MASTERARBEIT

Titel der Masterarbeit

"The layout of the supermarket shelf and its influence on consumer behavior"

Verfasserin

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Brief Contents

Table of Contents

List of Abbreviations

ACC	attention, consideration and choice
BxHxD	Breadth x Height x Depth
FD	fixation duration
HZ	Hertz
ms	milliseconds
n.s.	not significant
s	seconds
SD	search duration
sig.	significance
SKU	stockkeeping unit
VSB	Variety Seeking Behavior

List of Figures

List of Tables

1 Introduction

Customers entering a supermarket normally do not pay much attention to the arrangement of the products in the shelves. They may be irritated if products have been reassigned to a different location in the supermarket, but generally they do not concern themselves with the layout of the displays, while indeed in many instances, retailers do spend a lot of time and energy deciding about how to design the layout of the supermarket shelves. The question remains whether they also consider how the customers will react to a certain layout or not.

Retail shelf space is a scarce resource and hence a thorough planning of the shelving is necessary. On the one hand, retailers want to arrange the shelves in order to maximize their profits; on the other hand, it is also important to design a display which can easily be browsed by the customers. Unsatisfied or confused consumers tend to form negative opinions about the retailer and might opt for different stores for their next shopping trip (Titus & Everett, 1995). Hence, it is of importance to keep the customer in mind when filling the shelves.

To make things even more complicated, the manufacturers of the offered goods want to be included in the decision as well. For them, it is not the overall profitability which is important, but only the individual sales of their own products. They want their products placed on the most valuable spots of the display in order to receive most customer attention and increase purchase likelihood.

Previous research has attempted to answer the questions arising from these often conflictive goals, but, as will be the topic of the following chapters, often those answers are incomplete or contradictive. In order to fill this research gap, the present study attempts to give a more complete picture of how to arrange a shelf, taking a larger number of factors into consideration. Campo and Gijsbrechts (2005, p. 384) highlight that issues such as "shelf layout (number of facings per item, vertical and horizontal position on the shelf, and shelf arrangement, e.g., by brand or by type)" are an important area of research in this matter.

Previous research has used different approaches to measure the effects of changes in the shelf layout. Some focus solely on the outcomes on sales (e.g., Drèze, Hoch, & Purk, 1994), which completely neglects the customer's point of view. More recent studies follow the suggestion of Campo and Gijsbrechts (2005,

p. 390) who state that "[c]ombining them [i.e., consumer information] with eye-tracking devices may further enhance our insights into how CM [Category Management] changes drive consumer attention and search".

This recommendation is also adopted in the present study. A laboratory experiment will be conducted using a remote eye-tracker combined with a questionnaire to gain better insights into the minds of the shoppers. A laboratory experiment, rather than a field study, gives the opportunity for a very controlled setting, eliminating the influence of other possible explanations.

Additionally, while focusing on the effects within a product category, multiple product categories will be investigated to achieve generalizability of the results. Furthermore, within the product categories, there is variation of brands and flavors, a complication which has been ignored by most previous studies.

Hence, the study attempts to improve the layout of the supermarket shelf by supplying easy-to-follow rules rather than complicated heuristics for the retailer, as well as to achieve a better understanding of the customers concerning their interaction with the shelf layout. Insights in this field are of particular importance, because "Category Management (CM) has become one of the core areas of interest to both manufacturers and retailers" (Campo & Gijsbrechts, 2005, p. 383).

Chapter 2 focuses on previous studies in the area of shelf design and leads to the development of the hypotheses in chapter 3. In chapter 4, the methodology of the present study is explained and the following chapter describes the data collection. The core of this thesis is chapter 6, which tests the established hypotheses and describes the results of the study. At the end, a summary of the results is presented followed by a conclusion with managerial implications, limitations and suggestions for further research.

2 Theoretical Background

There is no doubt that the retailer's decision which products to stock have an influence on what customers purchase. Out-of-stock studies have shown that a majority of customers rather substitute their intended purchase with another product than delay the purchase or go to a different store (Emmelhainz & Stock, 1991; Walter & Grabner, 1975). But availability is not the only way a retailer can influence the decision of his customers. Borin and Farris (1995) found that brand loyalty might increase purchase likelihood for a certain product, but there are other influencing factors as well, such as the shelf layout. The layout of the supermarket shelf and the allocation of shelf space are widely discussed areas, both for practitioners and scientists.

Some retailers employ software for the problem (e.g., Spaceman or Prospace); others rely on their gut feeling and stack the shelves without outside help (Hansen, Raut, & Swami, 2010). A common rule-of-thumb is the assignment of space based on the respective market shares (Borin & Farris, 1995). Many researchers have also tried to develop algorithms and heuristics to improve the shelf design in terms of profitability (e.g., Abbott & Palekar, 2008; Borin & Farris, 1995; Campo & Gijsbrechts, 2005; Hansen et al., 2010; Urban, 1998; Zufryden, 1986), but those approaches tend to be limited in the number of factors that can be included or are too complicated to be calculated; often, the optimal allocation cannot be reached (Borin & Farris, 1995). One of the issues is, for example, that the models take previous sales into account, which is problematic on two levels. On the one hand, previous sales tend to be influenced by the previous display within the shelf and low sales for poorly placed products could prove to be a vicious circle due to its diminishing prospects (i.e., based to unsatisfying sales volumes, the assigned space is further reduced, which in turn leads to further diminished sales, and so forth). On the other hand, in the case of a new product, there are missing data for the calculations and it is more difficult to assign an appropriate spot in the shelf to these products. And this is not a minor problem, since a lot of new products are introduced continuously.

Hence, a simple set of rules would be preferable for the retailer. Many studies have looked at individual factors and how changes influence consumer behavior (e.g., Chandon, Hutchinson, Bradlow, & Young, 2009; Curhan, 1972; Desmet &

Renaudin, 1998; Drèze et al., 1994; Sigurdsson, Saevarsson, & Foxall, 2009).
When designing the layout of a supermarket shelf, there are a large number of factors, which can be manipulated, and within the scope of this Master Thesis, it is impossible to cover all of them. Thus, the emphasis is on these factors which are necessary in order to be able to set up a supermarket shelf: While it is important to choose where to place a product in the shelf and how many of the same SKUs (stockkeeping unit[1]) to place next to each other, it is not necessary to adapt the lighting for a particular product category compared to the other areas in the supermarket; therefore the first two points (among others) will be part of the thesis while the last one will not.

2.1 Layout of the Supermarket Shelf

The basic questions answered will be *where* to place *what* and *how*. *Where* designates the vertical and horizontal location of the products in the shelf, *what* defines the outer appearance pertaining to the distinctiveness of the packaging and more generally the signs, which are placed at the shelf, *how* refers to the number of facings (i.e., how many of the same SKU are placed next to each other) of the products, but also to the overall arrangement of the shelves (i.e., how the SKUs are grouped together).

As is depicted in Figure 1, the present study will investigate how changes in the layout of the supermarket shelf will affect consumer behavior. Additionally, it is postulated that certain consumer characteristics could have a moderating influence on these effects.
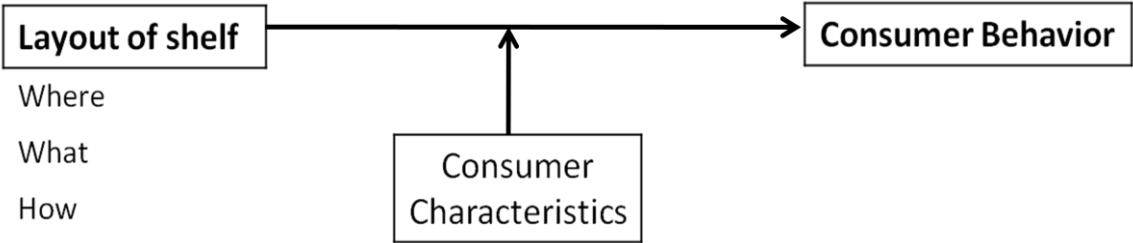
Figure 1: Basic Model

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[1] A stockkeeping unit (SKU) is a "distinct unit within a brand or product line distinguishable by size, price, appearance, or some other attribute" (Kotler & Keller, 2009, p. 368), i.e., Kellogg's Cornflakes 500g.

The following sections report previous studies, which have focused on any of these issues concerning the layout of the shelf and what variables they used to measure consumer behavior. Whether or not they have taken consumer characteristics into account will be addressed in chapter 3.

2.1.1 Where

With a predetermined[2] set of products to be put into the shelf, one of the important questions is where to place the individual products within the shelf, both horizontally and vertically. Valenzuela, Raghubir, and Mitakakis (2012) concentrate on the consumers' perspective and they discover that consumers (at least to some extent) have certain expectations about the supermarket shelf. Vertically, products of high quality are expected to be on the higher levels, while cheaper products are normally found on the lower levels. Horizontally, they expect popular brands to be in the middle of the shelf and, normally, store brands are expected to be close to them to profit from the attention the popular products receive. But Valenzuela et al. (2012) also realize that those beliefs held by the participants in their study do not necessarily reflect the reality found in supermarket shelves. The implications of these findings have not been addressed in their research, but they argue that the consequences of this discrepancy could have either positive or negative effects: On the one hand, mismatches between expectations and reality could lead to unsatisfied customers, who might choose to do their shopping somewhere else. On the other hand, it could force the customers to spend more time engaging with the supermarket shelf and the additional attention might actually lead to additional purchases.

Other researchers have covered this topic from the retailer's perspective; that is, how shelf arrangement influences sales. Drèze et al. (1994), for example, measure the effects of different vertical and horizontal placements on sales. Sigurdsson et al. (2009) also use sales as the dependent variable, but they only analyze vertical effects. The problem with those two studies is the lack of understanding of the underlying forces at work. Since only actual purchase are recorded, it is impossible to infer how the consumers react to the arrangement of the shelf.

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[2] While choosing the right mix of products is also a very fundamental question, its inclusion would go beyond the scope of this research project.

Valenzuela and Raghubir (2009), on the other hand, only examine horizontal effects, trying to elicit a center-stage effect, and they use choice in a laboratory experiment as dependent variable. Along with which of the five products in the array was chosen, they also recorded recall of the five products. Using recall as a proxy for attention is an improvement towards learning about consumers' reaction to the location of the products, yet measuring attention directly offers even better insights.

The study conducted by Chandon et al. (2009) explores how a systematic variation of the vertical and horizontal position influences consumers' purchase intentions while also collecting data with an eye-tracker, measuring consumers' attention towards the shelf and the displayed products: Do the respondents spend more time attending to the products they consider buying compared to the ones they are not interested in? Results of these studies (and the ones following in the next sub-sections) and how they shape the hypotheses of the present study are described in chapter 3.

2.1.2 What

Another important question related to the layout of the shelf is the distinctiveness of elements on the shelf. On the one hand, this refers to the distinctiveness of the packaging, compared to the surrounding products, which is known as saliency, and on the other hand, signage can be used to enhance certain areas of the shelf or highlight particular products.

2.1.2.1 Saliency

Saliency depends on the "form, color and luminance" (Pieters & Wedel, 2007, p. 225) of an object and the more one object distinguishes itself on one of these features from the surrounding area, the more salient it is (Berger, Wagner, & Schwand, 2012). For example, a green apple in a basket full of red apples is more salient than the other apples, while a red tomato in the same basket, will not stand out as much since color and form are only slightly different.

