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Research report

What information do consumers consider, and how do they look for it, when shopping for groceries online? ☆

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ABSTRACT

Previous research investigating what information shoppers seek when purchasing groceries has used either lab-experiments or observed shoppers in supermarkets. The present research investigates this question in a relatively naturalistic online-grocery environment. Forty participants completed their weekly shopping online while their eye-movements were recorded. Ten of the participants were subsequently interviewed to gain insight into their information seeking behaviour. We found that, when looking for products, 95% of participants navigated through the 'virtual departments', 80% used the 'search' facility, and 68% browsed the special offer pages. Once on the product pages, participants tended to look at the pictures of products, rather than examine detailed product information. To explain these findings, we suggest that online grocery sites simulate familiar supermarket environments, which may explain why consumers prefer to browse categories of products rather than use search terms. We also suggest that additional strategies are needed if consumers are to be encouraged to view detailed product information.

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Introduction

Online grocery shopping is a relatively new environment that is rapidly growing in popularity. According to ShopperVista (2013), around a fifth of households in the UK are buying groceries online every month. For around a third of these, online shopping is the main way that food is purchased, while the other two thirds of households use online shopping to supplement offline purchases. This growth in online grocery shopping is predicted to increase by around 15% per annum, and account for approximately 10% to 12% of the market by 2020 (Rankin, 2013). Compared to traditional supermarkets, online environments present consumers with different challenges and opportunities. For example, in a supermarket a consumer has to walk to the correct aisle in order to find a product, whereas an online environment allows consumers to find products in a number of different ways, such as entering a search term, navigating through categories of products, or browsing special offer pages. Having found a product, consumers using an online system can access a large and varied amount of information, some of which is available in an offline environment (e.g., lists of ingredients, price), but some of which is not (e.g., which two products are often

purchased together). Even when the nature of the information provided in offline and online environments is similar, it is often presented in a different format. For example, to examine the ingredients that a product contains, consumers using an online system may need to click on an "extra information" tab, instead of looking at, for example, the back of the package. Given the increase in online shopping, it is important to understand what information consumers consider when shopping for groceries online, and how they go about finding it in this new environment.

Finding products

Online grocery retailers offer consumers at least three main ways of finding products. A consumer can either search for a product by entering a search-term (e.g., 'cinnamon bagels') into a search bar, access a list of special offers and view only those products that are discounted, or navigate through the different tabs and links (e.g., look at a list of breads in a virtual bakery department). Navigation involves two main stages. First, consumers traverse through a hierarchy of virtual departments until they locate a specific department. For example, a consumer looking for cinnamon bagels may navigate through to the bakery, then bread, before getting to a list of different types of bagels. In the second stage, the consumer may have to choose between several similar products either by requesting that the website sort the items by a specific attribute (such as price) or by scanning through the list of products. Searching is also a two-stage process. First, the consumer generates a search

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query that includes an attribute associated with the desired product (e.g., name, brand, etc.). The search engine then returns a set of results from which the consumer selects the relevant item.

The processes of navigating and searching have received considerable attention in the field of information sciences. While searching tends to be the more popular method of information seeking on the Internet (Levene, 2011), and is considered a more flexible system (Lansdale, 1988), navigation is often preferred when users seek to retrieve information in a familiar environment, such as a system for organizing personal files (Bergman, Beyth-Marom, Nachmias, Gradovitch, & Whittaker, 2008). It is yet to be explored whether users of an online grocery shopping system prefer to navigate in what is likely to be a relatively familiar environment (i.e., in that the organization and structure of virtual and physical departments is likely to be similar in online and physical supermarkets, respectively), or to search as they are likely to do when using the Internet for other tasks. This question is crucial for understanding how pre-purchase information is obtained by consumers using online grocery sites.

Navigation is typically viewed as having a number of limitations. For example, the nested, hierarchical structure of the categories, which is often described using a location metaphor (such as 'departments'), requires consumers to remember the exact path required to retrieve information (e.g., to get to semi-skimmed milk, consumers may have to navigate from fresh-food to dairy to milk to semi-skimmed). This process can be difficult (Lansdale, 1988) and the path may not always be obvious. For example, non-dairy yogurts may be classified under 'yogurts', 'desserts' or 'special diets'. Navigation has been shown to be difficult for users approaching tasks using the Internet, mostly due to their lack of familiarity with the relevant categories and sub-categories (Levene, 2011). In contrast to navigation, searching is a more flexible strategy for finding items, as it allows users to reach an item using any part of the name (e.g. brand, type of product) that they happen to remember (Lansdale, 1988). This feature, combined with the power of search engines to automatically categorize pages, means that search engines such as Google have become the most popular method for retrieving information on the Internet (Levene, 2011). However, despite the apparent flexibility of searching over navigating and its preference by users of the Internet, it has consistently been shown that, in environments where people are familiar with the nested structure (such as a personal filing systems), people prefer to navigate and only resort to searching when navigation does not allow them to reach the target (Bergman et al., 2008).

