of the present study is to test the effect of nudging on the AW purchase behaviour in a VS. Based on the previous literature, we designed a multilayered nudge that should increase the availability and visibility of AW products: We implemented an additional shelf in the VS, that only consisted of AW products and made this new shelf salient through footsteps on the floor and banners. Furthermore, we examine variables that mediate and moderate the effect of nudging. We pre-registered the following three hypotheses: i) Nudging increases AW products purchases compared to the control group, ii) The effect of nudging on product purchases is mediated by ease of finding AW products: Nudging leads to higher ease of finding, which leads to more AW product purchases, iii) Price sensitivity moderates the effectiveness of nudging: Among price sensitive consumers, the effectiveness of nudging decreases. Figure 1 presents an overview of the research model.

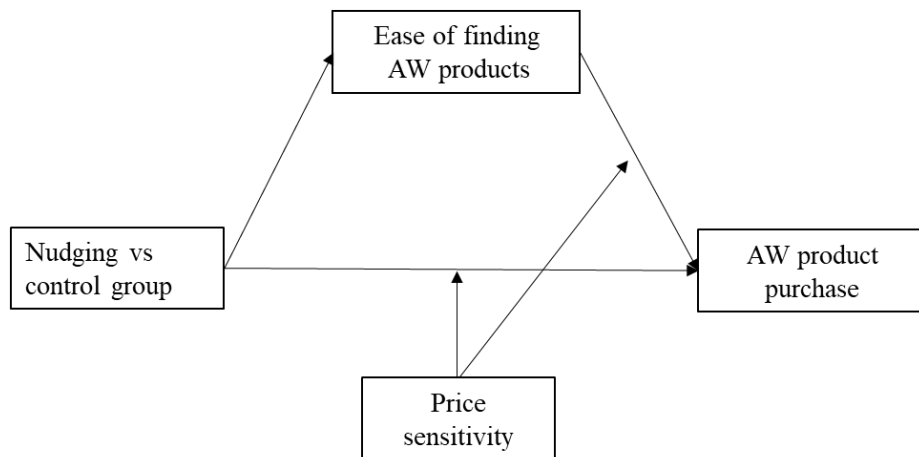


Figure 1. The research model.

2. Method

2.1. Experimental design

The study followed a between-subjects experimental design. Participants were randomly assigned to the control group or the nudge group¹. The data was collected in April 2023 and the recruitment was performed by a market research agency that invited consumers from their panel. Participants could only perform the experiment on stationary devices (e.g. computer, laptops), but not on mobile devices, such as smartphones, as those were not compatible with the VS tool. The target population consisted of German consumers and eligibility criteria for study participation were: regular shopping of meat, milk, and eggs, being (co-)responsible for grocery shopping of the household, and being in the age range of 18-65 years. Participants who did not meet the inclusion criteria and who failed to answer an attention check correctly were automatically screened out. We included only complete data sets in the data analysis and as pre-registered excluded participants who purchase no animal-based products in the VS (milk, egg or meat) and who experienced severe technological problems.

The sample size was determined with a Monte Carlo power analysis, by using the online calculator tool from Schoemann et al. (2020). The target power was set at 85% and the confidence level at 95%. We used correlation coefficients as input method to estimate the sample size for a small to medium effect size for all pathways, leading to a minimal sample size of $n = 360$. To account for possible exclusions, we overrecruited by approximately 10% and pre-registered to stop sampling at $n = 400$. The study was approved by the ZEF Research

¹ The experiment consisted of three more experimental conditions that were not related to the nudging research question. These conditions and other elements of the survey are reported elsewhere and were separately pre-registered.

Ethics Committee (Code: 8_ILR_21) and pre-registered at as.predicted. We share the pre-registration form here https://aspredicted.org/NQB_N1X.

