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Organics unpacked : The influence of packaging on the choice for organic fruits and vegetables

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Short Communication

Organics unpacked: The influence of packaging on the choice for organic fruits and vegetables

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ABSTRACT

In many supermarkets throughout Europe, it has become common practice in the fruit and vegetable department to offer options in plastic packaging. Recent trends, however, move towards the removal of packaging. The current study examines whether offering fruit and vegetables without primary packaging increases the likelihood that consumers choose these products. This is especially relevant for organic fruit and vegetables, given that plastic may be perceived as contrary to the sustainable nature of these products. A first experiment, using a student sample and an immersive 3D virtual supermarket environment, shows that choice for organic fruit and vegetables indeed increases when organics are offered without packaging. A second experiment with the virtual supermarket generalizes these findings to a sample of supermarket patrons, additionally showing that unpacked fruit and vegetables are preferred over packed options overall, both for organic and non-organic products. We conclude that removing the primary packaging of organic fruit and vegetables appears to be a promising intervention in attempts to increase organic sales.

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1. Introduction

In recent years, new supermarket concepts have appeared in many markets, offering products without packaging. Examples are Original Unverpackt in Berlin (Germany), Bag&Buy in Utrecht (the Netherlands), and Biocoop in Paris (France). Consumers buy or bring their own bags and jars and (re)fill these. The introduction of these new supermarket concepts and the interest they have raised indicate that despite obvious advantages of packaging, consumers may not always prefer products that are packaged. Well-established supermarket chains likewise adapt to consumer concerns about packing by leaving out packaging where possible (for instance the Albert Heijn in the Netherlands; te Pas, 2015).

The current study will examine consumer choice for packaged and unpackaged products in the fruit and vegetable category. For various reasons, the fruit and vegetables category offers an opportune possibility to study the influence of packaging. Consumers are accustomed to finding options in this category both with and without packaging, ensuring that responses to packed/ unpacked options are not due to novelty of the packaging but represent learned preferences. Furthermore, the category is highly relevant as fresh food, of which fruit and vegetables are part, accounts for a large portion of consumer spending on food, grocery and personal care items, ranging from 32% in the US to 53% in Europe and 60% in Asia (Karst, 2013). But what is perhaps most intriguing, is the common practice to offer organic options *with* and non-organic options *without* packaging, as a way to ensure that these are not mixed up and are traceable. For instance, the frequently asked questions page about the organic program of producer Dole (www.doleorganic.com) mentions: "Many retailers prefer to merchandise organic bananas in plastic bags so that they can be clearly distinguished from conventionally grown bananas and ensure that the consumer purchases the product at the correct price. Additionally, some supermarkets also prefer the plastic bags to guarantee the organic integrity of the product. The organic claim is, in fact, about how the product is grown, however, supermarkets are responsible for maintaining separation of organic from conventional fruit in order to avoid cross-contamination". As consumers tend to view packaging as wasteful and many consumers prefer more environmentally friendly packaging (Kassaye & Verma, 1992; Rokka & Uusitalo, 2008; Thøgersen 1999), this results in the counterintuitive situation in which more sustainable options are offered in what at least appears to be a less sustainable format and vice versa. It has enticed consumer protests, as evidenced by

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initiatives to protest the use of plastic to package organic produce (e.g., the blogpost http://myplasticfreelife.com/2009/06/organic-food-in-plastic-packaging-isnt/ and the recent change.org petition in Australia (Law 2015)). This implies that there may be a missed opportunity to increase the sales of organic products by offering these products unpacked.

Unpacked offering of fruit and vegetables on the store shelves concerns what is known as 'primary packaging': the immediate container of the product itself (Wu & Dunn, 1995). Secondary and shipping packaging, which are needed for storage, identification, and transport, and which are discarded before the product is placed on the store shelves, are not the topic of the current investigation. The main objective of the current study is to examine if offering organic fruit and vegetables without primary packaging increases their choice likelihood. We assess this in two controlled experiments, using students (experiment 1) and a sample of supermarket patrons (experiment 2), and employing immersive 3D virtual technology in both experiments.