Saliency on the supermarket shelf can be achieved by the retailer through special signage as will be the topic of the next section, but most salient features stem from the packaging design of the individual products. Hence, the responsibilities as well as the possibilities lie with the manufacturer. Yet, it is still an important factor to be

considered by the retailer as well when arranging the shelf. Products which are inherently salient and will therefore easily attract attention irrespective of their location and the number of facings can be arranged differently than products which are essentially inconspicuous based on their packaging. The effects of saliency on the supermarket shelf are also analyzed by Pieters and Warlop (1999, p. 2): "Manufacturers use vivid packaging design to make their brand more noticeable among its competitors. Retailers manage shelf space and special displays to draw attention to products and brands they prefer to sell". The model of Krajbich, Armel, and Rangel (2010, p. 1297) "predicts that such irrelevant factors [as salience and location] could affect choice". They call the factors irrelevant because they do not actually influence the quality of a product itself.

A close link between saliency and attention has also been established by other studies (e.g., Jost, Ouerhani, von Wartburg, Müri, & Hügli, 2005; Parkhurst, Law, & Niebur, 2002; Pieters & Wedel, 2007). The studies by Jost et al. (2005) and Parkhurst et al. (2002) also discover that the effect is strongest for the first few seconds of examining the stimulus. The research of Milosavljevic, Navalpakkam, Koch, and Rangel (2012, p. 73) shows that the effects of saliency are important, "especially under the conditions of rapid decision making and cognitive load that characterize everyday decisions, such as many supermarket purchases".

2.1.2.2 Signage

Another important way to direct attention towards certain products or even categories is the practice of using signage, "an industry term which references shelf-signs, floor mats, displays and murals among other miscellaneous forms" (Rodriguez, 2007, p. 5). While all forms have been addressed in previous research (e.g., Chevalier, 1975; Turley & Milliman, 2000), only shelf signs are going to be discussed in this study; all other aspects subsumed under the term signage are not directly applicable to the shelf, but rather address other areas of the supermarket, such as aisles, floors or walls.

Signage, as it is used here, includes all pieces of information on the supermarket shelf, which tell something about the products or product category. Information provided by the manufacturer on the product itself (e.g., on the packaging) is, however, not included. Some labels are required to be on the shelf, others are placed voluntarily by the retailers.

Price tags are normally placed in the first category. In Austria, supermarkets are forced by law to show the price of the product easily legibly as well as the price per unit if applicable (Bundesrepublik Österreich, 1992). The dual pricing is necessary for packed goods, but not for unpackaged goods such as fruit and vegetables because in that case the price label does not show the actual price a customer has to pay for a banana, but rather the price of a kilogram of bananas.

Voluntary signs, on the other hand, can be used for various reasons. Sometimes additional signs are placed to advertise special deals in terms of price reduction or bundle offers. Other possible signage might give information about new products or even promote an established product. Promotion, however, does not necessarily mean that the product is offered at a lower price than usual.

Different researchers have studied the effects of price-cuts (e.g., Guadagni & Little, 1983; Wilkinson, Mason, & Paksoy, 1982), signs advertising price-cuts (e.g., Anderson & Simester, 2001; Inman & McAlister, 1993) and promotional signs without price cuts (e.g., Inman & McAlister, 1993; Inman, McAlister, & Hoyer, 1990; Zhang, 2006) and for all three instruments, positive effects on sales could be found.

Previous research has established that the usage of too many signs should be avoided. On the one hand, too many signs can hurt their credibility (Anderson & Simester, 2001) and, on the other hand, this could lead to consumer confusion and turn out to be distracting rather than helpful. For a more profound elaboration on consumer confusion refer to Garaus (2012).

If not used excessively however, signs are supposed to work as a guiding system and lead consumers' attention towards certain products or areas in the shelf. These signs tend to be quite colorful and thus they are more eye-catching than other parts of the shelf.

2.1.3 How

The question of *how* the products are placed on the supermarket shelf refers to the surroundings of the products. On the one hand, an SKU can be surrounded by items of the same SKU (i.e., there are multiple facings of an SKU) and, on the other hand, it determines based on which criteria the products around the SKU are

selected (i.e., are SKUs grouped based on brands or attributes, arranged vertically, horizontally or in a block format, or is there no notable pattern?).

2.1.3.1 Facings

The literature refers to the first point either as facings or as shelf space assigned to an SKU. While the facing-decision lies solely with the retailer, the assigned shelf space is also influenced by the inherent size of the products, which can vary greatly across as well as within product categories. When discussing shelf space, this is not only a decision to be made on the SKU level, but also for the whole product category (e.g., how many meters of shelf space should be allocated to tea products). Yet, for the studies mentioned hereafter the shelf space assigned to the product category is assumed to be pre-specified by the shelf space available in the supermarket and the number of categories that have to be shelved. Hence, a major issue is, after deciding on the location of the SKUs, how many facings the individual SKUs should receive and whether facings are held constant or whether there is variation within the product category (i.e., whether all SKUs in a category receive the same number of facings, or if some SKUs are allocated more facings than others).

Some of the experiments which have been discussed in a previous chapter concerning the location within the shelf also research the effects of facings, such as Chandon et al. (2009) and Drèze et al. (1994), while others focus entirely on the issue of the number of facings and their effect on sales (e.g., Abbott & Palekar, 2008; Curhan, 1972; Desmet & Renaudin, 1998; Hansen et al., 2010; van Nierop, Fok, & Franses, 2008).

As will be discussed in more detail in chapter 3.3.1, results reported by the researchers are quite contradictory; some find positive effects of additional facings on sales or purchase intentions; other researchers conclude that as long as empty shelves can be avoided (i.e., the shelf is replenished before any SKU is sold out), a low number of facings is sufficient. A possible explanation for those discrepancies might stem from the different product categories that are analyzed. Brown and Tucker (1961) argue that there are different types of products which respond differently to variations in facings. The main criterion for their distinction is purchase frequency of the product category. The underlying assumption is that the less inclined consumers are to buy a product for their daily needs, the stronger the

effects of additional facings. But if that was the only reason for the different degrees of effects of additional facings, variations concerning the number of facings within a product category would be unreasonable for the retailer; if effectiveness of additional space allocated to a product is only dependent on the product category, it would be more practical to increase the space of the total product category, rather than focusing on individual SKUs. While it makes matters more complicated for the design of the shelf, effects should be negligible for many of the offered product categories. Yet, as any observant shopper has probably noticed, facings vary all across the supermarket shelves. Hence, it is reasonable to assume that there are some additional factors influencing the effects of additional facings on sales and purchase intentions.

2.1.3.2 Arrangement

As has already been indicated before, when deciding on the layout of the shelf, it is also important to keep the overall arrangement of the shelf in mind. Many product categories include multiple brands and, within the brands, different variants (e.g., different flavors or sizes). In these cases, product allocation decisions should not be based solely on the perfect location for a specific SKU, but should rather strive for a comprehensive allocation process. SKUs can either be grouped by brand or by attribute (i.e., the different variants) and they can be arranged vertically, horizontally or in blocks. Complying with neither of these options will make it difficult for consumers to orient themselves around the supermarket shelves.

Little previous research has analyzed these issues. Only very general tendencies have been discussed in the literature until now. Kleinmuntz and Schkade (1990, p. 1) state that "displays influence the decision processes", concluding that "[a]ttribute based presentations encourage attribute based operations" (Kleinmuntz & Schkade, 1990, p. 11), while Simonson and Winer (1992) find that when products are arranged by brand, consumers find it more difficult to make comparisons across brands and are hence more inclined to buy more variants of the same brand, as is the case in their yoghurt-study.

2.2 Effects of Shelf Layout – Measures of Success

The previous points *location*, *facings*, *signage, saliency* and *arrangement* are the independent factors contributing to the layout of the shelf. They can easily be

manipulated or controlled for in experiments and are continuously adapted in real world settings in the supermarkets. Yet, to determine whether or not the approach of changing the layout of the shelf is successful, indicators to measure the success are necessary.

The studies described in the previous sections have employed different methods to evaluate the success of their independent variables. Principally, there are two ways to determine the effects of the changes made to the shelf layout. Either, one focuses on the retailer's perspective and concentrates on sales or choice, contingent on the type of experiment conducted (i.e., whether it is a field or laboratory experiment), or the focus is on the customers' perspective (i.e., how satisfied are the customers with the layout, how easy is it for them to orient themselves, of how quickly do they find their sought products?). Previous research has almost exclusively focused on the retailer's perspective.

2.2.1 Retailer's Perspective

One way to measure the effects of different shelf layouts is the analysis of changes in sales, which has been done by several researchers (e.g., Curhan, 1972; Drèze et al., 1994), but the results of supermarket data can be distorted due to a "large number of influencing factors that are extremely difficult to control in a supermarket" (Borin & Farris, 1995, p. 168). For example, sales in other product categories could have cross-category effects, which might be limited to some brands but not others and therefore bias the results. It is also more difficult to ensure that all products are visible on the shelf at all times. Even though a product should have multiple facings, one of the rows could be sold out and this would again affect sales. To avoid such issues, other researchers analyze purchase intention instead and some of them also look at visual attention as an intervening variable (e.g., Chandon et al., 2009).

When consumers browse the shelves, there are three important stages which can be analyzed. First, which products are looked at and which ones are neglected (*attention*). A smaller set of the viewed products make up the consideration set[3] (*consideration*), which are considered to be an option and in many cases one of

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[3] Products in the consideration set are products which "meet initial buying criteria" (Kotler & Keller, 2009, p. 208) but are not necessarily purchased on a given occasion.

the products in the consideration set is finally chosen and bought (*choice*). Of course, sometimes customers abort the shopping process and do not buy any product, but this outcome and the underlying reasons are beyond the scope of the study at hand.

Other studies take *recall* as an intermediate stage into account, but they mainly use it as a proxy of attention (e.g., Valenzuela & Raghubir, 2009), thus it will not be analyzed in the present study since it is possible to measure attention directly. Additionally, Chandon et al. (2009) find that *recall* does not represent attention very well. Rosbergen, Pieters, and Wedel (1997, p. 305) also agree that "[r]esults of memory research […] cannot be easily generalized to the domain of attention" and are therefore only a poor representation.

2.2.1.1 Effects on Visual Attention

Visual Attention is one of the possible variables to measure the success or failure of those manipulations and adaptations. The relationship between the layout of the display and attention is supported by Armel, Beaumel, and Rangel (2008) and Janiszewski (1998).

Milosavljevic and Cerf (2008, p. 387) state that "attention serves as a processing bottleneck"; we can never focus on everything that is presented to us, a lot of information remains unprocessed (Desimone & Duncan, 1995; Egeth & Yantis, 1997; Parkhurst et al., 2002). Therefore, there have to be some factors which help us decide subconsciously what to look at and what not. These decisions can either focus on the area or the objects which attract our attention (Soto & Blanco, 2004).

Since the visual sense is the primary sense employed when shopping for packaged goods and no study available to the author has taken any action to measure other forms of sensual experience, attention and visual attention are used interchangeably in this thesis. Another very important distinction in terminology concerning attention, however, is *bottom-up attention* versus *top-down attention*.

Bottom-up Attention

Milosavljevic and Cerf (2008) refer to bottom-up attention also as pre-attention because it usually determines the first phase of a new task, after the onset of new stimulus material or when finding oneself in a new situation. This is true for

participants in an experiment, but also for real-life situations. Hence, "initial fixations are controlled mainly in a bottom-up manner" (Jost et al., 2005, p. 114).