2.2. Procedure and material

In this section, we describe the set-up of the online experimental study, followed by a concise description of the corresponding material in the subsequent paragraphs. First, participants gave written consent to participate in the study and we assessed whether they were eligible. Next, participants received a tutorial in which all functions of the virtual supermarket were explained. Then, they entered the virtual supermarket and performed the shopping task. Depending on the condition, participants performed the task either in the control supermarket or in the nudge supermarket. After completing the shopping task, participants were asked to fill out a survey. We assessed technical problems that participants might have encountered, participant's evaluation of the virtual supermarket, psychological constructs, such as, perceived freedom of choice, ease of finding AW products, and price sensitivity. Lastly, we collected information on participants' socio-demographic background and purchase behaviour and provided a debriefing.

2.2.1 The virtual supermarket

We utilized a 3D browser-based virtual supermarket that we designed in collaboration with a market research agency for a broader research project, the study is part of. The basic structure of this VS is the same as in Bach et al. (in press), but some details in the set-up were changed for this experiment. Before entering the virtual supermarket, participants read a tutorial that explained the key functions of the virtual supermarket. Participants learned how to navigate in the VS by using the mouse cursor and the keyboard, how to take a look at products in the shelf, how to add and remove products from the shopping cart, and how to check-out from the VS. The tutorial consisted of short written instructions and images that illustrated each function. In addition, participants were informed about some important characteristics of the VS, for example, that certain aisles could not be entered and that not all shelves in the VS were interactive. Before entering the supermarket, participants were also given the instructions to purchase milk, eggs and three different meat products for their household. To increase the external validity, we asked participants to spend their usual budget and to only purchase products that they would also be willing to pay in a regular shopping situation. Then, participant entered the VS.

The VS of this study included interactive shelves, from which participants could select eggs, milk and different fresh meat products as well as vegan alternatives. The VS offered a variety

of 10 different types of milk and 7 types of eggs, including various German brands, but also the own brand of a retailer. The meat shelf consisted of 24 different chicken, pork, beef and minced meat products that all carried the same fictitious trademark. The prices for all products were based on real German market prices. In all shelves, participants could select between several standard and AW products. To distinguish between animal welfare and standard products, we utilized two different existing labels from the German food market: For milk and meat, we refer to the 4-stages animal-husbandry label (HF) that was implemented by retailers (Initiative Tierwohl, 2019). We considered HF1 and HF2 as standard products, whereas those carrying the stage HF3 and HF4 were classified as AW products. For eggs, we considered the legally required EU marking for eggs (EU, 2008). We define organic or free range eggs as AW products and eggs from cages hens as standard products. In addition to the animal-based products, participants could also select a variety of vegan milk and meat alternatives. An overview of all products, including some relevant characteristics can be found in Table A1 in the Appendix. Similar to a real supermarket, participants could take products out of the shelves. When participant selected a product, they saw a high-resolution 3D representation of the product that they could inspect from all angles. Selected products could either be added to the shopping cart or be returned to the shelf. The non-interactive shelves depicted photos of a wide range of other product categories (e.g. pasta, yoghurt, cleaning agents), but no products could be selected from these shelves. In order to complete the shopping task, participants had to navigate to the check-out. At the check-out, participants got to see the final selection of products one more time and the final sum. At this stage, participants had again the opportunity to remove products from the shopping cart, or they could terminate the task by paying. However, this final step was only hypothetical and participants did not really have to pay the product, neither did they receive real products in the end.

2.2.2. The animal welfare nudge

As experimental manipulation, we modified the above described VS of the nudge condition, by implementing a multilayered AW nudge. The nudge consisted of three elements (See Figure 2). First, we added an additional shelf in the supermarket, that consisted only of AW products. Hence, this nudge was thought to facilitate the search for AW products, by placing all products centrally in one location. Moreover, this nudge increased the availability of AW products, as we did not remove the AW products from the other shelves in the supermarket, but increased the overall number of AW products. Second, we implemented footsteps on the floor of the VS,

which guided participants from the entrance area directly to the animal welfare shelf. This element sought to increase the salience of the AW shelf and facilitate the ease of finding AW products by providing guidance. Third, we implemented banners in the entrance area and next to the animal welfare shelf, that included information about the AW shelf and a prompt to purchase AW products. This element was sought to increase the salience of the AW products and to provide additional information to the consumers about the shelf.