1.1. The functions and costs of packaging

How a food product is packaged can influence consumers' taste impressions (Becker, van Rompay, Schifferstein, & Galetzka, 2011), generate emotional responses (Liao, Corsi, Chrysochou, & Lockshin, 2015), and predispose consumers to purchase (Murray & Delahunty, 2000). Packaging has many functions and prior research has proposed various categorizations for these functions (Marsh & Bugusu, 2007; Prendergast & Pitt, 1996; Rundh, 2005). Three overarching categories recur throughout the literature related to (1) containment and handling, (2) protection and preservation, and (3) information and communication. First, packaging has a containment function, keeping the product together and facilitating handling both throughout the supply chain and by the end-consumer (Marsh & Bugusu, 2007). This includes logistical convenience in terms of ease in storing the product and moving it through the supply chain (Prendergast & Pitt, 1996). Some of the packaging involved, such as pallets and wrapping to allow bulk handling, never reaches the consumer. A second main function of packaging is its ability to protect the product from outside influences and preserve the quality of the product itself. Packaging acts as a barrier to safeguard a product from physical influences (e.g., crushing during transport), chemical influences (e.g., exposure to moisture) and biological influences (e.g., micro-organisms) (Marsh & Bugusu, 2007; Rundh, 2005). At the same time, packaging can help preserve product quality by helping to maintain favorable product aspects, such as preserving the carbon dioxide in carbonated soft drinks. A third main function of packaging is communication and information provision. Packaging can help consumers identify products and brands, draw attention to a product, and provide relevant information about the product itself and its use (Prendergast & Pitt, 1996; Underwood, Klein, & Burke, 2001; Van Herpen & Pieters, 2007; Wells, Farley, & Armstrong, 2007). Because food products are often characterized by a homogeneous appearance of the unpacked product, this function is especially relevant as a means to differentiate and position these products (Simms & Trott, 2010).

Packaging can perform these functions, but this comes at a cost. This entails both the monetary cost of the packaging material itself and the environmental burden that packaging causes (Kassaye & Verma, 1992; Simms & Trott, 2010). Packaging can reduce food losses throughout the supply chain, and this has been argued and shown to outweigh the packaging waste itself in various cases (Williams & Wikström, 2011), especially when packages can be recycled or reused. In consumer perception, however, packaging often represents wastefulness, and is seen as a symbol of the 'throwaway society' (Roper & Parker, 2013). The current study examines how packaging influences consumer choice, as important input for managerial decision making. We do not study whether packaging has positive or negative overall environmental consequences nor do we take a normative stance on whether packaging is or is not wasteful. We examine how packaging affects consumer choice for fruit and vegetables so that manufacturers and retailers can use this information in their decision on whether to use packaging, alongside other relevant information.

1.2. Main hypothesis

Although packaging clearly has distinct advantages for consumers in terms of convenience, food safety, and information, there is also empirical evidence that consumers dislike packaging. In the context of fruit and vegetables, prior research indicates that consumers' ideal fruit and vegetables are unpacked (van der Pol & Ryan, 1996). There may be various reasons for this preference: it is easier to touch the product, which is both rewarding by itself and a way to check quality (Peck & Childers, 2006; van der Pol & Ryan, 1996), consumers do not need to buy a preset amount but are free to choose any number of items, and consumers may perceive less environmental impact of packaging. The latter might be especially important for organic options, where unpacked products may fit better with the environmental product image of the product, as we will examine.

The main hypothesis underlying this study is that unpacking organic fruit and vegetables will increase their choice likelihood. We will test this hypothesis in two experiments. Additionally, we examine whether the effect of unpacking is larger for organic than for non-organic products, and whether consumers with a more positive attitude towards organics respond more strongly to unpacking, to explore whether the unpacking is especially impactful for organic products.

2. Experiment 1

This experiment provides a first test of the hypothesis, using a controlled environment and a convenience sample of students. To increase realism of the task and a feeling of being present in the choice environment, we used a representation of a brick-and-mortar supermarket in an immersive 3D virtual environment.