The first few seconds of viewing stimulus material is guided by scanning the most striking features to get an overview and, hence, attention is strongly guided by saliency. "Bottom-up attention is a rapid form of selective attention that depends on the intrinsic properties of the input, such as its colour or intensity" (Milosavljevic & Cerf, 2008, p. 383). Berger and colleagues (2012, p. 412) state that bottom-up attention works both "automatically and unconsciously". This kind of behavior is rooted in evolutionary development. "Bottom-up mechanisms are thought to operate on raw sensory input, rapidly and involuntarily shifting attention to salient visual features of potential importance — the spot of red against a field of green that could be a piece of fruit, the sudden movement that could be a predator." (Connor, Egeth, & Yantis, 2004, p. 850) It began as a means of survival and is still a helpful guide through a world crammed with an overabundance of information (Desimone & Duncan, 1995).

While bottom-up attention is generally considered to be active primarily at the beginning of any task, it has been discovered that, to a lesser extent, it is at work continuously. "Overall, our results indicate that attention is indeed guided by stimulus-driven, bottom-up mechanisms under natural viewing conditions even when top-down mechanisms are presumably operating" (Parkhurst et al., 2002, p. 121). Those top-down mechanisms are the topic of the next section.

Top-down Attention

Top-down attention is usually employed when attention is goal-directed. This means that, in a very general sense, people will look at different things dependent on the task at hand because the necessary information can be obtained that way most easily and quickly (Berger et al., 2012). Transferred to a supermarket context, a consumer adhering to a shopping list will skip many shelves (assuming he is familiar with the general layout of the supermarket) and not pay any attention to them, because he knows that the needed products will not be found there. Instead he will approach those shelves, where the needed products are located, one after the other. This behavior can be classified as selective attention (Kroeber-Riel, Weinberg, & Gröppel-Klein, 2009).

Pieters and Wedel (2007) have analyzed top-down attention and its effects on print advertisings and they discover that the underlying goal of the task influences how attention is allocated. It has not been researched yet in a supermarket context, but it is reasonable to assume that similar effects can be expected for the supermarket shelf. Yet, the factors influencing top-down attention are all mostly out-of-store factors[4] such as brand familiarity, brand experience, existence of a shopping list and so on. Out-of-store factors are factors which influence the consumers before they come to the store and therefore operate on a very personal level. Consumers have different experiences concerning brands; they have seen commercials advertising some products but missed others; also more personal features can influence top-down attention, for example, mood, time pressure or demographics, such as gender and age. Since those factors cannot be manipulated in an experiment but merely (to a certain extent) be observed, the processes underlying top-down attention are not a primary concern when designing the layout of a shelf. Yet, attention towards the supermarket shelf cannot be separated into bottom-up and top-down attention; therefore it is necessary to understand the underlying principles guiding the latter concept as well, because in many instances, attention is a "hybrid form of these two modes of operation" (Berger et al., 2012, p. 418).

Similar to bottom-up processes, top-down attention is also grounded in evolutionary tactics. "Top-down mechanisms implement our longer-term cognitive strategies, biasing attention toward colored spots if we are hungry or toward sudden movements and quadrupedal shapes if we fear a predator" (Connor et al., 2004, p. 850). Goals and tasks help us to focus our attention on the areas which are most promising for success based on our innate criteria.

2.2.1.2 Effects on Product Choice

It has been shown that attention is a valid variable to measure the effects of shelf changes to the shelf layout on consumers, but, from a retailer's perspective, solely attracting attention is not enough. Thus, it is also interesting to measure the effects of those changes on purchase likelihood or intention. Chandon et al. (2009) use

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[4] Exceptions might be promotional activities at the entrance or other types of in-store advertising.

purchase intention as a proxy for sales in their laboratory experiment. For their purposes, they split purchase intention into consideration and choice.

Compared to field experiments, which use only sales as measure of success, it might seem superfluous to record the consideration set in addition to choice, but the importance of whether or not a product is included in the consideration set for further purchases has been well established in the literature. Van Nierop and colleagues (2010, p. 72) state that "it is imperative – both theoretically and practically – to use models that accommodate consumer consideration" when measuring the effectiveness of shelf layouts. Products in the consideration set "meet initial buying criteria" (Kotler & Keller, 2009, p. 208) but only a subset or just one product is chosen from this set. Which is in accordance to the definition of van Nierop et al. (2010, p. 63) that "consumers follow a two-stage decision process of brand choice. In the first stage, they narrow down the global set of alternatives to a smaller set, the consideration set, from which a choice is made in the second stage." The composition of the consideration set is influenced by prior experiences with products in that category, but can also be affected by out-of-store promotional activities (Mitra & Lynch, 1995) or in-store measures such as "display and shelf space" (van Nierop et al., 2010, p. 68). They also find that the consideration sets stated by the consumers correlate strongly with the ones they observed in their study; hence asking consumers for their considered products is a reliable way of measuring the consideration set.

Additionally, choice of one of the products in the consideration set serves as a proxy for actual purchase (Chandon et al., 2009).

2.2.2 Consumers' Perspective

While the retailer might strive to highlight certain products either by giving them a prominent location or multiple facings or by placing signs promoting the product, the consumer wants a pleasant shopping experience. Of course, there are a lot of factors influencing the shopping experience which are not directly related to the layout of the shelf, but are rather more holistic issues such atmosphere of the store, including lighting and music, or the friendliness and competence of the personnel (see Turley and Milliman (2000) for an overview). However, since this study is focused on the supermarket shelf, these other issues are beyond the scope of this thesis.

When investigating the consumers' perspective, one could measure consumer satisfaction with the layout of supermarket shelf, but as Shewfelt (1999) points out, consumer satisfaction is neither a very tangible nor an easily quantifiable concept. Hence, it is proposed that measuring the duration it takes a consumer to make his or her shopping decision within a certain product category, rather than the complete shopping trip, is a more objective way to evaluate the effects of changes to the shelf layout. Thus, search duration is considered to be the benchmark for ease of orientation at the shelf.

2.2.2.1 Effects on Search Duration

Few studies concerning the supermarket shelf focus on the consumers' perspective at all, as far as the author knows. Oliveira-Castro (2003) measures the search duration for a product category and per chosen product within the category and compares search duration across different product categories. However, he does not change the layout of the shelf, but instead compares products with different base price levels. Based on his findings, he shows that search duration is shorter for cheaper product categories compared to more expensive categories.

2.3 Research Gap

Several research gaps arise based on the previous literature review. Apart from the combined analysis of location and facings, no interactions have been analyzed; no study known to the author has included the effects of saliency, either.

Furthermore, there is a research gap considering the product variety; most studies are limited to the analysis of different brands, but neglect the additional complication of taking the different variants among brands (i.e., different sizes, flavors, etc.) into account as well. No conclusions have been reached so far about the arrangement of the shelf on a category level rather than the individual SKU (i.e., how SKUs should be arranged in relation to each other)

Additionally, consumers' response to the shelf arrangement has been widely neglected in previous research. The present study will attempt to address those research gaps.

3 Hypotheses

The main objective of this study is to identify what guides attention across a supermarket shelf and what measures might be taken to lead attention either to certain locations in the shelf or to particular SKUs.

Many studies have analyzed the effects of position in the shelf (vertically and horizontally) as well as the number of facings. The present study should serve as a validation for previous research in that area, but it also attempts to go a step further and analyze additional aspects of attention enhancements.

As has been mentioned in the previous chapter, there are certain decisions that have to be made, when arranging a supermarket shelf. For each SKU it has to be decided where to put it in the shelf, both vertically and horizontally (*location*), how many of the same SKUs to place next to each other (*facings*) and what signs to use to provide the consumer with the necessary information (*signage*). Signs are one way to create saliency, but it is also important to regard the *saliency* of products due to their package design. Furthermore, apart from decisions for individual SKUs, the effects of the shelf arrangement as a whole are considered as well.

The following sections describe the influence of those factors on attention, consideration, choice and search duration as has been discovered in the literature and deduce the hypotheses analyzed in this study. For the decisions made on individual SKUs, the effects will be measured on attention, consideration and choice (cf. Chandon et al., 2009), while the measure of success for the overall arrangement is the search duration.

3.1 Where

When analyzing the location of an SKU, previous research has shown that the vertical effect is stronger than the horizontal effect. (Chandon et al., 2009; Hansen et al., 2010)

How these effects work in detail is the topic of the following subsections.

3.1.1 Vertical Effects

In the literature, there seems to be general agreement that the lowest shelf is not a good position but agreement ends when trying to decide on the most prominent

height. Although "Eye-level is buy-level" is a well established and oft repeated phrase, Drèze et al. (1994, p. 312) find that the definitions of eye-level are not as uniform as might be expected: "experts were referring to any one of several shelves above the knees but below 6 ½ feet [around 2 meters]".

Sigurdsson et al. (2009) find positive effects for the middle of three shelves, while purchase likelihood is the same for the upper and the lower shelf. Chandon et al. (2009) agree that the shelves in the middle enhance attention but they assert that products placed in the upper half of the shelf are, along with more attention, also more likely to be considered or even bought. Drèze et al. (1994) conclude that a location between 130-135 cm above the floor is the most favorable. Van Nierop et al. (2008) find a positive correlation between shelf height and sales, signaling an advantage of the shelves located towards the top.

These findings can be summarized in the following hypotheses:

> *H1· SKUs on the upper shelf boards …*
> *a) receive more attention …*
> *b) are considered more often …*
> *c) are chosen more often …*
> *… than SKUs on the lower shelf boards.*

Valenzuela et al. (2012) also point out that consumers have certain expectations concerning the lower shelves; they expect cheap products to be on the bottom shelf. Additionally, Parkhurst et al. (2002, p. 107) state that expectations like these can "influence the allocation of attention" via top-down mechanisms. Hence, it is reasonable to assume that price sensitive consumers have internalized the expected location of cheap products and will focus their attention accordingly.

Therefore the following hypothesis suggests a moderator to H1·.

> *H1·m   Price-sensitive customers …*
> *a) pay more attention to …*
> *b) are more likely to consider …*
> *c) are more likely to choose …*
> *… SKUs on the bottom shelves than other customers.*

3.1.2 Horizontal Effects

The advantage of a central horizontal position is a well-researched concept. Chandon and colleagues (2009) find strong support for the center-advantage

assumption in their eye-tracking study. Valenzuela and Raghubir (2009) illuminate the issue from a different perspective, focusing on the implicit meaning of a central horizontal position in the mind of the customer. They argue that products placed in the middle of the shelf might not necessarily receive more attention but they are more likely to be chosen because people believe that products placed in the middle of the shelf are the more popular options. This effect, however, is limited to people whose buying decisions are influenced by the opinions of others; that is the case because when purchasing products for others, it is considered more important to buy popular products, instead of following own preferences. In a later study, Valenzuela et al. (2012) discover that customers generally think that a central location is the best location for a product.

The advantage of a central position is also supported by researchers from other disciplines, such as Feria (2008, p. 1192), a psychologist, who states that the center bias is "a pervasive phenomenon in visual perception" and concludes that there is a "general bias toward the centers of objects and scenes" (Feria, 2008., p. 1194) of the visual system.

Since there seems to be little doubt about the benefit of a central location for a product, this study will focus on a different aspect of the horizontal location; namely, whether there is a difference between the left and the right half of the shelf. Hansen and colleagues (2010, p. 95) argue for an advantage for products on the left since people tend to 'read' shelves "from left to right within a given section of the shelf". This search direction is also supported by van der Lans and colleagues (2008)

The proposed advantage of the left half of the shelf is also supported by findings from brain research. Information that is perceived in the left visual field is initially processed in the right hemisphere, which allows for a more holistic analysis, than information, which is processed in the left hemisphere, since this hemisphere focuses on a "preliminary analysis of verbal information" (Janiszewski, 1990, p.264). The right hemisphere can "identify, elaborate, and coordinate information" (Janiszewski, 1990, p. 264) which is necessary to identify a product and ultimately make a purchase decision. Therefore it is argued that products on the left side of the shelf are more likely to be attended and processed in order to be possibly considered and chosen.