There have been several attempts to explain the preference for navigation in familiar contexts. One explanation relies on the cognitive demands of searching versus navigating. When consumers search for a product, they are required to generate a precise search term. This can be challenging, as it requires that the person correctly recalls a product name or brand and accurately spells it (Gwizdka, 2010). This process likely involves linguistic resources (Benn et al., 2015) and may interfere with a concurrent verbal memory tasks such as remembering a shopping list. For example, Bergman, Tene-Rubinstein, and Shalom (2013) found that recalling a list of words from memory was disrupted more by searching than by navigating. In contrast, navigation is based mainly on recognition because progressing through a hierarchy provides immediate visual and contextual feedback about the success of navigation as well as clues about the next step (Teevan, Alvarado, Ackerman, & Karger, 2004). Lastly, it has been suggested that navigation in a virtual environment is similar to navigation in the real world (Benn et al., 2015), in that it relies on specialized brain regions around the hippocampal formation that are used for navigation in the real world (Maguire, Frackowiak, & Frith, 1996, 1997). As such, navigation in familiar spaces is considered to be a deep-routed neurocognitive behaviour that does not compete for linguistic resources. As such, navigating to find products may be cognitively easier.

Deciding between products

Once consumers using an online grocery website have identified relevant products, they then need to decide which products to buy. Online environments provide various types of information about products. Typically, consumers first see a list of products (e.g., bagels) that contains a small image of the product, its title (e.g., "New York Bakery Co. cinnamon and raisin bagels"), along with its price and whether it is currently on offer (i.e., discounted or part of a special promotion). Further information about the product, such as its ingredients or allergy information, is often available on a separate page that can be accessed by clicking on the image of the product or its title. Much of this information is part of compulsory labelling systems that have been introduced in an attempt to promote public health as well as awareness of environmental and social issues (e.g., animal welfare, fairtrade, country of origin). For example, in the UK, it is compulsory to label food items with information such as ingredients, nutritional information, whether the product includes genetically-modified ingredients, allergy information and more. It is presumed that clear labelling allows consumers to make informed choices (Kim, Nayga, & Capps, 2001). However, evidence on label viewing and information seeking behaviour during online grocery shopping has not, to the best of our knowledge, been previously reported.

Studies of information seeking in traditional supermarket environments typically report relatively high levels of (self-reported) label usage. For example, Bender and Derby (1992) found that, between 1982 and 1986, 80% of U.S. consumers reported that they paid attention to ingredients lists and/or nutrition labels on food products. However, recent studies using more objective measures of label usage have reported lower figures. For instance, Grunert, Wills, and Fernández-Celemin (2010) examined the use of nutrition labels in supermarkets in the UK using in-store observations alongside interviews and questionnaires. Across six product categories, only 12% of consumers were observed looking at the back or side of the product packaging before selecting a product. Similar findings were reported in five other European countries: Sweden, France, Germany, Poland, and Hungary (Grunert, Fernández-Celemin, Wills, Storcksdieck Genannt Bonsmann, & Nureeva, 2010). These studies suggest that, while some consumers use detailed information about products to guide their choices (at least some of the time), most consumers purchase products after simply looking at the front of the package.

One objective way to investigate what information consumers attend to when selecting products is through the analysis of eye-movements (for a review, see Graham, Orquin, & Visschers, 2012). For example, Beattie, McGuire, and Sale (2010) used eye-tracking to examine whether consumers look at information about the environmental impact of products such as a light bulb, liquid detergent, or orange juice. Beattie et al. found that consumers looked at information about the carbon footprint of the light bulb, but paid less attention to carbon information on the other two products. Despite a relatively small sample (only 10 participants took part), these findings demonstrate how eye-tracking can be used to investigate what information consumers consider. Consumers' goals have also been shown to influence the amount of attention that they pay to different types of information about food products. For example, van Herpen and Trijp (2011) asked participants to either 'buy a cereal product' or 'buy a cereal product that will give you a healthy start for the day'. They found that emphasizing health motivation increased attention towards, and use of, nutrition labels (see Visschers, Hess, & Siegrist, 2010, for similar findings).

While laboratory experiments are important for understanding the information that consumers consider when making specific purchases (Graham et al., 2012), manipulating participants' motivations as well as limiting the choice of products constrains ecological

validity. Shopping environments are complex, cognitively involving, and require many skills (Baumeister, Sparks, Stillman, & Vohs, 2008), such as the application of rational choices (e.g., to select products that represent the best value for money), self-control (e.g., to avoid tempting but fatty foods), or following rules (e.g., avoiding pork products if on a Halal diet). A few studies have, however, investigated what information consumers consider when selecting products outside of the laboratory. For example, a study commissioned by the Food Standards Agency in the UK (Rawson, Janes, & Jordan, 2008) investigated whether consumers viewed food labels in a real-life environment. Twelve shoppers were fitted with mobile eye-trackers, and were asked to purchase three food items. One half of the shoppers were asked to purchase products that required attention and thought (e.g., a breakfast cereal suitable for a nut allergy sufferer), while the other half were asked to purchase products that were less likely to require special attention because they did not need to satisfy specific criteria (e.g., a breakfast cereal that they do not usually buy). Rawson et al. found that shoppers who were asked to look for specific products fixated more often and for longer on food labels than shoppers asked to purchase products that did not require special attention. This study demonstrates that it is possible to study information search during shopping outside the laboratory. However, the number and type of products that Rawson et al. examined was still constrained, and the number of participants that were studied was relatively small ($N = 12$). It is therefore an open question what information consumers attend to in real grocery shopping environments, particularly online environments, when specific goals or motivations are not highlighted or made salient.