2.1. Method

2.1.1. Participants and design

Participants were 100 undergraduate and graduate students at a Dutch university (68% female, mean age 22 years), who were recruited around campus. They were randomly assigned to one of the conditions of a two group design. They either saw an assortment of fruit and vegetables in which the organic products were packed (and non-organic unpacked) or an assortment in which the non-organics were packed (and the organics packed). Packaging consisted of plastic material, with the product clearly visible. Plastic was chosen because it is a common packaging material in the fruit and vegetable category, and the use of plastics has increased due to the low cost of materials and functional advantages (Marsh & Bugusu, 2007). A check in the INNOVA database, a food and beverage product database that includes packaged products from over 70 countries worldwide (www.innovadatabase.com), supports the prevalence of plastic packaging for fresh fruit and vegetable. We calculated the percentage of packaged fresh fruit and vegetables for which plastic was used as packaging material across five European countries (the Netherlands, the UK, the Czech Republic, Denmark, and Spain), resulting in percentages ranging from 87% to 95%. Plastic is thus the most commonly used packaging material for packaged fresh fruit and vegetables throughout Europe.

2.1.2. Virtual supermarket

The virtual supermarket system consisted of a PC with three LCD screens of 42 in. each. These screens were placed at an angle, such that participants obtained a 180 degree field-of-view within the virtual environment. The shopping simulation software was developed by Green Dino BV (www.greendino.nl). Eye-level was set at the average adult height. Navigation through the virtual environment took place with keyboard and mouse, and products could be picked up by a mouse click. When a product was picked up from the virtual shelf, a picture of the product appeared on the front screen together with the shelf tag.

2.1.3. Procedure

Participants first received a practice session to familiarize themselves with the virtual supermarket and navigation therein. They received instructions on how to move around in the virtual supermarket and how to select products, and were asked to fulfill a few exercises (e.g., walk to the wine assortment, select a bottle of wine and put it back, buy a pack of sprinkles). The practice environment did not contain fruit or vegetable products.

Next, participants were asked to imagine a situation in which they were planning to cook multiple dishes with friends that evening. They were told that they still needed to buy fruit and vegetables while the rest of the ingredients were already bought. They received a shopping list with eight products (carrots, tomatoes, broccoli, cauliflower, leek, apples, pears, bananas), and it was mentioned that they could buy the standard amount indicated and did not need to worry about the number of items to buy for each option. They next visited the virtual supermarket with the fruit and vegetables department. For the eight products in the shopping list, both organic and non-organic options were available. Prices for organic options were 1.5 times the prices for conventional options, to represent realistic price differences. Fig. 1 provides a picture of the setup of the system and of the virtual shelf containing fruit and vegetables. After buying the products, participants finished their visit to the virtual supermarket, and answered a questionnaire on a laptop computer.

2.1.4. Measures

The main dependent variable was the number of organic choices made (0–8 products). In the background questionnaire, various constructs were measured. Included was a measure for attitude towards organic fruit and vegetables, consisting of three items ('I think that it is important to buy environmentally friendly produced fruit and vegetables', 'I am positive about buying environmentally friendly produced fruit and vegetables', and 'Environmentally produced fruit and vegetables are for me' ($\alpha = 0.86$), Dutch version cf. Melnyk, van Herpen, Fischer, & van Trijp, 2011), on a 7-point scale ranging from completely disagree to completely agree. Participants also indicated for various products, including fresh organic fruit and fresh organic vegetables, how often they had consumed these in the past months (with scale points never, less than once a month, once a month, 2–3 times a month, 1–2 times a week, 3–6 times a week, daily). They also answered a question on preference for unpacked products (single item, "I choose products without packaging over products with packaging, if this is possible").

2.2. Results

2.2.1. Background of participants

Participants generally had a positive attitude towards organically produced fruit and vegetables ($M = 5.2$ on the 7-point scale). The consumption of organic fruit and vegetables differed greatly: many participants indicated to consume these either never or less than once a month (30% for vegetables and 37% for fruit), whereas another large group indicated to consume these once or more times a week (36% for vegetables and 32% for fruit).

2.2.2. Choice

Across both conditions, participants bought an average of 2.65 organic items among the 8 items on their shopping list. Most purchases were thus for non-organic products. The percentage of people choosing an organic item differed between 21% (for cauliflower) and 43% (for apples). An independent-samples *t*-test showed that, in line with our hypothesis, participants bought more organic products when these were unpacked ($M = 3.40$) than when these were packed ($M = 1.73$; $t(98) = 3.70$, $p < 0.001$).