This leads to the following hypotheses:

H2· SKUs on the left half of the shelf …
      a) receive more attention ...
      b) are considered more often ...
      c) are chosen more often ...
   …than SKUs on the right half.

These hypotheses are based on the assumptions that it is a static situation (i.e., the customer does not approach the shelf from either side, but is directly confronted with it) and that the shelf width is limited to a standard shelf breadth of one meter.

3.2 What

As has already been indicated, the present study is not concerned with the question of which products are stocked and which ones are not, but assumes that the product mix is predetermined (i.e., within the experiment there will be no variation of the product set), which is an approach employed by many researchers (e.g., Chandon et al., 2009; Curhan, 1972; Desmet & Renaudin, 1998; Drèze et al., 1994; Simonson & Winer, 1992).

Hence, the question of *what* to place in the shelf does not directly relate to the individual SKUs but rather to more general features of the shelf. Instead of looking at the individual products, the next subsection discusses the packaging of the products and whether it attracts attention or not. The following section deals with another way to lead attention to certain areas of the shelf, namely the use of signage.

3.2.1 Saliency

Generally, every SKU has a certain level of saliency. Important features, in this respect, are color, brightness, size, shape, orientation and contrast. Hence, if some products are more salient than others, for example, due to their color attributes, this "can affect the location and duration of fixations" (Milosavljevic et al., 2012, p. 67) and if an SKU attracts more attention for positive reasons (as compared to attention due to disgust), it is also more likely to be bought. Clement (2007) argues that this effect can even overrule brand preferences.

But salience can also help the customer find the preferred brand faster; van der Lans et al. (2008, p. 926) discover that "salient brands are indeed found faster". If

consumers know what they are looking for, saliency "can efficiently guide attention to the target" (Wolfe & Horowitz, 2004, p. 1).

The effects of saliency are especially important in the first five seconds of the search process; at this stage, attention is mainly guided by bottom-up factors (Jost et al., 2005). But Parkhurst et al. (2002) discovered that bottom-up processes are steering attention throughout the search process even when top-down processes are already applied as well. Hence, the effects of salience should be at work throughout the search process.

> *H3· Salient SKUs …*
> > *a) receive more attention …*
> > *b) are more likely to be considered …*
> > *c) are more likely to be chosen …*
> *… than non-salient SKUs.*

Clearly, some respondents have already made their decision prior to arriving at the shelf. In line with this assumption, Milosavljevic et al. (2012) found that consumers who do not show a strong preference towards one of the offered products are more responsive to the saliency of products. And "if consumers do not possess a strong preference for one or more brands (i.e., when extrinsic motivations are weak), variety-seeking switching may be more likely to occur" (van Trijp, Hoyer, & Inman, 1996, p. 284). Similarly, Campo & Gijsbrechts (2005) find that variety seeking behavior influences the perception of the shelf. Hence, those consumers should be more susceptible to the effects of saliency:

> *H3·m Variety Seekers …*
> > *a) pay more attention to …*
> > *b) are more likely to consider …*
> > *c) are more likely to choose …*
> *… salient SKUs compared to other customers.*

3.2.2 Signage

Apart from salient packaging, retailers have their own tools to guide attention to certain areas of the shelf by placing signs. The types of signs of interest here are the ones promoting specific SKUs. While Inman and colleagues (1990, p. 74) "use the term promotion signal to describe any sign, marker, or other indicator of a price promotion on the brand display used to draw consumers' attention to a special

offer", the present study extends the definition by excluding the necessity of a price reduction. Hence, signs with and without a price cut will be discussed separately.

3.2.2.1 Promoted SKUs with Price Reduction

Previous research has established the positive effects of price-cuts (cf. Guadagni & Little, 1983; Wilkinson et al., 1982), but it has also been shown that signaling a discount either via additional signs or coloring of the existing price labels lead to higher amounts of purchased goods as well (cf. DelVecchio, Krishnan, & Smith, 2007; Thomas & Garland, 1996). Yet it is unclear if that is a direct relationship and consumers tend to choose these products because of the lower price or if it is the enhanced attention brought to these products that leads to more favorable opinions of the product. After all, studies have shown that many customers are not aware that the purchased product was in fact reduced in price (Anderson & Simester, 2001; Dickson & Sawyer, 1990; Zeithaml, 1988). So "customers can rely on sale signs to help guide their decisions" (Anderson & Simester, 2001, p. 139) and that way it is not important to remember prices and purchase decisions can be made with less cognitive effort.

Hence, the following hypotheses will be tested:

> H4. Promoted SKUs with a price cut …
> > a) receive more attention ...
> > b) are more likely to be considered ...
> > c) are more likely to be chosen ...
> … than SKUs without promotion.

3.2.2.2 Promoted SKUs without Price Reduction

While it is difficult to separate the effects of the signs from the effects of the price reduction in the previous section, since they co-occur, previous research has shown that promotional signs have an impact on sales even without an accompanying price cut.

Some studies have used sale signs, but made no changes to the actual price and this led to a significant increase in sales (Anderson & Simester, 2001; Guadagni & Little, 1983; Inman et al., 1990). Yet, while this might be considered deceptive, another branch of research has found positive effects of promotional signs on sales without implying a price cut. Inman and McAlister (1993, p. 341) explain this

"promotion signal sensitivity" with the "eye-catching nature of signs" (Inman and McAlister, 1993, p. 353) and assume that some customers might have misread the signs assuming there would be a price reduction nevertheless. A similar explanation is offered by Grover and Srinivasan (1989) and Zhang (2006), who suppose that consumers equate a promotional sign with a price promotion because of previous experiences.

Hence, the same hypotheses established for promoted products with a price cut should be valid for promotions without a reduction in price as well.

> *H5· Promoted SKUs without a price cut …*
> *a) receive more attention ...*
> *b) are more likely to be considered ...*
> *c) are more likely to be chosen ...*
> *… than SKUs without promotion.*

3.3 How

The question of *how* are the products displayed in the shelf is two-fold. On the one hand, it addresses the issue of whether there are multiple items of the same SKU placed next to each other (i.e., multiple facings) and on the other hand, it is concerned with the overall arrangement of the shelf (i.e., based on which attributes are the SKUs arranged within the category).

3.3.1 Facings

In addition to the decision where to place a product, it is also very important how many items of the same SKU should be placed on the shelf. Campo und Gijsbrechts (2005) argue that larger areas assigned to a SKU can signal importance and thereby make the SKU more attractive to the customers.

One way of measuring the effects of additional facings, is calculating the space elasticity (i.e., the changes in sales based on changes in the number of facings). The underlying meaning is very similar to price elasticity, but the effect is expected to be positive, since additional facings should encourage more attention and increase choice likelihood, rather than the opposite as is the case for price elasticity, which is negative for most products.

A number of studies reach the conclusion that space elasticity is on average around 0.2 (Chandon et al., 2009; Curhan, 1972; Desmet & Renaudin, 1998). That means that when the number of facings is doubled, this leads to an increase in

sales of 20%. Other studies do not offer such concrete numbers, but reach a similar conclusion that additional space leads to additional sales (Abbott & Palekar, 2008; Drèze et al., 1994; Hansen et al., 2010; van Nierop et al., 2008)

Yet while there is an overall tendency that more space means more sales, there are large differences among individual product categories. Curhan (1972) even reports some studies, which find negative elasticity scores, yet it is not specified which product categories were analyzed. Curhan (1972, p. 407) blames "inadequacies in experimental control" for this counter-intuitive effect.

Although a general positive effect of additional facings on sales is expected, "the ratio of sales/space decreases as space increases" (Borin & Farris, 1995, p. 155) and the effects are not linear, but sometimes described as "S-shaped or Concave" (Campo & Gijsbrechts, 2005, p. 385). The small effects of added facings might be based on the assumption that "most products receive an over-allocation of shelf space" (Desmet & Renaudin, 1998, p. 445) already.

However, even if the effects are not very strong, there should still be a positive influence of additional facings on consumer behavior.

> H6· SKUs with more facings …
>   a) receive more attention ...
>   b) are considered more often ...
>   c) are chosen more often ...
> … than SKUs with fewer facings.

3.3.2 Arrangement

While the previous sections have dealt with decisions for individual SKUs (e.g., where to place them and how many facings per SKU), it is also important to arrange a shelf which is coherent across the product category as a whole. Most categories contain a certain number of brands and those brands offer different variants (e.g., different flavors or sizes) and this inherent order of products should be adhered to. Either all products of the same brand should be grouped together or the similar variants across brands; which of those two possibilities is preferable, is unclear so far, as will be discussed later.

While the manufacturer wants his products placed on the prime spots in the shelf, the retailer needs to focus on the coherence of the shelf, addressed above. Shelves which are well arranged make it easier for customers to find the products

they are looking for and this, in turn, leads to happier customers. This raises the question of which arrangement is most suitable, in general. That issue is a two-fold question: First, it has to be determined if there is a general search pattern (i.e., do consumers tend to search in a vertical or horizontal direction) and second, it is important to know whether consumers find it easier to orient themselves when the individual brands are grouped together or if a grouping according to attributes (e.g., flavors, functions,…) is more useful.

Concerning the first point, Gilchrist and Harvey (2006) argue that horizontal eye movements are more frequent compared to all other directions (i.e., vertical or diagonal). This effect was especially strong for structured displays; hence a similar outcome can be expected for viewing a supermarket shelf, which is a highly structured display. Other researchers have also found evidence pointing to a horizontal searching strategy. Van der Lans et al. (2008, p. 926) even offer more details and state that people tend to use a "left-right zigzag strategy". This would mean that consumers tend to scan one shelf board from left to right and then jump across the shelf in order to scan the next shelf board from left to right and so on. This is also supported by Hansen and colleagues (2010, p. 95), who argue that people 'read' shelves "from left to right within a given section of the shelf". Hence, products placed on the left side of the shelf should have an advantage over products place further to the right, which leads to the following hypothesis:

H7 The search duration for SKUs on the left is shorter than for SKUs on the right.

A study conducted by a commercial marketing research firm analyzes the optimal placement of beer six-packs. They discover that consumers finish their shopping process the fastest, when the brands are arranged vertically; it takes them a bit longer when the brands are arranged horizontally and the elapsed time is longest when the beer is organized according to the type or flavor. The respondents also claimed that the vertical arrangement is arranged more clearly and resembles the favored layout the closest. (plan + impuls, 2011) This suggests that a vertical arrangement is to be preferred, which is in line with the search direction mentioned before. Since consumers tend to scan the shelves horizontally, it should be preferable to have the different types of products they are looking for (e.g., the different beer brands in the study of plan + impuls, 2011) primarily next to each

other. So if someone is looking for a particular brand and all offered brands (with one of the variants) are placed on one shelf board, the consumer can switch to a vertical search strategy as soon as the designated brand has been found.

The second question, however, is, whether brand should be the preferred sorting variable. Simonson & Winer (1992) have manipulated the yoghurt shelf, sorting it once by flavor and then by brand, but they focused on effects on purchases rather than ease of orientation for the customers. The only relevant finding stems from Campo and Gijsbrechts (2005, p. 385), who conclude that arrangement "by brand [is] better than alphabetic or by type". To test this assumption, the following hypothesis will be tested:

H8 Vertical arrangement by brands will shorten search duration.