The present research

The current growth in online food shopping allows researchers to investigate how consumers find and decide between products in a relatively unobtrusive way. In the present research, participants were asked to do their weekly shop while their viewing patterns were recorded using an eye-tracker. Following their shopping, a subset of the participants were presented with videos of their eye movements and invited to comment. By using eye-tracking and asking participants to do their actual shopping using a real website, we aimed to capture objective and ecologically valid data in a relatively unobtrusive manner. Given that consumers should be familiar with the departments that are common to both online and physical supermarkets (e.g., the bakery, fresh fruit section), we hypothesized that consumers would be more likely to navigate to products than to search for them. We further predicted that use of labels (e.g., lists of ingredients, or nutritional information) would be relatively low, but that consumers who had restrictions on the food products that they sought (e.g., dietary restrictions like vegetarianism) might be more likely to do so.

Method

Participants

Forty participants (26 females¹) aged between 19 and 54 years ($M = 30.10$, $SD = 10.42$) were recruited between July and August 2012 via an email sent to a list of research volunteers at two large universities in the UK. Participants were asked to do their weekly grocery

shop using the website of a British multinational grocery and general merchandise retailer (Tesco). In return, they were offered £15 in cash, and 350 points towards the retailer's reward scheme. In order to reduce the effects of familiarity with the system, we only recruited participants who had not previously used this specific online grocery site.

Procedure

Upon arrival, participants were seated at a Tobii T120 eye-tracker and, after a short explanation of the eye-tracking system and calibration of their eye-movements, they were directed to the online grocery site. Participants were asked to register and were then given as long as they needed to explore the site and to complete their shopping. On average, participants spent 31.35 minutes ($SD = 15.84$) doing their shopping and purchased an average of 19.81 products ($SD = 14.46$). In order to avoid recording personal information, the eye-tracker was turned off before participants processed their payment and completed their delivery details.

Participants were then asked to complete a short questionnaire that included three yes/no questions about their diet: 'Are you a vegetarian or a vegan?', 'Do you have any specific dietary requirements (e.g., food allergies, Kosher diet)?', and 'Are you currently on a weight-related diet?'. The questionnaire also measured demographic information such as participants' gender, age, level of education, and income.

Ten of the participants were then offered the opportunity to view their recorded eye-movements on the screen and to describe why they looked where they did (known as a 'playback interview'; Rawson et al., 2008). Their verbal responses were recorded in order to gain an insight into their viewing patterns and shopping experience.

Approach to analysis

Participants' eye-movements were recorded and analysed using Tobii Studio version 3.1 software. The 40 participants looked at around 100 pages each. Thus, we needed to find a way to characterize the nature of information search across approximately 4000 different pages. Most fixations were on what we termed 'navigation' pages (i.e., pages that listed products within particular virtual departments). Therefore, for the navigation pages, we analysed the specific information that participants attended to in detail. Specifically, for each of the pages, we defined the following regions of interest (ROIs): (a) product picture, (b) price of product, (c) product description (e.g., "New York 5 Cinnamon & Raisin Bagels"), (d) information on special offers (e.g., "buy one get one free"), (e) list of items in the (virtual) basket, and (f) current price of basket (Fig. 1). For the pages that resulted from participants entering search terms (hereafter termed 'search' pages) and lists of special offers (termed 'special offer' pages), we simply coded how often and for how long participants viewed the pages.

In addition to the main navigation, search, or special offer pages, participants could also click on any product to view detailed information about it on a new page. For each of these 'extra information' pages, we defined the following ROIs where available: (a) product picture, (b) product description, (c) price of product, (d) traffic light information (using the colours of a traffic light, a colour is used to illustrate the number of calories and amount of sugar, fat, saturated fat and salt in the product), (e) vegetarian or vegan symbols, (f) nutrition table, (g) list of ingredients, (h) environmental information (e.g., that the packaging is recyclable), (i) allergy information, (j) list of items in the basket, and (k) current price of the basket (Fig. 2).

Having identified the ROIs for each of the pages of interest, we then computed the proportion of fixations that participants

¹ Male and female participants did not significantly differ on any measure (i.e., extent of navigation versus searching, proportion of fixations on special offer or special information pages, average price per product, all $ps > 0.09$). The only exception was that female participants purchased, on average, significantly more products ($M = 22.08$, $SD = 16.10$) than did male participants ($M = 12.79$, $SD = 8.28$), $t(38) = 2.01$, $p = 0.05$.