If packing organic products in plastic is perceived as especially incongruent compared to packing conventional products and disliked for this reason, we would expect participants with a more positive attitude towards organics to respond more strongly towards the packaging condition than people with a less positive attitude. When examining attitude towards organic and the self-reported preference for unpackaged products (single item, see method section), we found a significant but modest correlation of 0.284 ($p = 0.004$), indicating that participants with a more positive attitude towards organics stated to choose unpackaged products more. Subsequently, we conducted an ANOVA with condition and the mean-centered attitude scale as independent variables, along with their interaction, and the number of organic products chosen as the dependent variable. Packaging condition remained significant ($F(1, 96) = 23.09$, $p < 0.001$). As would be expected, the main effect of attitude was positive and significant ($F(1, 96) = 42.23$, $p < 0.001$, $\beta = 1.10$). The interaction effect was not significant ($F(1, 96) = 0.36$, $p = 0.553$). Thus, participants with a more positive attitude towards organics chose more organic products regardless of whether these were packed, and they did not respond more strongly to non-packaging than participants with a less positive attitude. This suggests that perhaps people respond positively to non-packaging in general, and not especially for organics, a point that we will examine further in the second experiment.

Summarizing, this first experiment finds support for our hypothesis. Consumers are indeed more likely to buy organic fruit and vegetables when these are offered without packaging. Because these effects were tested with a student sample, generalizability to the general population needs to be checked. Furthermore, in this first experiment we compared situations in which one of the two products was packed. Given the rising interest in package-free retail environments, testing against a condition in which both organic and non-organic products are unpacked could provide more insights. This also allows to test whether packing organics is more detrimental to choice than packing non-organic products. Experiment 2 was set up to address these points.

3. Experiment 2

3.1. Method

3.1.1. Participants and design

Participants were 150 shoppers in a Dutch supermarket located in Wageningen (65% female, age ranging between 17 and 83 years with a mean age of 41 years). Adult supermarket patrons were approached at the end of their shopping trip and asked to participate. Most participants had a university education (41%), but groups with only secondary education (16.7%) and intermediate levels were also well represented. Table 1 provides a comparison of gender and age distribution of the sample with the Dutch population and with the population of Wageningen. The sample showed an adequate dispersion across age categories, with a lower proportion of people in the age groups 'under 20 years' and