Kök and Xu (2011, p. 1549) argue that "consumers make purchase decisions in a two-stage hierarchical choice process". Additionally, there are two different types of choice processes. Either the customer chooses the brand first and then selects a product type within the brand in a second stage, or the customers decides on the product type before making a final choice among the brands which offer this type. On the one hand, they reason that the order of the steps depends on the product category (i.e., brand-choice comes first for categories where products are hardly differentiated while the choice of type is initial for categories which include functionally different product types). On the other hand, they also say that the followed order is to an extent customer-dependent. If this reasoning is broadened to the arrangement of the shelf, an extension to the previous hypothesis arises. Taking customer preferences into account, it is reasonable to assume that brand-focused customers will indeed find their preferred product faster if the shelf is vertically arranged by brand; yet customers who decide first on the product type (i.e., a certain attribute of the product) will find the product faster if the shelf is arranged by these differentiating attributes.

H8id   Vertical arrangement by brands will shorten search duration for brand-focused customers.
H8ie   Vertical arrangement by attributes will shorten search duration for attribute-focused customers

3.4 Overview

Since the number of hypotheses derived from the literature is quite large, Figure 2 gives a summary of the hypotheses. Hypotheses 1-6 portray an influence on attention, consideration and choice and to signal these multiple relationships, "·" serves as a placeholder for the three dependent variables. The vertical arrows from the top signal a moderator-relationship of the variables written in the box, while the vertical arrow from below indicates an interaction; this is also emphasized by the dashed line of the arrow.
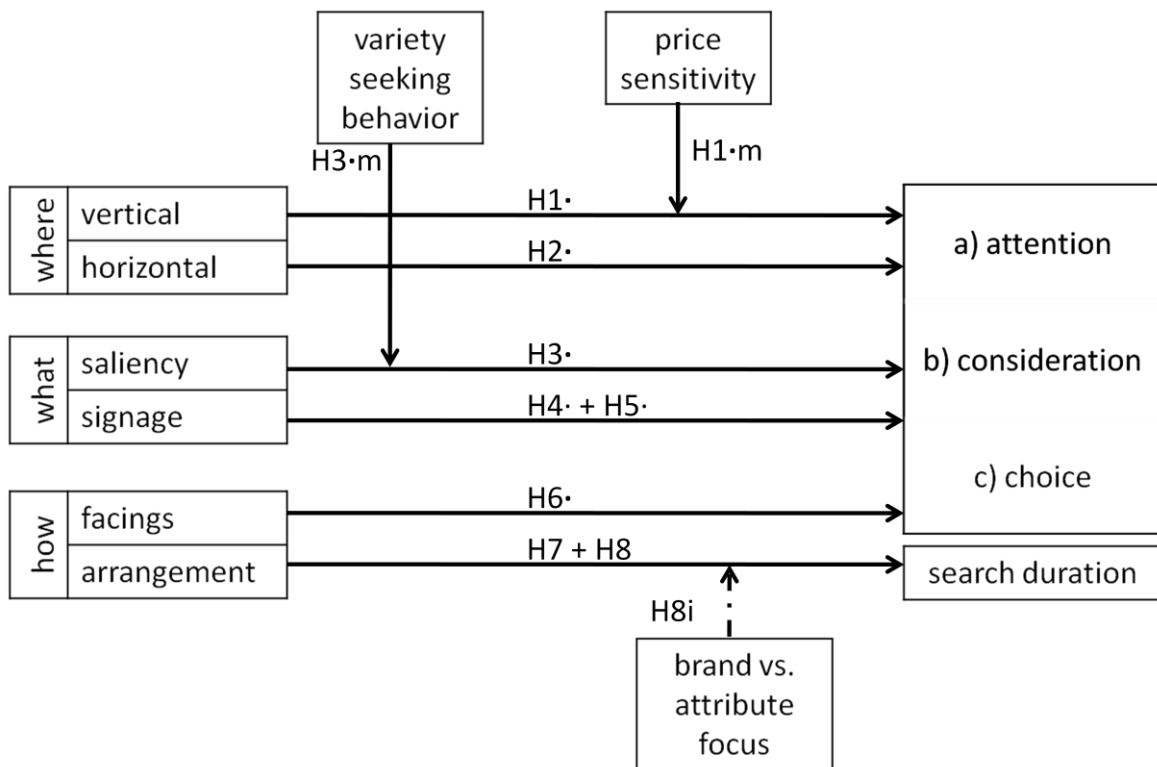
Figure 2: Summary of the Hypotheses

Table 1 gives a verbal overview of the hypotheses, for future references, it can also be found in the appendix on page 111.

H1·	SKUs on the upper shelf boards …
	     a) receive more attention …
	     b) are considered more often …
	     c) are chosen more often …
	… than SKUs on the lower shelf boards.

H1·m	Price-sensitive customers …
	     a) pay more attention to …
	     b) are more likely to consider …
	     c) are more likely to choose …
	… SKUs on the bottom shelves than other customers.

H2·	SKUs on the left half of the shelf …
	     a) receive more attention ...
	     b) are considered more often ...
	     c) are chosen more often ...
	… than SKUs on the right half.

H3·	Salient SKUs …
	     a) receive more attention …
	     b) are more likely to be considered …
	     c) are more likely to be chosen …
	… than non-salient SKUs.

H3·m	Variety Seekers …
	     a) pay more attention to …
	     b) are more likely to consider …
	     c) are more likely to choose …
	… salient SKUs compared to other customers.

H4·	Promoted SKUs with a price cut …
	     a) receive more attention ...
	     b) are more likely to be considered ...
	     c) are more likely to be chosen ...
	… than SKUs without promotion.

H5·	Promoted SKUs without a price cut …
	     a) receive more attention ...
	     b) are more likely to be considered ...
	     c) are more likely to be chosen ...
	… than SKUs without promotion.

H6·	SKUs with more facings …
	     a) receive more attention ...
	     b) are considered more often ...
	     c) are chosen more often ...
	… than SKUs with fewer facings.

H7	The search duration for SKUs on the left is shorter than for SKUs on the right.
H8	Vertical arrangement by brands will shorten search duration.
H8id	Vertical arrangement by brands will shorten search duration for brand-focused customers.
H8ie	Vertical arrangement by attributes will shorten search duration for attribute-focused customers

Table 1: Overview of Hypotheses

4 Methodology

In order to test these hypotheses (for an overview, see Table 1 on page 28), which have been established in the previous chapter, three experiments are created, that allow for the necessary manipulations and give the possibility to collect the needed data.

Following the work of previous studies such as Chandon et al. (2009), this study is based on laboratory experiments with the use of an eye-tracker. The steps of the data collection are to a large part very similar to the experiment conducted by Chandon and colleagues (2009): The participants in both studies are seated in front of a computer screen and asked to look at pictures of supermarket shelves. Each picture depicts a shelf filled with different SKUs from one product category each. While they look at the picture, their eye movements are recorded and they have to indicate which products they might consider buying. This part of the experiment is later referred to as free browsing, because there are no limitations concerning the time the respondents spend looking at the shelves nor about the number of products they have to consider. Additionally in this study, in order to be able to test hypotheses H7 and H8 about the search duration based on different arrangements of the shelf, they also have to perform a search task to ascertain their search duration. After viewing all pictures, they need to complete a questionnaire (for more details see chapter 4.5 on page 49). Among other questions, respondents make their final product choice for each category. That way, participants provide information about their consideration set and their choice and, with the help of the eye-tracker, their attention towards the individual SKUs in the shelves is recorded. Details about the equipment and the recording procedure will follow in section 4.4 on page 47.

Since it is not possible to test all hypotheses within one experiment, three different experiments are designed. The first clear separation is between the hypotheses with attention, consideration and choice as dependent variables and those with search duration; different tasks are necessary to get the data, which is exemplified in column 2 in Table 2; free browsing indicates that the participants can browse the shelves freely at their own pace and name those products they are interested in (consideration), while for the search task the search duration, until the sought-after SKU is found, is recorded. Within one experiment, it is possible to test all

hypotheses concerning the search duration, but it has to be a product category with variation in brands and flavors because hypothesis 8 tests the assumption that sorting the products by brand is preferable to a sorting by flavor.

experiment	task	independent variables	product category: variation in …	tested hypotheses
experiment 1	free browsing	vertical location, horizontal location, facings, saliency	brands	H1·, H1·m, H2·, H3·, H3·m, H6·
			flavors	
			brands and flavors	
experiment 2		signage	brands and flavors	H4·, H5·
experiment 3	search task	arrangement	brands and flavors	H7, H8, H8id, H8ie

Table 2: Overview of Experiments

Concerning the task *free browsing*, it is not possible to test all variations mentioned in hypotheses 1-6, which are listed in the third column, thus signage stands in a different cell. While vertical and horizontal location as well as facings have already been tested jointly by Chandon and colleagues (2009) and since saliency is not manipulated but only controlled, it will be analyzed within the same experiment, namely experiment 1; experiment 2 focuses only on the effects of signage: In order to test the effects of signs, it is best to keep the promoted SKU as well as the location and number of facings constant, in order to avoid spurious explanations for the detected effects.

Experiment 1 concentrates on the remaining hypotheses (i.e., vertical location, horizontal location, facings and saliency). In principle, one product category would be sufficient, but in order to achieve generalizability of the result, three product categories will be used to test them. One product category with a dominant brand and only variation in flavor as well as a product category with only variation in brand and a third category with variation in both brand and flavor are included. Overall, this sums up to five product categories, one product category each for experiment 2 and 3 and three product categories for experiment 1.

For the four product categories in experiment 1 and 2, where the respondents can browse freely, it is important that the packaging concerning size and shape is fairly similar. The same approach was used by Chandon et al. (2009), who used boxes of soap and pain reliever for their study. These products cannot be used in this study however, since on the Austrian market there are not many different types of packed soaps and pain relievers are not sold in the supermarket. Therefore, different product categories need to be used, but attention is paid to the fact that

the packaging should be comparable across the different SKUs within the category. That way, it is avoided that respondents recognize the brand without looking at it directly just from the blurry shape they perceive from the corner of their eyes. Products with similar packaging are rare since every manufacturer wants their product to catch customers' attention. Yet, for some categories there are limited ways to wrap it reasonably and therefore boxed tea, cereals, half liter bottles of beer and bagged chips are chosen for this study. Arguably, they do not look perfectly alike but similar enough to necessitate attention to determine the exact SKU.

The fifth product category is the only one which is not a food product, namely shampoo. It is reasoned that the category shampoo offers a wide range of brands and within those brands a large number of different variants for different hair types. This makes it the perfect category for arranging the shelves either by brand or attribute[5].

Since the data for the three experiments are collected jointly, the number of experimental groups is identical for the experiments. The necessary number of groups is predetermined by the goals of the hypotheses. One the one hand, two groups are needed to establish the vertical effect, by using a mirrored layout of the shelf; that way we are able to compare the different results for the individual SKUs, depending on whether they were placed on the upper or lower half of the shelf. Hence, if there are any significant differences in attention pattern and consideration and choice likelihood, manipulation of location is the only possible explanation since everything else has been held constant. However, with only those two groups, it would be impossible to test the effects of variation in facings or horizontal position, since they are held constant within those two groups. Thus, another set of two groups is necessary to test the different effects of placement on the left or right half of the shelf, with a shelf design that is mirrored along the vertical axis. Therefore, two different shelf layouts have to be designed for each of the three product categories. Within those two shelf layouts, SKUs have to be assigned different numbers of facings in order to achieve the necessary manipulations for hypothesis 6 about the number of facings.