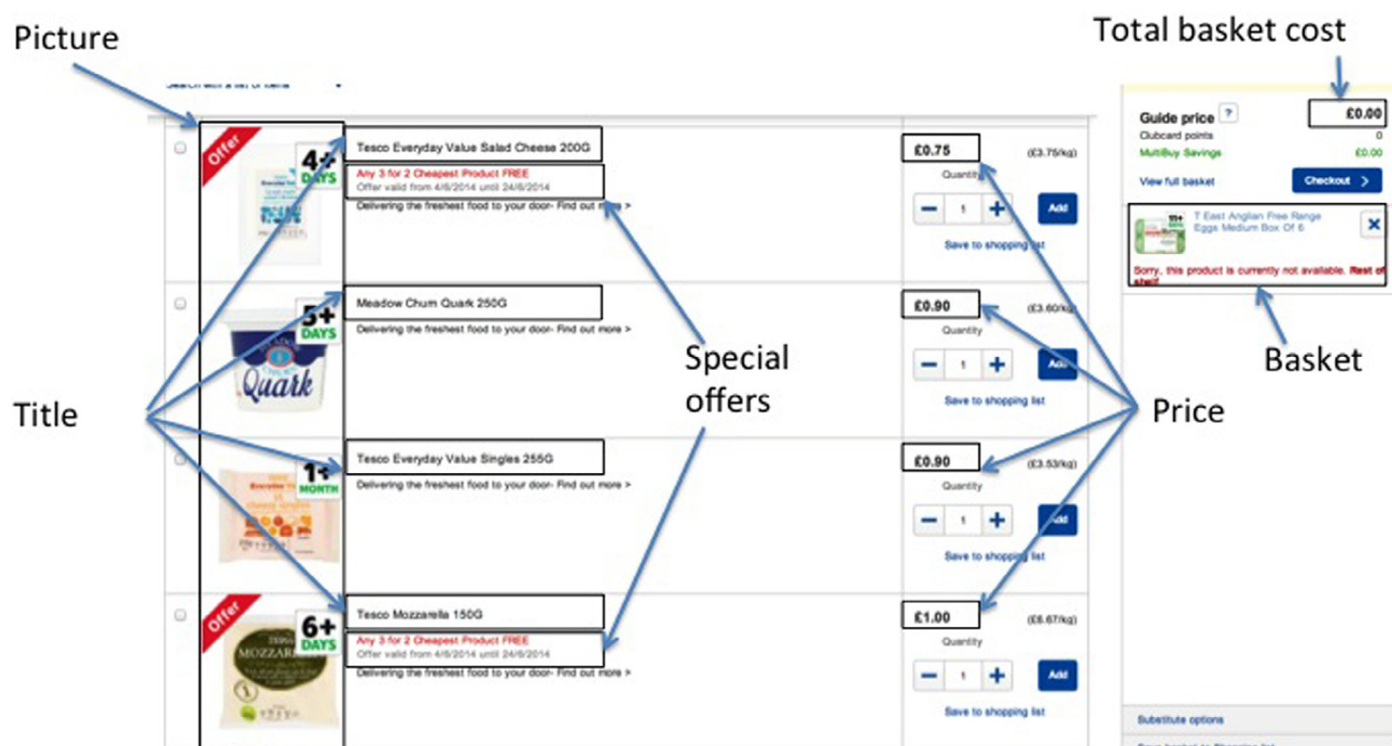


Fig. 1. Regions of interest identified on the navigation page.

made to each ROI across the pages that they viewed. These proportions were computed as the number of fixations on the specific regions divided by the total number of fixations for that participant on that type of page (e.g., number of fixations that participant X made on price information on navigation pages divided by the total number of fixations that participant X made on navigation pages). Proportions were used in order to overcome individual differences in reading time or time spent doing the shopping. Navigation or extra information pages that contained non-food items (i.e., clothing, toiletries, pet food and accessories, etc.) and any pages that did not contain products (such as the home page, delivery pages, etc.) were excluded from the analyses.

Results

How did participants find products?

Table 1 shows the number of participants who looked at particular types of pages during their shop and the proportion of fixations (across participants) on each of the types of pages. Only two participants (5%) did not use navigation as a way of finding products. Of these two, one participant used only the special offer pages to select products, while the other participant used a mixture of the special offer pages and the search method. On average, just over half of the fixations were on navigation pages. The next most commonly used method to find products was searching (around one-third of the fixations). Thirty two participants (80%) used the search bar to look for products at some point during the shop. Less than 10% of the fixations were on special offer pages, although the majority of participants (27 or 68%) looked at these pages at some point during the shop.

How did participants choose between products?

Twenty six participants (65%) looked at the pages providing extra information about products, and on average, 8.63% ($SD = 15.74\%$) of fixations were on these pages. Table 2 shows what information participants looked at within the navigation and extra information pages. A repeated measures ANOVA with the type of information (ROI) as the independent variable, and the number of fixations as the dependent variable, revealed significant differences between the ROIs, $F(4, 34) = 84.73$, $p < 0.001$, $\eta^2 = 0.91$. Pairwise comparisons based on univariate F tests revealed no significant difference between the number of fixations on the picture and the product title information ($p = 0.96$). However, participants looked at pictures and titles significantly more than information on deals ($p < 0.001$), the contents of the basket ($p < 0.001$) and the price of products ($p < 0.001$).

When considering the pages providing extra information about products, a repeated measures ANOVA revealed significant differences between the number of fixations on each of the ROIs, $F(11, 11) = 12.10$, $p < 0.001$, $\eta^2 = 0.93$. Pairwise comparisons based on univariate F tests revealed that pictures were looked at more than any other region ($p < 0.001$), apart from the contents of the basket ($p = 0.128$). The lack of difference between the extent to which participants looked at the picture and the basket contents is likely to be due to the relatively large variance in the extent to which participants looked at the contents of the basket.