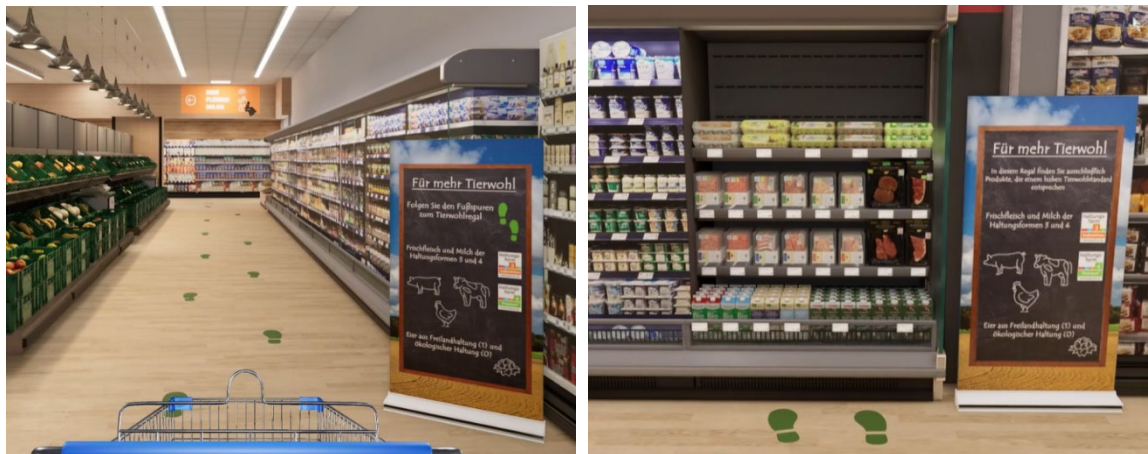


Figure 2. Implementation of animal welfare nudge in the virtual supermarket.
Note. Left image shows entrance area of the supermarket, right image shows AW shelf.

2.2.3. Survey measures

After completing the VS task, participants filled out a survey. First, we assessed whether any *technical problems* occurred. Based on previous research with this VS tool (Bach et al., in press), we provided participants with a list of possible technical problems, from which they could select everything that occurred, as well as, an open text field. To evaluate the impact of technical problems on the VS task—for those who indicated to have technical problems—we asked participants to rate the *technical impairment* ('How did the technical problems affect your purchasing?') on a 7-point Semantic Bipolar scale (1 = not at all, to 7 = severely). Next, participants were asked to rate the *ease of using the VS* with three items ('I found it easy to find my way inside the virtual supermarket', 'I was able to do exactly what I wanted to do in the virtual supermarket', 'I had difficulties using the virtual supermarket properly') on a 7-point Likert scale (1 = I strongly disagree, 7 = I strongly agree). To evaluate the degree of similarity of the present VS with real supermarkets, we measured the *realism of the VS* with three statements ('The prices in the virtual supermarket corresponded to realistic market prices', 'I would make the purchase decision in the same way if I actually had to pay for the products', 'The set-up of the virtual supermarket reminded me of supermarkets I know'), using the same Likert scale as described previously.

Next, we measured the psychological construct *perceived freedom of choice* based on a scale by van Kleef et al. (2012). We used three items that were measured on a 7-point Semantic Bipolar scale (not free in my choice – free in my choice, strongly restricted – not restricted, strongly influenced – not influenced) and showed a high internal consistency (Cronbach's $\alpha = 0.88$). Then, we assessed the *ease of finding AW products* – the proposed mediator – with three items ('I found it easy to find animal products from better husbandry conditions in the virtual supermarket', 'The supermarket supported me in finding animal products from better husbandry conditions', 'Animal products from better husbandry conditions were very visible and easy to find in the virtual supermarket') that also showed a high internal consistency (Cronbach's $\alpha = 0.89$). Lastly, we measured consumers' grocery shopping related *price sensitivity*. We modified the price sensitivity scale from Lichtenstein et al. (1993) and used three items ('I try to save money by looking for low prices', 'I usually go to more than one shop to find low prices', 'The time it takes to find low prices is worth the effort to me') that showed an acceptable internal consistency (Cronbach's $\alpha = 0.78$).