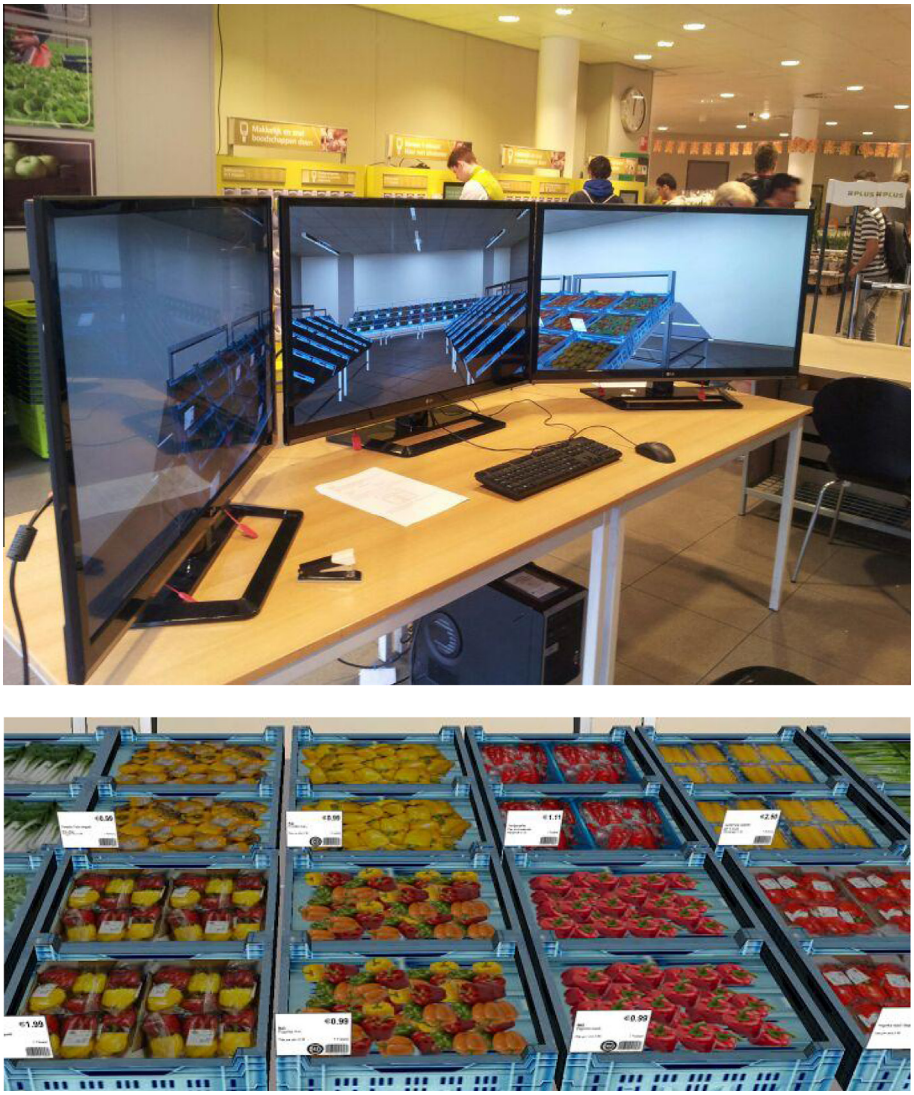

Fig. 1. Impression of the virtual supermarket system and of the virtual fruit and vegetable section.

Table 1
Comparison of age and gender between the Dutch population, the population of Wageningen, and the sample (experiment 2).

Demographic	Dutch population (2015)[a]	Wageningen (2015)[a]	Sample
Gender			
Male	49.5%	48.2%	34.2%
Female	50.5%	51.8%	65.1%
Age			
<20 years	22.7%		17.7%
20–40 years	24.5%		33.3%
40–65 years	35.1%		36.7%
65–80 years	13.4%		11.6%
>80 years	4.3%		0.7%
Age			
<20 years		20.0%	17.7%
20–25 years		15.0%	17.0%
25–45 years		27.3%	23.1%
45–65 years		22.6%	29.9%
65–80 years		10.6%	11.6%
>80 years		4.5%	0.7%

[a] Source: Dutch Central Bureau of Statistics (CBS).

'80 years or older', and also a higher proportion of females, than in the population, which is to be expected given our sampling of adult supermarket patrons. Participants were randomly assigned in a 3 group design (both organic and non-organic fruit and vegetables unpacked vs. organic packed and non-organic unpacked vs. organic unpacked and non-organic packed). Prices were set as in the first experiment.

3.1.2. Procedure

Participants were recruited in the local supermarket, while they were doing their grocery shopping, over a 3 day period in June 2014. After they consented to participation in the study, they were led to the virtual supermarket, which was located near the entrance of the store in a secluded corner. The same virtual supermarket system was used as described in experiment 1, and a similar procedure to familiarize participants with the system was used. In contrast to experiment 1, participants were not free to move around the virtual supermarket as they wished, but a fixed shopping route was laid out to ease moving through the virtual environment, since we expected that some people in the sample may have low prior experience with computer usage and gaming

environments. Participants were asked to choose six products (leek, carrot, cauliflower, kiwi, apples and pears), provided on a shopping list. Each of these products was available in both organic and non-organic form, either unpacked or in plastic packaging depending upon condition. After choosing the products, participants were led to another seat to fill in a pen-and-paper questionnaire. After completing the experiment, they received a discount voucher of 5 Euro for the supermarket in which the study took place. Most participants took less than 15 min to complete the experiment.

3.1.3. Measures

As in the first experiment, the main variable of interest was the number of organic choices made from the 6 products that people were asked to buy. This was recorded by the computer. Again, various constructs were measured in the questionnaire. A manipulation check assessed whether people had seen that there were both organic and regular options for the fruit and vegetable products (yes/no answer options). Two further questions assessed whether they thought the organic and the regular options were packed or unpacked. Attitude towards organic fruit and vegetables (3 items, $\alpha = 0.89$) and preference for unpacked products were asked with the same questions as in the first experiment. As background variables, age, gender, and education level were asked, as well as the consumption of fresh organic fruit and vegetables (same items and answering scales as in the first experiment).