Relationship between dietary restrictions and information search

Four participants (10%) reported that they were vegetarian, 10 participants (25%) had restrictive diets (e.g., halal, lactose, or wheat intolerance), and 5 participants (13%) were on a weight-related diet. A series of ANOVAs (with Bonferroni adjustment) were used to examine whether participants' dietary restrictions had an effect on

The image shows a screenshot of a Pizza Express website product page for 'Pizza Express Margherita Pizza 250G'. Various regions of interest are highlighted with blue boxes and labeled with arrows from the left. The labels include: 'Picture' (pointing to the pizza image), 'Title' (pointing to the product name), 'Product Price' (pointing to the price £4.50), 'Basket total' (pointing to the total price £1.75 in the basket), 'Vegetarian information' (pointing to the 'V' vegetarian icon), 'Traffic light' (pointing to the traffic light nutrition icon), 'Items in Basket' (pointing to the basket summary), 'Allergy information' (pointing to the 'Allergy information' section), 'Environmental information' (pointing to the 'Other information' section), 'Ingredients list' (pointing to the 'Ingredients' section), and 'Nutrition information' (pointing to the 'Nutrition' table).

Title

Pizza Express Margherita Pizza 250G

Picture

Product Price

£4.50

Basket total

£1.75

Vegetarian information

Traffic light

Items in Basket

Allergy information

Environmental information

Ingredients list

Nutrition information

Typical Values	Typical values as sold per 1/2 pizza
Energy	1205kJ/290kcal
Protein	13.4g
Carbohydrate	37.9g
of which sugars	5.6g
Fat	8.3g
of which saturates	4.6g
Fibre	3.4g
Sodium	0.64g
Salt	1.60g

Fig. 2. Regions of interest identified on the extra information pages.

Table 1
Viewing patterns by type of page (standard deviations are in parentheses).

Type of page	Percentage of participants (N = 40)	Percentage of fixations (N = 121,410)
Navigation	95%	53.17% (32.69%)
Search	80%	30.83% (29.73%)
Special offer	68%	7.37% (10.70%)
Extra information	65%	8.63% (15.74%)

the way that they looked for products (i.e., the proportion of fixations on search pages, navigation pages, special offers or extra information pages). Vegetarianism, specific dietary requirements and weight-related dieting had no effect on the type of pages that participants viewed, $F_s(1, 38) < 2.90$, $ps > 0.227$ $\eta^2 < 0.46$, suggesting that the presence or absence of dietary restrictions did not influence how participants approached finding products.

A series of ANOVAs (with Bonferroni adjustment) were then used to examine whether having a vegetarian, weight-related or other restrictive diet had an effect on what information participants viewed within the navigation and extra information pages. Dietary restrictions had no effect on the nature of the information that participants

Table 2
Proportion of fixations on different types of information within navigation and extra information pages (standard deviations are in parentheses).

Type of Information	Navigation pages (N = 74,034)	Extra information pages (N = 7801)
Picture of product	19.07% (8.90%)	13.83% (8.92%)
Title of product	18.96% (6.88%)	4.41% (4.89%)
Price of product	3.07% (2.23%)	1.16% (1.81%)
Deals and offers	4.10% (3.28%)	2.58% (2.59%)
Products in basket	4.06% (4.60%)	12.77% (17.17%) ^a
Total price of basket	0.58% (1.17%)	2.48% (3.33%)
Nutrition		4.17% (4.78%)
Ingredients		3.30% (5.81%)
Allergy information		2.97% (6.75%)
Traffic light information		1.90% (2.15%)
Vegetarian/vegan logo		0.56% (0.87%)
Recycling information		0.09% (0.42%)

Note: Percentages do not add to 100%, as participants also looked at other areas on the screen (such as list of virtual departments at the top of the screen).

^a One participant looked at the products in their basket while viewing the extra information pages more than 3 SD longer than the mean. The group mean excluding this participant was $M = 10.59$, $SD = 13.37$.

Table 3
Primary and secondary themes identified in the playback interviews.

Primary theme	Secondary theme	Illustrative quote
Finding products	Methods of searching or navigating	<i>I think at this point I started looking at different ways of categorizing foods rather than just using the tabs at the top</i>
Information required to inform purchase decisions	Recalling what products are needed	<i>I am thinking of what I normally have</i>
	Balancing information provided online with other considerations	<i>I think they are both 500 grams so I pay that extra 1p to get the free range ... then I delete the scampi, because it's actually still expensive, and I will be the only one eating it. But, if I buy the fish finger, my youngest daughter will – she loves it – so buy it for her</i>
	Consideration of other life circumstances	<i>Wondering whether I need cheese biscuits because my Mum and Dad are coming</i>
	Environmental and social concerns	<i>I don't like to give any big supermarket too much business</i>
How the familiarity of products shapes decisions	The role of pictures	<i>So I was looking through the picture and if I like the look of it I look at the info</i>
	Habitual purchases	<i>I don't so much for cheese (check ingredients list to see if it is vegetarian) ... I usually know whether they are just from buying them regularly</i>
		<i>I'm buying the stuff I always buy</i>
The experience of online shopping	Familiar concepts	<i>All my stuff will always be light choices, I rarely ever get full fat.</i>
	Comments on using the online shopping site	<i>Just getting to grips with how to add things to the basket</i>
	Issues specific to online shopping	<i>When I'm picking out fresh stuff, I always like to look at it and see whether that looks like it's gonna be juicy</i>
		<i>It said live 5 plus [on the fresh fruits] – I just wanted to check whether that lifeline was 5 plus days or something. Just wasn't 100% sure.</i>
	How information is presented	

viewed within the navigation pages, $F_s(1, 36) < 2.42$, $ps > 0.097$, $\eta^2 < 0.47$, or the extra information pages $F_s(1, 24) < 2.97$, $ps > 0.103$, $\eta^2 < 0.624$.