3. Results

3.1. Preliminary analysis

400 participants were recruited to test the effect of nudging on AW product purchase behaviour. We excluded 5 participants because they did not purchase any animal-based product (milk, meat, or eggs) in the VS and 21 participants because they encountered severe technical problems in accessing in the VS. The final sample consist of $n = 374$ participants of which $n = 186$ were assigned to the nudge condition and $n = 188$ to the control condition. Participants were on average $M = 44.39$ years old ($SD = 12.11$) and purchased milk ($M = 4.97$, $SD = 0.99$), eggs ($M = 4.71$, $SD = 0.85$), and meat ($M = 4.73$, $SD = 0.87$) several times per month. Approximately half of participants use the 4-stage animal husbandry label sometimes or often (52.90%), when doing grocery shopping. One quarter of participants uses the label (almost) always (25.40%) and approximately one quarter never or rarely (21.70%). We observed a similar pattern for the EU mandatory egg marking and the organic label. More sample characteristics can be viewed in Table 1.

A randomization check revealed no significant difference between the condition with regards to age, household size, gender, education, shopping responsibility, grocery shopping behaviour, diet, occupation, income, or price sensitivity (all $ps > 0.16$). Hence, we can assume that the randomization was successful.

Table 1. Sample characteristics

Gender	%	Occupation	%
Women	40.64	Employee	69.79
Men	59.46	Self-employed	5.88
<u>Age</u>		Job seeking	4.28
19-29 years	11.77	Unemployed	6.95
30-39 years	25.40	Pensioner	8.65
40-49 years	25.40	Apprentice/ student	4.55
50-59 years	24.33	<u>Education</u>	
60-65 years	13.10	Currently in school education	0.53
<u>Shopping responsibility</u>		Low school degree	4.01
Mainly responsible	74.87	Medium school degree	10.70
Co-responsible	25.13	High school degree	10.43
<u>Household size</u>		Apprenticeship	34.22
1-3 people	79.14	College degree	6.15
4-6 people	20.86	University degree	33.96
<u>Income</u>		<u>Dietary style</u>	
Less or equal than 900€	4.82	Omnivore	64.17
901 € - 1,300 €	5.08	Flexitarian	32.62
1,301 € - 2,000 €	18.18	Pescetarian, Vegetarian, Vegan	3.21
2,001 € - 3,600 €	32.35	<u>Shopping habit</u>	
3,601 € - 5,000 €	24.06	Supermarket	61.76
More than 5,000 €	10.70	Discounter	36.63
Not disclosed	4.81	Other	1.61

3.2. Evaluation of virtual supermarket

On average, participants experienced $M = 1.00$ ($SD = 1.13$) out of the six listed technical problems. Most often, participants reported difficulties related to the mouse pointer ($n = 177$), low resolution or lagging image quality ($n = 99$), and long loading time of the virtual supermarket ($n = 90$). However, these issues did only little-to moderately ($M = 3.51$, $SD = 1.47$) impact the shopping experience, indicating that participants could complete the shopping task as intended. This view is also supported by the reported ease of using the virtual supermarket (Figure 3). The majority of participants (66.60%) agreed that they could do exactly what they wanted to do in the VS and 71.10% found it easy to navigate inside the virtual supermarket. Nevertheless, a substantial number of participants (32,1%) agreed that they encountered difficulties in using the virtual supermarket properly. Hence, overall the virtual supermarket appears to be rather well functioning and the majority of participants could complete the shopping experience, although some participants faced difficulties.

Overall, the virtual supermarket was perceived as realistic by participants (Figure 4). The majority of participants (72.20%) agreed that the virtual supermarket resembled the set-up of other supermarkets and 69.00% would make the same purchase decision if they actually had to pay for the products. Similarly, the majority of participants (64.40%) agreed that the prices of products in the VS corresponded to realistic market prices.

On average, participants experienced a rather high freedom of choice ($M = 5.17, SD = 1.45$) during the VS task. This perception was not significantly different across the conditions ($t(372) = 1.00, p = 0.31$), thus, the AW nudge fulfilled one of the most important criteria according to the original definition by Thaler and Sunstein (2008) by operating without decreasing the freedom of choice.