3.2. Results

3.2.1. Background of participants

As in the first experiment, participants generally had a positive attitude towards organic fruit and vegetables ($M = 5.22$ on the 7-point scale). The consumption of organic fruit and vegetables differed greatly across participants: similar to the first experiment, many participants indicated to consume these never or less than once a month (27% for vegetables and 31% for fruit), whereas another large group indicated to consume these once or more times a week (36% for vegetables and 34% for fruit).

3.2.2. Manipulation check

Overall, 95.3% of participants indicated to have seen that both organic and regular products were present in the virtual supermarket. When asked whether these options were packed or unpacked, 78.5% of participants provided the correct answer for regular fruit and vegetables, and 75.8% provided the correct answer for organic fruit and vegetables. Participants in general thus seemed aware of the options that were available.

3.2.3. Choice

Across conditions, participants bought an average of 1.89 organic items from the 6 products on the shopping list. Most purchases were thus for non-organic products. An ANOVA showed that, in line with our hypothesis, the number of organic products bought differed between conditions ($F(1, 147) = 4.92$, $p = 0.008$). As expected, planned comparisons showed that the number of organic products bought was significantly higher when non-organics were packed ($M = 2.49$) than when organics were packed ($M = 1.24$, $p = 0.002$). The condition in which both products were unpacked was in between ($M = 1.90$) and not significantly different from either ($p = 0.103$ and $p = 0.137$ compared to non-organics packed and organics packed, respectively). We find no indication that packing organics had a larger effect on product choice than packing non-organics.

As in the first experiment, we observed a positive correlation between attitude towards organics and self-reported preference for unpacked products ($r = 0.449$, $p < 0.001$). Again, as in the first experiment, a more positive attitude towards organics was related with a higher choice of organics ($F(1, 143) = 73.97$, $p < 0.001$, $\beta = 1.09$), but there was no significant interaction with packaging condition ($F(1, 143) = 1.82$, $p = 0.166$).

All in all, this second experiment has replicated the results of the first experiment using a sample that is representative for supermarket patrons. Table 2 provides a summary of the findings of both studies, by providing the proportion of items from the shopping list for which organic options were chosen. Results show that unpacked fruit and vegetables are chosen over packed options. Although people with a more positive attitude towards organic products also tend to choose unpacked products more in general, this does not translate into a greater response to our manipulation. Moreover, we find no evidence of an asymmetric effect whereby packaging is more detrimental to the choice for organics than to the choice for non-organic options: both options are chosen more when these are not packed. This suggests that choice for unpacked options might be more related to convenience or other personal benefits than to societal considerations.

4. General discussion

Across both experiments, moving from a convenience sample in study 1 to a more representative sample in study 2, results show that offering fruit and vegetable products without packaging increases choice. This confirms current trends towards reducing packaging and offering products without packaging. Previous literature has provided relevant and useful insights about different types of packaging, both regarding to the effects that these different types of packaging have on consumer decision making (e.g., Becker et al., 2011; Liao et al., 2015; Murray & Delahunty, 2000), as well as in relation to the functions that packaging performs (e.g., Marsh & Bugusu, 2007; Rundh, 2005). Adding to this literature, the current study identifies positive effects of not packaging products at all. This option of removing all primary packaging had not received much prior research attention before. Our results are thus highly relevant and point towards an opportunity to increase sales of especially organic fruit and vegetables that so far has been overlooked in prior research.

The results indicate that offering products without packaging has similar effects for organic and non-organic products, and that a positive attitude towards organic does not moderate the effects. The choice increases as a result of offering fruit and vegetables unpacked appear not to be limited to a specific segment of consumers who have a positive attitude towards organic, nor are these effects limited to organic products only. This further supports the relevance of our study.

4.1. Implications

Our results have important implications for research on product packaging. Whereas the functions and benefits of packaging have received ample research attention (Marsh & Bugusu, 2007; Prendergast & Pitt, 1996), as well as the environmental benefits of packaging throughout the supply chain in terms of reduced food losses (Williams & Wikström, 2011), much less research attention

Table 2
Choice for organic fruit and vegetables, as a proportion of the number of items on the shopping list.