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[5] For the non-food category shampoo, *attribute* is used instead of *flavor*.

Using four groups is also advantageous to test the hypotheses about signage. So, the effects of three different signs can be compared to the results of a control group. Additionally, when respondents search for one of four different products each in the search task, there is a wider variety for SKUs placed on a horizontal continuum from left to right, which tests H7, concerning the search duration of products on the left compared to products further to the right.

The following sections are concerned with the sequence of the experiment based on the information given before, the design of the planograms for the five product categories, the compilation of the stimulus material and the measurement of the variables.

4.1 Sequence of the Experiment

For each respondent, the experiment will follow the same general steps. At first, the participants will look at pictures of supermarket shelves. Each picture shows a shelf filled with products from one category. While viewing the individual pictures, they are asked to indicate which products they might consider buying. They can name multiple products, but are not forced to consider any in case they never purchase products from this category. When they feel they have spent enough time browsing the shelf, they can switch to the next picture; the procedure is repeated for all four product categories, where either the location, number of facings or signage is manipulated.

After the free browsing task is completed for all four product categories, the respondents will have to perform two search tasks to determine which arrangement of the shelf eases orientation for the consumers and thereby reduces the search duration. For the search task, the participants look at a picture of two facings of a shampoo SKU and are instructed to memorize it in order to be able to find it in the shelf, which appears on the screen next. As soon as the product is found, they have to confirm their finding with a mouse click on the product. This procedure is repeated, but the target shampoo bottle as well as the arrangement of the shelf changes. In one picture the shelf is arranged vertically by brand and in the other picture it is arranged vertically by attribute.

An overview can be seen in Table 3. The last column specifies the data, which is collected while the respondents perform the task. All other necessary information

is collected after the experiment with the follow-up questionnaire, described in section 4.5 on page 49.

product category	task	independent variables	data collected
boxed tea	free browsing	horizontal + vertical location, facings, saliency	attention data consideration set
cereals	free browsing	horizontal + vertical location, facings, saliency	attention data consideration set
chips	free browsing	signage	attention data consideration set
beer	free browsing	horizontal + vertical location, facings, saliency	attention data consideration set
shampoo (2 times)	search task	arrangement	search duration

Table 3: Sequence of the Experiment

The order of the product categories is the same for every participant. It might be argued that this could lead to sequence effects, but Chandon et al. (2009) reports that although they varied the order within their experiments they could not find any differences arguing that the sequences does not influence the results of the individual product categories. A fixed order also seems more realistic since in a retail environment, customers are guided along a pre-specified path as well and, thus, approach different product categories in a similar series. Since the participants saw two pictures of a shampoo shelf, group membership decides the order of the shampoo shelves and which SKUs have to be searched for. For details, see sections 4.2.6 and 5.1.

4.2 Design of the Planograms

The variation of the layout of the shelves across the four groups for the different product categories is the topic of this chapter.

A planogram is the schematic representation of the supermarket shelf. It determines how the shelf has to be stacked. Since the size of the packaging varies greatly between the different product categories, it is necessary to design different planograms for all five categories. Furthermore, the planograms per category have to be different for the four groups. The only exception is the shampoo shelf, since there are only two variations necessary, namely sorting the shelf once by brand and once by attribute. Overall, this results in 18 different planograms (i.e., four product categories with four variations for the groups and two planograms for shampoo).

Thanks to a cooperation with Interspar, an Austrian retailer of groceries, it became possible to use such a wide variety of products, since they made the products available for this study. Furthermore, they also provided the respective price tags and the signs used to test the hypotheses about product signage.

Another helpful cooperation was established with the company Assmann, who provided a supermarket shelf in order to be able to take realistic pictures, resembling a supermarket shelf. The dimensions of the individual shelf are 1x1.95x0.35 (BxHxD in meters) and each product category fills the maximum area of the shelf, the beer shelf is the only exception.

Since the term *shelf* can be ambiguous, referring both to the whole structure and to one board, *shelf* is only used to describe the complete frame, while *shelf board* is used for the individual levels.

4.2.1 General Remarks

When designing the planograms, there are certain conditions that apply to all product categories.

In experiment 1, where the number of facings is varied across SKUs (i.e., for tea, cereals and beer), it is the goal to allocate about the same number of SKUs to the possible facing combinations (e.g., 4 SKUs with 1 facing, 4 with 2 facings and 4 with 3 facings).

As far as possible, multiple facings of an SKU should be next to each other on the same shelf board; it is only overruled by the premise of vertical arrangement which might entail that multiple facings have to be spread across multiple shelf boards. But in this case, the facings of one SKU have to be on adjacent shelf boards, resembling a block of this SKU.

Original price tags with the original prices from Interspar are placed below all products. In case, more than one facing per SKU is placed next to each other, there is only one price tag and it is placed in the middle of the area covered by the identical facings (i.e., below the middle of odd-numbered facings or between the two middle facings when even-numbered). When the same SKU is located on multiple shelf boards, there is a price tag on each board.

The vertical distance between the shelf boards is adjusted based on the height of the products; hence the number of levels differs across categories. The number of shelf boards varies from three for beer to eight for boxed tea.

4.2.2 Boxed Tea

The first thoughts put into the design of the tea planograms are the general parameters. The size of the shelf allows 6 facings next to each other; based on common practice of retailers, each facing is stacked with another item of the same SKU on top, resulting in 12 facings per shelf board. There is enough room for 8 shelf boards; hence, there are 16 boxes of tea vertically on top of each other. Overall, this leads to 96 product facings. Figure 3 shows a schematic representation of the tea shelf, every cell indicates room for one facing, the permanent horizontal line represents the shelf board, and the dashed line denotes that there are two facings stacked on top of each other on each shelf board. The six columns stand for the six facings, which can be placed next to each other on every level. Overall, there are 96 cells which need to be filled.

Figure 3: Schematic Representation of the Tea Shelf

Since tea is a product category with many different brands and flavors, the tea-planogram consists of 6 different brands with four different flavors[6] each, resulting in 24 SKUs. Since there is a natural connection between the products stemming from similarities in brand and flavor, they should not be assigned to their spots as freely and unrelated as is the case with planograms, with only variation in either brand or flavor (i.e., beer and cereals respectively). Taking this limitation into

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[6] The flavors are black tea, herbal tea, fruit tea and green tea.

account, there are two possible ways to arrange the shelf meaningfully: As has been shown in the literature, a vertical arrangement of products, irrespective of the sorting variable, is to be preferred (van der Lans et al., 2008); hence, one tea planogram is arranged by brand and the other one by flavor, in both cases the arrangement is vertical.

When sorting the shelf by brands, the first decision is already made, since there are 6 columns (i.e., 6 facings next to each other) and 6 brands, hence every brand will be assigned to one column, as is indicated in Figure 4. It is randomly determined which brand will be number 1 and so forth.

brand 1	brand 2	brand 3	brand 4	brand 5	brand 6

Figure 4: Distribution of Brands in the Tea Shelf

The next decision, of how many facings to distribute between the individual flavors, needs more elaborate thinking. In order to reach 96 facings with 6 brands and 4 flavors each, the average number of facings is exactly four. Yet, if every SKU received four facings, there would be no variation and hence it would be impossible to test H6 about the effects of the number of facings. Therefore, the different number of assigned facings will be 2, 4 or 6. Odd-numbered facings are not possible due to the double layer of SKUs. Generally, each brand is assigned 16 facings (i.e., 96 overall facings split equally among 6 brands); hence a column could be either filled by having 2 and 6 facings twice (the last line in Table 4), or two times 4 and once 2 and 6 facings per SKU (the second line in Table 4). To ensure that all numbers of facings are equally represented, that is, of the 24 SKUs used in this planogram, 8 SKUs have two facings, another 8 four and the remaining 8 SKUs have 6 facings each. Hence, four brands are assigned to the 2-4-4-6 facing combination, as indicated in Table 4, and two brands are allocated to the 2-2-6-6 combination.

different # of facings per SKU	# of brands	overall # of facings per brand
2-4-4-6	4	16
2-2-6-6	2	16

Table 4: Brands per Facing-Combination

To guarantee a higher degree of variability, SKUs with the same number of facings within a brand should not be stacked below or on top of each other; hence the only

way to distribute the 2-2-6-6 combination is either 2-6-2-6 or 6-2-6-2. The same applies to the 2-4-4-6 combination, but there are more possible ways to combine these facings. Thus, a list of all possible combinations has been created and the four combinations (cf. the second line in Table 4), which are eventually used for the planograms, are picked randomly, as well as the final order within the planogram. Minor adaptations were made to ensure that across all brands the individual flavors receive an equal number of facings, namely 24. That means, every flavor can be found 24 times in the shelf, but for some flavors there are more facings combined with brand 1 (as indicated in Figure 5 with the respective flavors) and other flavors have more facings with brand 2 and so on.

In Figure 5, the resulting planogram can be seen. The numbers refer to the different brands, while the flavors are indicated by the letters. Note that each row represents a shelf board (the dashed lines from Figure 3 have been eliminated and the two facings are summed up in one cell) and therefore one label symbolizes two facings (i.e., 1a is listed twice in the figure, but represents four facings of this SKU). The order of the brands is randomly assigned to the columns as well as the order of the different flavors; yet the flavors are in the same order for each brand.

1a	2a	3a	4a	5a	6a
1a	2b	3a	4b	5a	6a
1b	2b	3a	4b	5a	6b
1b	2b	3b	4c	5b	6c
1b	2c	3c	4c	5b	6c
1c	2d	3c	4c	5c	6d
1c	2d	3c	4d	5d	6d
1d	2d	3d	4d	5d	6d

1-6 … brands, a-d … flavors

Figure 5: Planogram 1 for Tea

For the second planogram, where the flavors are arranged vertically, the situation is very different, since there are again 6 columns to fill, but only four flavors; hence two of the flavors will receive more space than the other two. The order of the flavors and which two flavors receive two columns is determined by chance and the results are shown in Figure 6.

It is determined that per shelf board, within a flavor there is only one brand to be placed, that means that both columns for flavor a or d present the same SKU on a

given shelf board. This prerequisite leads to the possible facing combinations listed in Table 5.

flavor b	flavor c	flavor a	flavor d

Figure 6: Distribution of Flavors in the Tea Shelf

Obviously, there are great differences in the number of facings between the two groups of flavors and as has already been mentioned, the overall number of facings per flavor differs this time, while it is identical for the different brands in planogram 1. Since some flavors are probably purchased more often than others, it is reasonable to assume that such a composition is possible in a supermarket setting as well.

different # of facings per SKU	# of flavors	overall # of facings per flavor
2-2-2-2-4-4	2	16
4-4-4-4-8-8	2	32

Table 5: Flavors per Facing-Combination

The order of the facing combination taken from Table 5 is again determined randomly as well as the order within the combinations (i.e., whether a flavor is split across brands in the order of 2-4-2-2-4-2 or any other possible order of the number of facings). Again a random choice among all combination possibilities is executed. The result of the process is planogram 2, which can be found in Figure 7. The overall order of the brands is assigned randomly as well, but across flavors the order of the brands is constant.