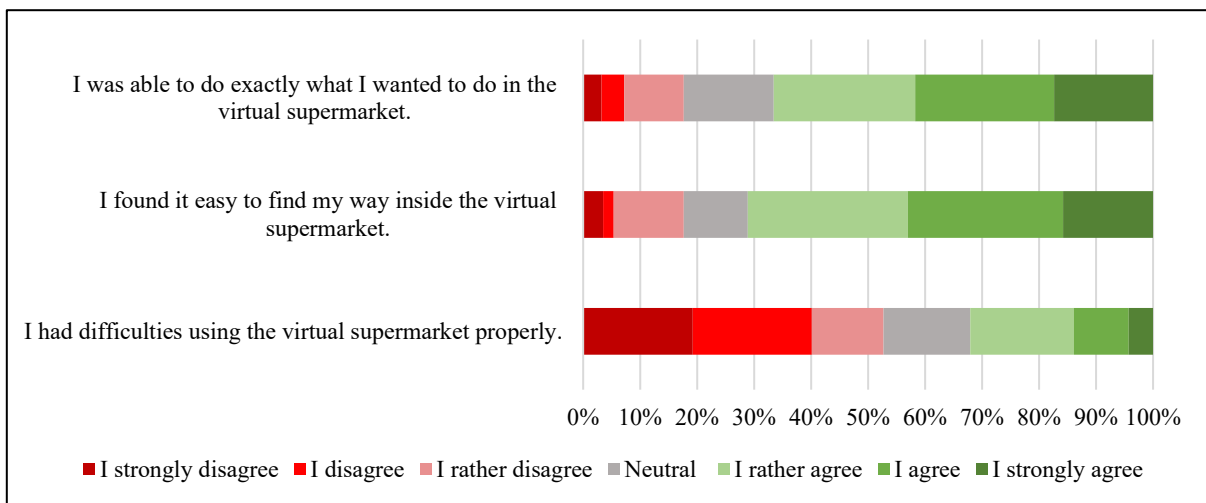


Figure 3. Ease of using virtual supermarket

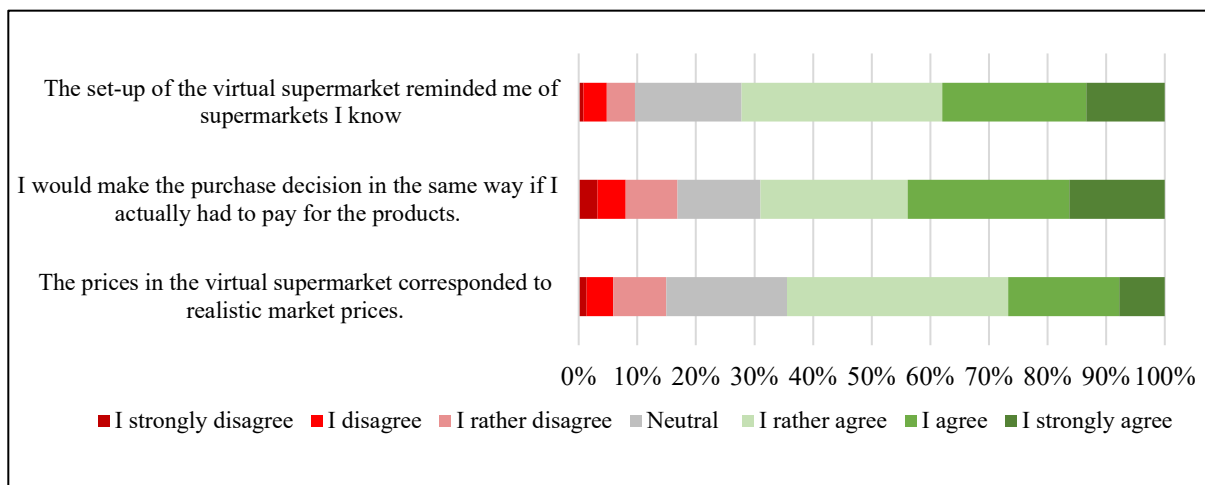


Figure 3. Realism of virtual supermarket

3.3. Main analysis

Participants purchased on average $M = 5.08$ animal-based products ($SD = 2.05$, $Min = 1$, $Max = 21$) in the VS. As main dependent variable, we analyzed the share of animal welfare items that participants purchased, defined as the amount of AW products divided by the total amount of animal-based items. The share of the nudging condition ($M = 0.69$, $SD = 0.35$) was almost twice as high as the share of the control group ($M = 0.38$, $SD = 0.35$), which is a statistically significant difference of a large magnitude ($t(372) = 8.57$, $p < 0.001$, *cohen's d* = 0.91).

To assess whether the effect of nudging on the share of animal welfare products was mediated by ease of finding AW products and moderated by price sensitivity, we performed a conditional process analysis. We used the SPSS macro PROCESS (v4.0) by Hayes (2018) and calculated Model 15. This model combines two OLS regression analyses: First, the effect of the independent variable (IV) on the mediator is investigated. Second, the effect of the IV, mediator, and moderator on the dependent variable (DV) is investigated. The IV is a dummy variable (1 = nudge, 0 = control) that expresses participants condition and the DV a ratio variable that express the share of animal welfare product purchases. The mediator is included in the analysis as the mean score of the three ease of finding items and the moderator consists of the mean score of the three items to measure price sensitivity. To test for the moderation effect, mean-centered interaction terms with price sensitivity are calculated. The OLS regressions are estimated with heteroscedasticity consistent standard errors (HC4, Cribari-Neto, 2004) and the indirect effect is calculated with 5,000 bootstraps. The output of the regression analyses can be found in Table 2.