Condition	Experiment 1	Experiment 2
Organics unpacked, non-organics packed	0.43 (0.28)	0.42 (0.35)
Organics packed, non-organics unpacked	0.22 (0.28)	0.21 (0.29)
Both organics and non-organics unpacked	NA	0.32 (0.34)

has been paid to potential disadvantages of product packaging. This is surprising, given that consumers have self-reported that their ideal fruit and vegetables are unpacked (van der Pol & Ryan, 1996). Offering fruit and vegetables unpacked allows consumers to touch these products directly, which they generally appreciate (Peck & Childers, 2006), allows consumers to determine the amount of products they buy more freely, and may lower the perceived environmental impact of consuming the product. Research on product packaging should thus take the option of offering products unpacked into account when possible.

There are also clear implications for retail managers and policy makers. Currently, in many supermarkets, organic options are packed whereas their non-organic counterparts are not. This puts organic fruit and vegetables at a disadvantage in terms of consumer choice. Attempts by retailers and public policy makers to increase the sales of organic products could benefit by a move to more unpacked offerings of these products in the store. Although the results indicate that consumers are more likely to purchase unpacked fruit and vegetables than packed options, it would go too far to advice that all fruit and vegetables are offered without packaging. Packaging can have important benefits, especially throughout the supply chain (Williams & Wikström, 2011) but also in-store, which also needs consideration. Still, removing primary packaging for organic fruit and vegetables in in-store environments could potentially remove a disadvantage for these products vis-a-vis non-organic options. When this is not desirable or possible, retailers could consider other ways to diminish the negative effects of packaging, such as offering products in different prepacked amounts and communicating the benefits of packaging.

4.2. Limitations and future research

One potential limitation of the first experiment is the use of a student sample. On the one hand, students may have a more limited budget than other consumers, potentially leading them to choose cheaper non-organic options. On the other hand, students may have a relatively high interest in organic products. To assess this further, the second experiment used a sample of supermarket patrons, and obtained similar results. This suggests that the use of a student sample in the first experiment did not lead to biased results in this case.

Another limitation is the use of overall attitude towards organic fruit and vegetables to assess whether responses to packaging differ between people. People choose organic products for various reasons, including taste and health considerations, in addition to sustainability concerns (Schifferstein & Oude Ophuis, 1998; Cottingham & Winkler, 2007). Whereas a concern for sustainability may be linked to a tendency to avoid packaging waste, this does not hold for these other reasons why people may have a positive overall attitude towards organic. Future research could assess whether concern about sustainability moderates the effects of not using primary packaging on choice.

Future research could examine whether our results generalize to an actual supermarket, by testing the effects of offering (organic) produce without primary packaging on actual sales levels and market share. Future research could also examine consumer responses to different types of packaging. In our studies, plastic packaging was compared to unpacked options, because plastic is the packaging material currently used in the fruit and vegetable departments of supermarkets. As plastic is perceived as especially unsustainable our results might not apply directly to other forms of packaging. Offering products in other types of packaging materials such as paper, may be perceived better by consumers, and may attenuate the effects of packing. Another option would be the development of new packages that can protect the product while being perceived positively by consumers at the same time.

Overall, our results indicate that removing the primary packaging of organic fruit and vegetables can be a promising intervention in attempts to increase organic sales. This is supported by experiments using a virtual supermarket across a convenience sample of students and a representative sample of supermarket patrons.

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References

Becker, L., van Rompay, T. J., Schifferstein, H. N., & Galetzka, M. (2011). Tough package, strong taste: The influence of packaging design on taste impressions and product evaluations. *Food Quality and Preference, 22*(1), 17–23.

Cottingham, M., & Winkler, E. (2007). The organic consumer. In S. Wright & D. McCrea (Eds.), *The handbook of organic and fair trade food marketing* (pp. 29–53). Oxford: Blackwell.

Karst, T. (2013). *Nielsen sees falling share of fresh at grocery stores* : . The Packer. March 13 2013 (accessed November 24, 2015) [available at: http://www.thepacker.com/fruit-vegetable-news/Nielsen-sees-falling-share-of-fresh-at-grocery-stores-197872931.html].