5b	5c	5a	5a	5d	5d
4b	4c	5a	5a	4d	4d
4b	2c	4a	4a	4d	4d
2b	1c	2a	2a	2d	2d
1b	1c	1a	1a	1d	1d
1b	3c	3a	3a	3d	3d
3b	6c	6a	6a	6d	6d
6b	6c	6a	6a	6d	6d

1-6 … brands, a-d … flavors

Figure 7: Planogram 2 for Tea

Overall four different planograms are needed for the four groups; furthermore, it was established that in order to test effects of horizontal and vertical locations, it is necessary to mirror the planograms. Hence, both planograms are mirrored, one

horizontally and one vertically. Chance determined that planogram 1 shown in Figure 5 is mirrored along a horizontal axis and planogram 2 from Figure 7 along a vertical axis resulting in the two designs shown in Figure 8 and Figure 9. With the first mirroring it is possible to determine differences in top and bottom locations and the second mirroring reveals differences between left and right, as is necessary to test hypotheses 1 and 2 respectively.

1d	2d	3d	4d	5d	6d
1c	2d	3c	4d	5d	6d
1c	2d	3c	4c	5c	6d
1b	2c	3c	4c	5b	6c
1b	2b	3b	4c	5b	6c
1b	2b	3a	4b	5a	6b
1a	2b	3a	4b	5a	6a
1a	2a	3a	4a	5a	6a

1-6 … brands, a-d … flavors

Figure 8: Planogram 3 for Tea

5d	5d	5a	5a	5c	5b
4d	4d	5a	5a	4c	4b
4d	4d	4a	4a	2c	4b
2d	2d	2a	2a	1c	2b
1d	1d	1a	1a	1c	1b
3d	3d	3a	3a	3c	1b
6d	6d	6a	6a	6c	3b
6d	6d	6a	6a	6c	6b

1-6 … brands, a-d … flavors

Figure 9: Planogram 4 for Tea

When the SKUs were assigned to the numbers and letters, minor adaption had to be made to planogram 2 and 4 because two of the brands did not cover the 4 needed flavors precisely. While the flavors were supposed to be black, herb, fruit and green tea, one brand of tea has no herb tea, but an additional black tea flavor, while there was no black tea for another brand but instead this one offers an additional herb tea. Hence, those two products were exchanged in the planograms, since the arrangement by flavor is paramount for planograms 2 and 4. So in one of the columns one brand is repeated twice but missing in the respective other column as a consequence. Yet, they are not placed in the direct vicinity of each other but at least separated by another SKU to avoid confusion about the sorting mechanism.

4.2.3 Cereals

The size of the shelf and of the products determine that there will be five product facings per board on five levels each, resulting in 25 facings overall. In order to offer a wide variety of products, 12 different flavors of the brand Kellogg's were chosen to be displayed; the 11 best selling products along with an unknown product that is to this point sold only in Germany. A similar setting was used by Chandon et al (2009), but instead of using different flavors, they combined 11 well-known brands with one unknown brand.

After having chosen the products and the general layout of the shelf (i.e., the number of products per shelf board and the number of the boards), the next step is to decide on the number of facings for the individual SKUs and how they should be varied. With 25 overall facings and 12 SKUs, the average number of facings is slightly above two, leading to a reasonable variation between one and three facings. The only two possible combinations ensuring that the different numbers of facings are represented fairly equal can be found in Table 6. In principle, it would also be possible to fill the shelf with 11 SKUs with 2 facings each and 1 SKU with three facings, but with such little variation in the number of facings, it would not be possible to test the hypotheses. Hence, the two combinations listed in Table 6 will be used because, that way, the numbers of SKUs with one, two or three facings are fairly similar. A completely equal distribution is impossible, because it would only lead to 24 overall facings.

	Combination 1: #of SKUs with	Σ of facings	Combination 2: # of SKUs with	Σ of facings
1 Facing	3	3	4	4
2 Facings	5	10	3	6
3 Facings	4	12	5	15
Σ		25		25

Table 6: SKUs per Number of Facings for Cereals

Furthermore, there are only a limited number of possibilities how the resulting number of facings can be combined in order to receive a 5x5 layout, especially with the restriction that a specific SKU should be placed only on one shelf board and the facings should all be next to each other.

Since the study is based on four groups, four different planograms need to be designed. For planogram 1, combination 1 from Table 6 is used; that means 3

SKUs have one facing, 5 SKUs 2 facings and 4 SKUs receive 3 facings. In order to avoid that all three SKUs with a single facing are on the same shelf board, one single facing is paired with two double facings and the other two singles are combined with a triple facing. The remaining three shelf boards are filled with two SKUs each, one double and one triple facing, as can be seen in Table 7.

different # of facings per SKU	# of shelf boards	overall # of facings per shelf board
1-1-3	1	5
1-2-2	1	5
2-3	3	5

Table 7: Shelf boards per Facing-Combination for Combination 1

The order of the facings per shelf board was randomly assigned. The vertical arrangement of the various boards was also randomly assigned. The resulting Planogram 1 can be found in Figure 10. The blocks are consecutively lettered, but the letters are allocated by chance to the various SKUs.

a	a	b	b	b
c	d	d	d	e
f	f	f	g	g
h	h	i	j	j
k	k	k	l	l

a-l … flavors

Figure 10: Planogram 1 for Cereals

Planogram 2, which can be seen in Figure 11, is designed around the same parameters as planogram 1. However, one difference is that in this case combination 2 from Table 6 is used to get more diversity concerning the number of different facings. Therefore, the possible combinations of facings (column 1 in Table 8) necessary to fill the 5x5 display changes as well. Now with five instances of triple facings, one has to be located on each shelf board and can thus only be combined with either a double facing or two single facings. Again the order of the facings along the individual shelf boards is assigned randomly as well as the vertical location of the individual shelf boards.

different # of facings per SKU	# of shelf boards	overall # of facings per shelf board
1-1-3	2	5
2-3	3	5

Table 8: Shelf boards per Facing-Combination for Combination 2

The big difference to planogram 1 is that this time the SKUs are assigned deliberately in order to ensure that the horizontal and vertical location differed from

planogram 1 as well as to guarantee that the products are displayed with a different number of facings. This means that SKU 1, which is on the top shelf in the left corner with 2 facings in planogram 1, receives a different location (i.e., second lowest shelf on the right) with a different number of facings (i.e., 3). This is done for all SKUs. This is necessary since the SKUs are of different popularity and if one SKU is always in the same position or with the same number of facings, and either chosen extremely often or hardly ever, it would be impossible to determine whether the choice likelihood is based on the specific location or rather the specific SKU.

h	h	h	i	i
f	l	c	c	c
e	e	e	k	k
b	b	a	a	a
d	j	j	j	g

a-l … flavors

Figure 11: Planogram 2 for Cereals

As was done for the tea planograms, these two planograms are also mirrored in order to receive planograms 3 and 4. It was determined by chance which planogram was mirrored vertically and which horizontally and, as a result, planogram 1 was mirrored along a vertical axis (i.e., products remained on the same shelf board, but those located on the right before can now be found on the left and vice versa). Planogram 2, on the other hand, was mirrored along a horizontal axis (i.e., now the horizontal position remains the same, but products on the top shelf boards in planogram 2 can now be found on the respective lower boards). Since the number of facings as well as the number of shelf boards is odd, the axis (i.e., the products in the middle considering the direction of mirroring) remains unchanged for both planograms. In Figure 12 and Figure 13 the results of the mirroring can be seen.

b	b	b	a	a
e	d	d	d	c
g	g	f	f	f
j	j	i	h	h
l	l	k	k	k

a-l … flavors

Figure 12: Planogram 3 for Cereals

d	j	j	j	g
b	b	a	a	a
e	e	e	k	k
f	l	c	c	c
h	h	h	i	i

a-l … flavors

Figure 13: Planogram 4 for Cereals

4.2.4 Beer

Since many beer brands do not offer different flavors, the beer shelf in this study displays only one SKU per brand; 12 brands are chosen based on their market share in the area in and around Vienna. Since many breweries act on a very local level, this regional focus was necessary for a reasonable representation of a supermarket shelf.

For the beer planogram it is decided to fill only three shelf boards and focus more on the horizontal effects. Thus, it is the only product category which does not make use of the whole shelf. The empty boards are, however, not shown to the respondents. Per shelf board it is possible to place 14 bottles of beer, resulting in a total number of 42 overall facings across the three shelf boards.

If each brand were to receive the same number of facings, that would have to be 3.5 facings per brand. But since variation in the number of facings is needed, the 12 brands receive different numbers of facings varying from 2 to 5 instead. On each shelf board, every number of facings should be available to have great variation in horizontal location. The exact composition of the planogram is again determined randomly by listing all possible combinations of 2, 3, 4 and 5 facings and assigning three of them to the three shelf boards by chance. Figure 14 shows the resulting planogram. The numbers are again consecutively assigned to the slots and randomly to the brands.

1	1	1	1	2	2	2	2	2	3	3	4	4	4
5	5	5	5	5	6	6	7	7	7	8	8	8	8
9	9	9	10	10	10	10	11	11	11	11	11	12	12

1-12 … brands

Figure 14: Planogram 1 for Beer

For planogram 2, the procedure was very similar. The planogram was assembled using the same method, but the brands were allocated differently. By chance it was determined whether the brands would move up or down a level and whether

they would gain or lose a facing at the same time. This procedure was employed because with only three shelf boards a random assignment of the brands would not have been able to assure a different vertical position in the two planograms.

As can be seen in Figure 15, SKUs moved one shelf higher while the top shelf became the bottom shelf and facings were reduced by one; only the SKUs, which received two facings in planogram 1 have 5 facings in planogram 2. That means, SKU 1 in planogram 1 is located on the middle shelf with 5 facings, therefore it moves to the top shelf in planogram 2 and is given one facing less (i.e., 4 facings). The fact that it also moves further to the right was, however, determined by the random process, which generated the 5-2-4-3 combination of facings for the top shelf board.

6	6	6	6	6	7	7	5	5	5	5	8	8	8
9	9	11	11	11	11	10	10	10	12	12	12	12	12
1	1	1	3	3	3	3	3	4	4	2	2	2	2

 1-12 … brands

Figure 15: Planogram 2 for Beer

This steered variation will make it easier to compare the effects of additional facings. For groups 3 and 4, the two existing planograms are again mirrored resulting in the planograms depicted in Figure 16 and Figure 17. Planogram 1 is mirrored horizontally and, hence, the middle shelf board remains unchanged; planogram 2 is mirrored vertically, thus all brands remain on the same shelf board, but products on the left are moved to the right and vice versa,

9	9	9	10	10	10	10	11	11	11	11	11	12	12
5	5	5	5	5	6	6	7	7	7	8	8	8	8
1	1	1	1	2	2	2	2	2	3	3	4	4	4

 1-12 … brands

Figure 16: Planogram 3 for Beer

8	8	8	5	5	5	5	7	7	6	6	6	6	6
12	12	12	12	12	10	10	10	11	11	11	11	9	9
2	2	2	2	4	4	3	3	3	3	3	1	1	1

 1-12 … brands

Figure 17: Planogram 4 for Beer

4.2.5 Chips

The main purpose of the chips planograms is to test the effects of signs. Six different brands of chips were chosen with two different flavors (i.e., salt and

paprika-flavored). On each shelf board, there is supposed to be one brand, one flavor on the left half and the other flavor on the right half, but the flavors are not on the same side for each brand. Facings are held constant across all different products; each SKU receives three facings.

1a	1b
2b	2a
3a	3b
4a	*4b*
5b	5a
6b	6a

1-6 … brands, a,b … flavors

Figure 18: Planogram for Chips

In Figure 18 the resulting planogram can be seen. The order of the brands and whether salt or paprika-flavor is located on the left is determined randomly. The numbers represent the different brands and the letters symbolize the flavor, where a means paprika and b stands for salt. The planogram remains the same for all four groups; the only manipulation is the way the products on 4a/b are promoted.