Playback interviews

Participants who took part in the playback interviews were generally forthcoming and appeared to enjoy seeing where they had looked while shopping. Seven of the participants commented on their experience of watching their eye movements. Participants sometimes found this information surprising and at times illuminating. For example, “*I didn't realize how much I looked at chocolate and sweets. . . I think it's because I know I'm not supposed to be having them*” [Participant 2], or “*Gosh, I spent a long time (deciding between ice-creams)*” [Participant 7] or simply “*So strange*” [Participant 2]. At times, observing their eye movements seemed to be revealing to participants: “*I don't think I was (looking at calorie info), no, erm, yeah I think I did actually I did have a look at that and I think, I can't remember. . .*” [Participant 9], or “*Actually I thought, I felt like I was only looking at the first few products on the page but I'm scrolling down quite a bit*” [Participant 38]. Two participants commented that “*I really enjoyed it*” [Participant 2] and “*Oh, this is interesting, yes*” [Participant 6].

Content analysis (e.g., Neuendorf, 2002) was used to analyse participants' responses during the playback interviews. One-hundred-and-fifty-six statements related to the way that participants looked for products or for information about products were identified. These were divided into three primary themes: (i) how participants find products (27 statements), (ii) information required to inform purchase decisions (89 statements), (iii) comments on products' familiarity (12 statements) and (iv) comments about online shopping (28 statements). These primary themes were further subdivided into secondary themes, as appropriate. Table 3 summarizes the coding framework.

How participants find products

Statements in this category included comments about methods for searching or navigating. Participants described the difficulties that they experienced when browsing lists of products within categories, such as not finding things in the category that they expected: “*I'm . . . looking for the little ones [little juice cartons]. I went back and it's under kids' drinks interestingly enough 'cause I suppose you would generally have them for packed lunch, although it's not necessarily a children's product*” [Participant 6], or “*I think at this point I started*

looking at different ways of categorizing foods rather than just using the tabs at the top" [Participant 7]. Problems with navigation often resulted in searching, but participants frequently reported difficulties identifying appropriate search terms. For example: "I am not finding it there so I think I end up typing it in, yes I do, and I can't spell it" [Participant 6], or "I typed in chickpeas but only 3 came up. ... I had to search again, under, I think, pulses or something like that, or tinned veg, and that's only when it came up" [Participant 6]. However, occasionally, search was preferred as it was considered to be a more focused strategy for identifying potential products: "Oh, I can't be bothered looking down the list [of items within a department] so I type it in" [Participant 6].

Information required to inform purchase decisions

Statements in this category suggested that participants were considering and balancing different types of information. For example, one participant reported trading social/environmental values against price: "then I was just comparing the prices of those two 'cause it's 1p difference to get free range lasagna sheets, yeah I think they are both 500 grams so I pay that extra 1p to get the free range" [Participant 9]. Another participant reported that they had to consider information that is mostly 'offline' in making their purchasing decisions (e.g., how much the item is needed, who will eat it and when, and whether it fits into a meal): "I just bought scampi. Like that, and then I delete the scampi, because it's actually still expensive, and I will be the only one eating it. But, if I buy the fish fingers, my youngest daughter will – she loves it – so buy it for her" [Participant 5]. Participants often mentioned considering other life events (e.g., visitors coming) when making decisions about which products to purchase. For example: "Wondering whether I need cheese biscuits because my Mum and Dad are coming, but I decide I'd split the difference and go for digestives" [Participant 6].

The importance of pictures in the online environment also emerged. For example, pictures were deemed to provide useful information: "Yeah I was just trying to find out what they actually were but there wasn't a description" [Participant 2], influenced participants' perception of the size of the product: "It was quite difficult (to find bread) because some of the pictures were different sizes even though they were the same size of bread" [Participant 7], and were used to evaluate products: "So I was looking through the picture and if I like the look of it I look at the info" [Participant 7]. Lastly, some comments reflected the idea that environmental and social concerns also played a role in the decision making process. For example: "I'm like, 'Shall I pick it up locally?' – cause I don't like to give any big supermarket too much business" [Participant 7].

How the familiarity of products shapes purchase decisions

Participants expressed familiarity with either concepts, such as fair-trade or low-fat ranges, or products and brands. Only one participant reported purchasing an item based on a familiar concept "All my stuff will always be light choices, like rarely ever get full fat" [Participant 35]. On the other hand, several participants reported making purchases out of habit: "I'm buying the stuff I always buy" [Participant 8], or "I was just looking for things I normally buy I guess I wasn't being very, erm, adventurous" [Participant 38]. However, participants also made more novel purchases, and these were often motivated by special offers: "I was looking for pasta sauce. This is a new product I tried because I usually get a different brand, but this one was on offer so I thought I'd try it" [Participant 2], or "Yeah they had a couple of different types (vegetarian food) that I hadn't seen before like the falafel and seeing as it was 2 for £3 I got another one" [Participant 7]. One participant linked the familiarity of the product with the likelihood that they would seek further information about the product: "I thought, oh, I know what the nutritional value of the things I'm looking at. If it was a new product, something that I was like 'oh

that looks interesting', I would have clicked on it to see what the nutritional value was" [Participant 7].