The first regression analysis shows that whether participants are assigned to the nudging or the control condition does not significantly influence the ease of finding AW products ($b = 0.24$, $p = 0.10$, $CI = [-0.05; 0.53]$), although the average ease of finding is higher in the nudging condition ($M = 4.56$, $SD = 1.41$), than in the control condition ($M = 4.31$, $SD = 1.42$). The second regression model shows that the share of AW product purchase is significantly positive related to the condition ($b = 0.31$, $p < 0.001$, $CI = [0.23; 0.37]$), ease of finding ($b = 0.04$, $p = 0.004$, $CI = [0.01; 0.06]$), and significantly negative to price sensitivity ($b = -0.06$, $p < 0.001$, $CI = [-0.09; -0.04]$). In contrast, the interaction terms showed no significant moderation effect of price sensitivity and the analysis of the indirect effect revealed no significant mediation effect of ease of finding. Hence, the data offer strong support for the first hypotheses, but not for the second and third hypotheses.

Table 2. Results of mediation analysis

Variables	Ease of finding			AW product purchase		
	<i>b</i>	<i>t</i>	95% <i>CI</i>	<i>b</i>	<i>t</i>	95% <i>CI</i>
<i>constant</i>	-0.00	-0.00	[-0.14; 0.14]	0.53	30.69***	[0.50; 0.57]
Nudge	0.24	1.65	[-0.05; 0.53]	0.31	8.71***	[0.23; 0.37]
Ease of finding	-	-	-	0.04	2.88**	[0.01; 0.06]
Price sensitivity	-	-	-	-0.06	-4.83***	[-0.09; -0.04]
Price sensitivity*Nudge	-	-	-	-0.01	-0.48	[-0.07; 0.04]
Price sensitivity*Ease of finding	-	-	-	-0.01	-1.23	[-0.03; 0.01]
<i>F (df)</i>	2.73 (1,372)			33.02*** (5,368)		
<i>R</i> ²	0.01			0.25		

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

4. Discussion

The goal of the present study was to evaluate the effect of nudging on animal welfare (AW) product purchases in a virtual supermarket (VS). Based on prior literature, we investigated the effect of a multilayered nudge. The nudge consisted of an additional AW shelf, banners and footsteps on the floor that sought to increase the availability and visibility of AW products. Additionally, we examined whether ease of finding AW products mediate and consumers' price sensitivity moderate the effectiveness of nudging, respectively.