Kassaye, W. W., & Verma, D. (1992). Balancing traditional packaging functions with the new 'green' packaging concerns. *SAM Advanced Management Journal, 57*(4), 15–25.

Law, J. (2015). *Customers up in arms about excessive packaging* : . . News.com.au., March 14, 2015 (accessed March 4, 2016), http://www.news.com.au/finance/business/retail/customers-up-in-arms-about-excessive-packaging/news-story/21863691c4bf979489bdafd3d32a2d21.

Liao, L. X., Corsi, A. M., Chrysochou, P., & Lockshin, L. (2015). Emotional responses towards food packaging: A joint application of self-report and physiological measures of emotion. *Food Quality and Preference, 42*, 48–55.

Marsh, K., & Bugusu, B. (2007). Food packaging–roles, materials, and environmental issues. *Journal of Food Science, 72*(3), R39–R55.

Melnyk, V., van Herpen, E., Fischer, A. R. H., & van Trijp, H. C. M. (2011). To think or not to think: The effect of cognitive deliberation on the influence of injunctive versus descriptive social norms. *Psychology & Marketing, 28*(7), 709–729.

Murray, J. M., & Delahunty, C. M. (2000). Mapping consumer preference for the sensory and packaging attributes of Cheddar cheese. *Food Quality and Preference, 11*(5), 419–435.

Peck, J., & Childers, T. L. (2006). If I touch it I have to have it: Individual and environmental influences on impulse purchasing. *Journal of Business Research, 59*(6), 765–769.

Prendergast, G., & Pitt, L. (1996). Packaging, marketing, logistics and the environment: Are there trade-offs? *International Journal of Physical Distribution & Logistics Management, 26*(6), 60–72.

Rokka, J., & Uusitalo, L. (2008). Preference for green packaging in consumer product choices do consumers care? *International Journal of Consumer Studies, 32*(5), 516–525.

Roper, S., & Parker, C. (2013). Doing well by doing good: A quantitative investigation of the litter effect. *Journal of Business Research, 66*(11), 2262–2268.

Rundh, B. (2005). The multi-faceted dimension of packaging: marketing logistic or marketing tool? *British Food Journal, 107*(9), 670–684.

Schifferstein, H. N. J., & Oude Ophuis, P. A. M. (1998). Health-related determinants of organic food consumption in the Netherlands. *Food Quality and Preference, 9*(3), 119–133.

Simms, C., & Trott, P. (2010). Packaging development: A conceptual framework for identifying new product opportunities. *Marketing Theory, 10*(4), 397–415.

te Pas, H. (2015). *AH: Meer onverpakte groenten en glutenvrij* : . Distrifood. March 10 2015 (accessed November 24, 2015) [available at: http://www.distrifood.nl/assortiment/nieuws/2015/3/ah-meer-onverpakte-groente-en-glutenvrij-10186042].

Thøgersen, J. (1999). The ethical consumer. Moral norms and packaging choice. *Journal of Consumer Policy, 22*(4), 439–460.

Underwood, R. L., Klein, N. M., & Burke, R. R. (2001). Packaging communication: Attentional effects of product imagery. *Journal of Product & Brand Management, 10*(7), 403–422.

van der Pol, M., & Ryan, M. (1996). Using conjoint analysis to establish consumer preferences for fruit and vegetables. *British Food Journal, 98*(8), 5–12.

Van Herpen, E., & Pieters, R. (2007). Anticipated identification costs: Improving assortment evaluation by diagnostic attributes. *International Journal of Research in Marketing, 24*(1), 77–88.

Wells, L. E., Farley, H., & Armstrong, G. A. (2007). The importance of packaging design for own-label food brands. *International Journal of Retail & Distribution Management, 35*(9), 677–690.

Williams, H., & Wikström, F. (2011). Environmental impact of packaging and food losses in a life cycle perspective: A comparative analysis of five food items. *Journal of Cleaner Production, 19*(1), 43–48.

Wu, H. J., & Dunn, S. C. (1995). Environmentally responsible logistics systems. *International Journal of Physical Distribution & Logistics Management, 25*(2), 20–38.