Issues related to online shopping

This category included comments reflecting participants' experience with the website, as well as issues that are specific to online shopping. Many participants took time to become familiar with the site as shown by comments such as: "I think I wasn't sure how to erm. ... just getting to grips with how to add things to the basket" [Participant 38], or "I'm still trying to familiarize with how it works and the like, you know?" [Participant 35]. Participants' views were split on the value of online shopping. For example, some participants pointed to the limitations of online shopping: "I think that is why I don't like doing online shopping, because even though I have saved a lot, but I'll be spending such a long time trying to find the best offer" [Participant 35], or highlighted the problems with fresh items: "When I'm picking out fresh stuff, I always like to look at it and see whether that looks like it's gonna be juicy" [Participant 7]. Other statements were more positive about online shopping: "I think what the good thing about online shopping is that it does restrict you because you have to type it in, whereas in the supermarket you'll walk past it and be like 'ooh yeah, I do fancy that'" [Participant 7]. Finally, a few statements focused on the way that the information was presented. For example, "I think you're scrolling up and down when you're online but if you're in the shop and if it's all on the shelf then I think I'd be able to sort it out relatively quickly, but I think as I was scrolling up and down and just pictures on a computer I got a bit fed up of it really and thought 'oh I'll just get some next time I'm actually in the shop when I need some'" [Participant 9]. One participant also commented on a few occasions where the pictures were missing: "And when it didn't have a picture it was a bit annoying cause you had to read" [Participant 8].

Discussion

The present research investigated consumers' information seeking behaviour while shopping for groceries at an online store. Participants were not restricted in the amount of time that they could spend shopping or in the number or type of products that they could purchase. The aim of the study was to collect relatively naturalistic data on how consumers find relevant products, the information that they consider when making purchasing decisions, and to examine whether information seeking behaviour is influenced by participants' dietary restrictions.

Identification of products

The most popular way for participants to find products was by navigating to pages listing particular products within virtual departments (e.g., looking for 'brown bread' within the 'bakery' department). More than 50% of fixations were made on navigation pages compared to just over 30% of fixations on search pages. Only two participants did not use navigation at any point during the shop, compared to eight who never searched for products. Data from the playback interviews suggested that, in many cases, searching was a response to a failed navigation attempt. These findings confirm our hypothesis that navigation would be the more popular method of finding a product, and supports the idea that, in a familiar environment, people prefer to navigate rather than search (Bergman et al., 2008). Navigation may be preferred as it does not interfere with linguistic working memory (Benn et al., 2015; Bergman et al., 2013), which may be required for tasks such as remembering which goods to purchase. Future research might test this idea by comparing the extent to which participants rely on navigation versus search when asked to remember a detailed shopping list versus when they have the shopping list in front of them (and so

do not need to remember its contents). Navigation also involves recognition of items, rather than recall, as each step provides visual and contextual feedback, as well as a reminder of the subsequent steps that may be required (Teevan et al., 2004). For example, a consumer may navigate from 'fresh-food' to 'dairy' and then select 'semi-skimmed milk' from a list of dairy products. This method further allows people to explore products within a category, such as similar products that are on offer.

The idea that consumers prefer to navigate rather than search for products because navigation is less demanding is consistent with a 'low-involvement theory' of grocery shopping (Hoyer, 1984; Lastovicka & Gardner, 1978), which suggests that consumers attempt to minimize the cognitive load required during shopping in order to manage the complex processes that are involved in purchasing decisions (Baumeister et al., 2008). The playback interviews described in the current research support the idea that purchasing decisions often involved consideration of a number of factors such as social and environmental aspects of shopping, financial and dietary restrictions, as well as life events and circumstances.

Although both eye-tracking and statements from the interviews suggested that participants preferred to navigate for products, specific searches were performed, particularly when navigating failed to identify the required product, or when the category was too large and resulted in a long list of items. This finding is consistent with previous observations that people almost always search when navigation fails to reach a target item (Bergman et al., 2008). However, the present research also attests to the difficulties that participants experienced when searching for products, particularly that it was, at times, difficult to identify the correct search term and that searching was sensitive to mistakes such as spelling errors.

Product selection

Once participants had found relevant products, they then needed to decide which of those products to buy. Analysis of participants' eye movements revealed that the pictures and titles of the respective products were the most frequently viewed type of information. This finding is consistent with previous studies that showed that consumers look at the front of a package most frequently when selecting a product (Grunert, Fernández-Celemín et al., 2010; Grunert, Wills et al., 2010). Interviews with participants in the present research also support the importance of pictures in the online environment, as participants commented that the absence of pictures made selecting products more difficult.