We found strong support for our first pre-registered hypothesis. The multilayered nudge almost doubled the share of AW product purchases, which corresponded to a large effect size (*cohen's d* = 0.9). Although the effect size of nudging can vary a lot – Cadario and Chandon (2019) observed a range from $d = 0.12$ to $d = 0.74$ in their meta-analysis – the observed effect size of the present study is exceptionally high. This might be partly related due to the nature of VS studies (see also van Herpen et al., 2016 and Bressoud et al., 2013 for a discussion of overestimation of effect sizes in VS research). However, generally this finding is in line with other previous research, suggesting that increasing availability and visibility of certain products is a very effective nudge (Mertens et al., 2021).

In contrast, the second hypothesis could not be supported. Although ease of finding significantly increased AW purchases, the groups did not significantly differ in the ease of finding AW products. One possible explanation for the lack of an effect is that it was also relatively easy to find AW products in the VS for the control group. While in German supermarkets only approximately 13% of the assortment consist of AW products, we increased this number in the VS of the present study in order to create some product variability (Verbraucherzentrale, 2020). Hence, not only participants in the nudge group might have

experienced an increased ease of finding AW products, compared to a real supermarket, but also participants in the control group. Similarly, our third hypothesis could not be supported. Price sensitivity did not moderate the susceptibility to the AW nudge. Although AW products were considerably more expensive than standard products, highly price sensitive consumers were equally affected by the nudge as low price sensitive consumers. We offer two explanations for the lack of a moderation effect. First, due to the hypothetical nature of the purchase decision, low price sensitive consumers might have been more inclined to follow the nudge, compared to when they really had to pay for the products. Hence, the nudge might have outweighed consumer' price sensitivity. Yet, we found a general relationship between AW product purchases and price sensitivity. Regardless of the presence of the nudge, highly price sensitive participants purchased less AW products, which is consistent with other prior literature (e.g. Yeh & Hartmann, 2021).

Evidently, the present study is not free of limitations and offers some implications for future researchers. The main limitation is that albeit the VS increases the realism of online research, the purchase decision remains hypothetical. Even though the present study suggests that the nudge is highly effective, more research is needed that replicates this finding with a field study in a real supermarket. A field study has a higher external validity as a VS experiment, because it observes consumers in their natural environment and usually includes real purchase decisions. The second limitation refers to the design nudge. The present study tested the effect of a multilayered nudge that consisted of several components – an additional shelf, footsteps on the floor, and banners. Since we did not evaluate the effectiveness of the single components, we cannot evaluate the effectiveness of the nudge when single components are missing. Therefore, more research is needed to evaluate whether an AW shelf is still highly effective, for example without additional footsteps or banners.

This study has important implications for the agriculture and food sector the future marketing strategies of AW products. We demonstrate that consumers purchase more AW products, when AW products are more available and more visible in the supermarket. In order to increase AW product purchases, retailers could place AW in a central location within the supermarket and make them as visible as possible. This would not only positively contribute to a more sustainable, animal-friendly consumption pattern, but also increase the sales volume of the supermarket. Such a development might be of particular relevance in the future when more AW labels are introduced to the market, such as, the upcoming governmental AW label in Germany. To conclude, multilayered nudges can significantly increase consumers' AW

product purchasing behavior in a VS, irrespective of individual price sensitivity and provide a promising future marketing strategy.