About a third of the participants (35%) never looked at information such as lists of ingredients or nutritional information. Indeed, on average, less than 10% of fixations were made on these pages. This relatively low level of attention to detailed product information is similar to that reported in previous studies of consumer behaviour in traditional supermarket environments (Grunert, Fernández-Celemín et al., 2010; Grunert, Wills et al., 2010), and may be explained by the already high cognitive load experienced by consumers (Baumeister et al., 2008), the difficulties that consumers have understanding labels (Cowburn & Stockley, 2005), or because participants may have purchased the products previously and so feel that they have sufficient knowledge about them (Grunert, Fernández-Celemín et al., 2010; Grunert, Wills et al., 2010). This last possibility is partly supported by data from our interviews. Future research might usefully employ similar naturalistic paradigms to that reported here, in order to examine the relative importance of these different explanations.

Dietary restriction and information search

There was no relationship between participants' dietary restrictions and the type of information that they viewed when shopping

online for food. While this finding appears to contradict previous research that suggests that specific motivations are associated with increased label viewing (e.g., Rawson et al., 2008; van Herpen & Trijp, 2011; Visschers et al., 2010), previous research that has reported a link between health motivation and viewing patterns has tended to focus on responses in a relatively controlled environment that rendered health goals highly salient (van Herpen & Trijp, 2011; Visschers et al., 2010). In contrast, the present research did not manipulate participants' motivation, nor did it restrict the products that participants were able to purchase. Our findings suggest that dietary restrictions did not increase the likelihood that consumers would seek additional information on products when shopping in an online environment.

Limitations

One important limitation of the present research is that we did not conduct separate analyses for items purchased by participants for the first time, compared to those that participants have purchased previously. It is possible that participants' information seeking behaviour was influenced by the extent to which they had purchased the product previously, as familiarity is likely to influence the likelihood that consumers read labels (Grunert, Fernández-Celemín et al., 2010; Grunert, Wills et al., 2010). Data from the playback interviews support this idea – participants reported that they were less likely to seek additional information when they purchased a familiar product, for which they already knew the information, or if they were buying a familiar type of product (e.g., a product from a low calorie range) in which case they trusted that the product had the qualities that were advertised. It would be useful therefore for future studies to ask consumers to identify which of their purchases are novel to see if this influences the information that shoppers attend to.

A second limitation of the present research is that the nature and large amount of data collected meant that we had to limit the analyses that we performed. Specifically, detailed analyses were only conducted for the navigation and extra information pages that participants viewed, but not the search pages. While the analysis is, therefore, not complete, the navigation pages represented the majority of pages that participants viewed when selecting products and analysis of the extra information pages helped us to understand (i) whether consumers attend to extra information and, if so (ii) whether this attention was influenced by their dietary restrictions. The full dataset is available from the first author, upon request, and we invite others to conduct additional analyses to investigate additional questions that they may be interested in.

Future directions

Future research into shopping behaviour should focus on further understanding information seeking behaviour and its underlying motivations, in a relatively naturalistic environment. The present research demonstrates that doing so is feasible and that the findings may not be the same as those obtained in laboratory or other settings that constrain ecological validity. Future research might also consider ways to capitalize on the opportunities offered by the online environment to provide helpful information to consumers in easy and accessible ways. For example, to encourage consumers to make healthy food choices, research could examine the effect of a 'low fat department' where consumers can find items with lower fat content, such as low fat yogurts, or at least sort the items within a category by their fat or calorie content. Another idea may be to explore the effect of providing information on the total calorie content of the basket, in a similar manner to the way that the cumulative price of the items is currently shown in the basket. Monitoring the relevant dimensions of goal striving is an

important self-regulatory process according to theoretical models of goal pursuit (e.g., Control Theory; Carver & Scheier, 1982) and empirical research (for reviews, see Harkin et al., 2014; Michie, Abraham, Whittington, McAteer, & Gupta, 2009). Furthermore, it has been shown that people find it easier to monitor information that is quantifiable (i.e., information that is easy to count, such as calories) than information that is less easily quantified (e.g., how healthy a product is) (Chang, Webb, Benn, & Stride, 2014; Josephs, Giesler, & Silvera, 1994). Therefore, we propose that presenting information (e.g., on how healthy products are) in a quantifiable way (e.g., as the total number of calories in a basket) could help consumers to make choices in line with their goals.

The findings of the present study also suggest that future research might examine the influence of communicating more information via pictures. For example, nutrition information could 'pop up' when consumers hover over the picture, or consumers might be allowed to 'zoom in' in order to view details. Cognitive science attests to the effect of salient visual information on attention (e.g., Theeuwes, 1994) and recent research has demonstrated that moving or animated information on a web-page attracts users' attention (Simola, Kuisma, Öörni, Uusitalo, & Hyönä, 2011). The importance of providing information in an easily accessible manner is further supported by research, which has found that the inclusion of labelling (such as traffic light information) on the front of packaging leads consumers to pay more attention to the information and make healthier choices (Bialkova & van Trijp, 2010; Watson et al., 2014).

Conclusion

The current study demonstrated that, unlike other online environments, consumers using online grocery shopping sites tend to navigate through virtual departments, rather than use direct searches in order to locate products. The preference for navigation has been previously documented with respect to personal information systems, strengthening the idea that users prefer to navigate in familiar environments. Once on the product pages, participants tended to look at the pictures of products, rather than examine detailed product information. While similar findings have been reported in traditional supermarket environments, it would be valuable to further explore why consumers do not look at detailed product information, ideally using a relatively naturalistic paradigm such as that employed here.

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