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Appendix

Table A1. Overview of available products in virtual supermarket

	Product	Type	Price	Price per liter/ kg
Milk	Andechser länger haltbare Bio Milch 3.8	AW*	1.65 €	1.65 €
	Andechser länger haltbare Bio Milch 1.5	AW*	1.55 €	1.55 €
	Edeka Bio frische Vollmilch 3.8	AW*	1.19 €	1.19 €
	Edeka Bio frische fettarme Milch 1.5	AW*	1.09 €	1.09 €
	Berchtesgadener Land Frische Bergbauern Milch 3.5	AW*	1.25 €	1.25 €
	Berchtesgadener Land Frische Bergbauern Milch 1.5	AW*	1.15 €	1.15 €
	Bärenmarke die frische Milch 3.8	Stan	1.45 €	1.45 €
	Bärenmarke die frische Milch 1.8	Stan	1.35 €	1.35 €
	Edeka Gut & Günstig frische fettarme Milch 1.5	Stan	0.89 €	0.89 €
	Edeka Gut & Günstig frische Vollmilch 3.5	Stan	0.99 €	0.99 €
Eggs	Dein Land Ei Gute Bio Eier	AW*	5.29 €	/
	Topphöfen 10 Bio Eier aus ökologischer Erzeugung	AW*	4.89 €	/
	Edeka Gut & Günstig 10 Eier aus Freilandhaltung	AW*	2.39 €	/
	Edeka Gut & Günstig 10 frische Bioeier	AW*	3.49 €	/
	Topphöfen 10 frische Eier aus Freilandhaltung	AW*	3.19 €	/
	Topphöfen 10 frische Eier aus Bodenhaltung	Stan	2.89 €	/
	Edeka Gut & Günstig 10 frische Eier aus Bodenhaltung	Stan	2.09 €	/
Meat	Gemischtes Hackfleisch - H1	Stan	4.69 €	9.38 €
	Gemischtes Hackfleisch - H3	AW*	5.89 €	11.78 €
	Gemischtes Hackfleisch - H4/Bio	AW*	8.59 €	17.18 €
	Rinderhackfleisch - H1	Stan	5.59 €	11.18 €
	Rinderhackfleisch - H3	AW*	6.99 €	13.98 €
	Rinderhackfleisch - H4/Bio	AW*	9.69 €	19.38 €
	Schweine Minutensteaks - H1	Stan	4.19 €	10.48 €
	Schweine Minutensteaks - H3	AW*	6.29 €	15.73 €
	Schweine Minutensteaks - H4/Bio	AW*	10.69 €	26.73 €
	Schweineschnitzel - H1	Stan	5.19 €	10.38 €

	Schweineschnitzel - H3	AW*	8.39 €	16.78 €
	Schweineschnitzel H4/Bio	AW*	14.99 €	29.98 €
	Hähnchen Minutenschnitzel - H2	Stan	5.49 €	13.73 €
	Hähnchen Minutenschnitzel - H3	AW*	7.49 €	18.73 €
	Hähnchen Minutenschnitzel - H4/Bio	AW*	14.19 €	35.48 €
	Hähnchenbrustfilet - H2	Stan	5.29 €	13.23 €
	Hähnchenbrustfilet - H3	AW*	7.59 €	18.98 €
	Hähnchenbrustfilet - H4/Bio	AW*	13.99 €	34.98 €
	Hüftsteaks - H1	Stan	7.89 €	26.30 €
	Hüftsteaks - H3	AW*	9.89 €	32.97 €
	Hüftsteaks - H4/Bio	AW*	11.99 €	39.97 €
	Rumpsteak - H1	Stan	8.79 €	29.30 €
	Rumpsteak - H3	AW*	10.99 €	36.63 €
	Rumpsteak - H4/Bio	AW*	14.29 €	47.63 €
Vegan	Veganes Mühlen Filet Typ Hähnchen	Veg	3.19 €	17.72 €
	Vegane Mühlen Schnitzel	Veg	3.19 €	17.72 €
	Veganes Mühlen Hack	Veg	3.19 €	12.76 €
	Garden Gourmet Vegane Filetstücke Hähnchen-Art	Veg	2.99 €	18.69 €
	Garden Gourmet Sensational Hack/Faschiertes	Veg	3.69 €	18.45 €
	LikeMeat Like Hack	Veg	3.19 €	17.72 €
	LikeMeat Like Chicken	Veg	3.19 €	17.72 €
	The Green Mountain Plant-Based Steak	Veg	4.79 €	23.95 €
	Viana Veggie Wiener Schnitzel	Veg	4.79 €	23.95 €
	Alpro Soya	Veg	2.09 €	2.09 €
	Oatly Hafer Bio	Veg	2.09 €	2.09 €
	Oatly Hafer Classic	Veg	2.09 €	2.09 €

Note. AW = Animal welfare, stan = standard, veg = vegan. Products marked with an asterisk were placed in the additional AW shelf.

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