One group serves as a control group, where there is no special signage. For another group, the chips in 4a are highlighted with a "Tipp"-sign, but no price reduction is granted. For the remaining two groups, two different types of calling attention to discounts are employed, which are currently used by the supermarket chain Interspar (this is also true for the "Tipp"-sign). One group sees the "Monatssparer"-Sign with a price reduction for both the products 4a and 4b[7] and the last group sees an "Aktion"-sign for only product 4a. The size of the price reduction is the same in both cases. The pictures of the used signs can be found in the appendix on page 115.

4.2.6 Shampoo

The design of the planograms for the shampoo shelves is straightforward. There is no variation in the number of facings, every product has two facings. Similar to the tea planograms, one planogram will feature the products sorted by brand and the other one sorted by attributes (such as for colored hair or for more voluminous hair). The shelf displays six brands with six different attributes each. The shampoo

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[7] The Monatssparer sign advertised all flavors of a certain brand, hence the price reduction applies to both the paprika flavored and the salted chips.

planograms serve as the basis to test hypotheses H7 and H8. Differences in search duration between the planograms will point to more or less visual clarity of the displays. Hence, an important point in designing the planograms is the fact that the products which will serve for the search task have to be on the same spot of the shelves in both instances. Otherwise, interfering factors such as shelf position could have an influence on the outcome. As can be seen in Figure 19, the general planogram is very simple. Since every product has two facings, this is not illustrated; one block stands for two facings. The order of the brands and the attributes is again determined randomly, but the order of attributes is held constant across brands.

1a	2a	3x	4a	5x	6a
1b	2b	3b	4b	5b	6b
1c	2c	3c	4c	5c	6x
1d	2x	3d	4d	5d	6d
1e	2e	3e	4e	5e	6e
1x	2f	3f	4x	5f	6f

1-6 … brands, a-f … attributes used for all brands, x … inconsistent attribute,
shaded areas indicate SKUs for search task

Figure 19: Planogram 1 for Shampoo

Figure 20 shows the analogue planogram with the products sorted vertically by attribute. This time, assignment was not random, but rather fixated around the four products that are marked in both planograms. These are the products that will have to be searched for. The locations of the relevant SKUs in the two planograms are exactly the same. Those four SKUs were chosen randomly, yet it was pre-specified that the location could not be either in the top or bottom shelf or on the extreme right or left. The edges of the planograms (vertically as well as horizontally) were intentionally not used to give the participants the opportunity to actually infer from the head of the category what will be found below it.

1a	1c	1b	1d	1e	0f
0a	3c	3b	3d	3e	3f
2a	2c	2b	0d	2e	2f
4a	4c	4b	4d	4e	0f
0a	5c	5b	5d	5e	5f
6a	0c	6b	6d	6e	6f

1-6 … brands, 0 … inconsistent brand, a-f … attributes used for all brands,
shaded areas indicate SKUs for search task

Figure 20: Planogram 2 for Shampoo

Also it could only be one SKU per row and per column because otherwise it would not be possible to transpose the individual columns around the marked SKUs due to overlaps.

Another step is taken to handicap horizontal search behavior. In planogram 1 the letters a-f are not used consistently, whenever a brand was used with an attribute that does not fit with the rest of the shelf, it is indicated with an x; for example, the last SKU in the first column is not 1f, but instead it is 1x in planogram 1 in Figure 19, hence the brand of the product is the same in the column, but its attribute is different compared to the remaining products in the row. The same is true for planogram 2, but in this case attributes are held constant but occasionally inconsistent brands are used and they are indicated with a 0 instead of the regular numbers 1-6. So if there are in fact significant differences to be found between the two planograms it is reasonable to assume that the vertical arrangement of brand/attribute works better than the other way around and not the horizontal arrangement because that is not consistent and therefore harder to grasp.

4.3 Compilation of the Stimulus Material

After designing all planograms, the actual stimulus material has to be composed.

The shelves are arranged according to the planograms described in the previous sections and then high quality digital pictures are taken. These pictures are then used for the stimulus material. Overall, there are 18 different pictures; four categories varied for four groups each and for shampoo there are only two variations. The pictures of the stimulus material can be found in the appendix on page 111ff.

4.4 Eye-Tracking

Some of the studies which have been previously discussed also made use of an eye-tracker for data collection purposes. Berger and colleagues (2012, p. 411) state that "eye tracking is a popular method to measure visual attention in scientific studies".

Visual attention can be measured using an eye-tracker, which records the eye movements of respondents and which areas have been looked at and for how long. It is well established in the literature that eye-movements are a proxy for visual attention; Jost et al. (2005, p. 107) state that "human eye movements are

tightly coupled to visual attention". It is also supported by Parkhurst et al. (2002, p. 108) who base their study on the postulation that "eye movements and attention are associated". Another study develops the connection even further and discovered that "WM [working memory] and attention closely interact" (Mayer, Kim, & Park, 2011, p. 864); hence attended objects are very likely to have been cognitively processed as well.

Before describing the equipment employed in this study, it is important to understand how the human eye works and how this makes it possible to closely track its activities.

4.4.1 The Eye

While people think that they see their whole environment in high resolution, this belief is actually not true. "Rather than having high-resolution processing at all locations, the best resolution is confined to the fovea, with massive losses in acuity occurring only a few degrees into the periphery." (Wolfe & Horowitz, 2004, p. 1) Therefore it is necessary to look directly at the location of interest in order to be able to see it accurately.

There are two basic tasks the eye performs, namely fixations and saccades. "Saccades are quick jumps from location to location during which vision is essentially suppressed […]. Fixations are pauses between saccades during which the eye is relatively immobile, and during which the visual system gathers information. The duration of fixations is variable, ranging from 50 milliseconds to over a second." (Pieters & Warlop, 1999, p. 2) But the minimal duration of 50 ms is controversial; for example, Parkhurst et al. (2002, p. 112) only count fixations with a "duration greater than 100 ms".

4.4.2 The Equipment

The eye-tracker used for this study is the SMI RED system. RED stands for Remote Eye-Tracking Device produced by the company Sensomotoric Vision (SMI). It records data with a sampling frequency of 120 Hz, which means that data points are recorded 120 times per second. The monitor is a 22 inch screen, which is placed about 70 cm away from the respondents.

The equipment illuminates the eyes of the respondent with infrared rays and records the reflections from the pupils and the corneas. Based on this information,

it can compute what both eyes are looking at on the screen. In combination with the information of the stimulus material presented on the screen, the eye-tracker records what the respondents are attending to.

Since the RED eye-tracker is binocular and it also tracks both the pupil and the corneal reflection, it can "compensate for smaller head movements" (Holmqvist, Nyström, Andersson, Dewhurst, Jarodzka, & van de Weijer, 2011, p. 25). It is also a system which is "easy to calibrate" (Morimoto & Mimica, 2005, p. 5). "During calibration, the distance and the angle between the infrared reflection and the center of the pupil can be measured while the subject looks at a grid of nine predefined areas." (Janiszewski, 1998, p. 295) Five of the points are used for calibration and the four last points are used to validate the accuracy of the measurement. The deviation between recorded location and expected location during validation is measured in degrees for the x- and y-values. Calibration can be repeated if the accuracy values are not satisfying, but if results do not improve after two rounds of calibration, the problem at hand is most likely an underlying issue like non-compatible contact lenses or glasses and cannot be corrected. Hence, eye-tracking data of respondents with faulty calibration values are not included in the analysis. For more details about the present study, please refer to section 5.1 on page 61.

4.5 Design of the Questionnaire

Following the eye-tracking experiment, the respondents have to fill in a questionnaire. Certain information is necessary in order to test all hypotheses. The questionnaire consists of multiple parts. For an overview of the questionnaire for this study see Table 9. The complete questionnaire (in German) can be found in the Appendix on page 118 and following.

page 1	data collection during the Eye-tracking experiment
page 2	welcome text
page 3	product choice
page 4	product usage frequency
pages 5-9	questions about product categories
page 10	questions about products seen on the shelf
page 11	demographic information

Table 9: Overview of the Questionnaire

First, all necessary information obtained during the eye-tracking experiment needs to be collected. That includes the ID of the respondent, the stimulus group and which SKUs were considered in each category. It is also recorded which shampoo

brand is searched for in the first and second search task. On the first page[8] (page 118f in the Appendix), there is also a field for comments in case something is noteworthy, as, for example, if the respondent is wearing glasses. This page is filled in by the researcher and is therefore not seen by the respondents. Hence, the questions are not numbered so that the first question answered by the respondents starts with the number 1. After the eye-tracking experiment, it is the respondent's turn to complete the rest of the survey; thus, a short introductory text follows on page 2.

The questions on product choice are the first questions answered by the respondent concerning this study[9]. This page of the questionnaire adapts to the information entered during the eye-tracking experiment concerning the consideration set of the respondent. So, each respondent gets to pick their final choice for each product category exactly out of those items he named during the eye-tracking experiment. However, there are two exceptions: if the respondent did not name any considered SKUs for a specific category, he is not asked for a final choice, since he already indicated a lack of interest in this category. Also, if only one product is entered into the consideration set, the respondent does not have to confirm that this is indeed also his final choice, but instead it is automatically counted as such. Once the question asking for a choice does appear, it has to be answered in order to continue to the next page.

The answers to question 13 on page 4 determine which of the subsequent questions will appear: respondents indicated their product usage frequency and for all categories where they stated *none*, the questions concerning the respective category are skipped. This is motivated by the type of questions that follow; if they do not use products from a certain category, they will not be able to answer the questions concerning their shopping behavior for this category.

The structure of the following pages is very similar across categories; about all five product categories the respondents are asked a certain set of questions: Whether they always buy the same product or prefer to try something different (7-point scale) in order to determine their variety seeking behavior, and whether price or

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[8] Page numbers refer to the information given in Table 9.
[9] However, they are preceded by a few questions relating to the study of Ms. Pröll due to a joint data collection effort, hence the questions on product choice start with number 9 rather than 1.

brand is more important to them (7-point Likert Scale) to establish their level of price sensitivity. This scale is also used by Chandon et al. (2009).

While those two questions are asked about each category, the third one differs, depending on the assortment in the respective shelf. For the product categories that consist of different brands and different flavors/attributes (i.e., tea, chips, shampoo), a question was asked to determine the importance of brand and flavor/attribute when purchasing a product in that category (two 7-point scales ranging from *not at all important* to *very important;* compare, e.g., question 14 for tea on page 122). For the product categories beer and cereals, questions about brand familiarity were asked instead. Since the shelves showed either different brands or different flavors, but not both, respondents were not asked to think about brand vs. flavor issues for these categories. The question about *brand familiarity* listed all SKUs depicted in the shelf and asked the respondents to decide to what extent they know the brands or flavors. The possible answer options were *don't know*, *known by name* and *known by taste.* These levels of brand familiarity are based on the findings of Alba et al. (1991).

As a result, there were three questions for each product category, but not all respondents answered these questions. First of all, individual questions could be skipped, there was no forced choice for these questions, and secondly, those respondents who indicated no product usage did not see the corresponding questions at all.

Questions 29 and 30 asked about the products seen on the shelf. On the one hand, the respondents had to indicate if they saw the product on the shelf, which they buy most often. This question was asked for all five product categories and the answer options were *yes*, *no* or *don't know*. The *don't-know* option was reasonable for instances where respondents did not feel they had seen all products on the shelf or in cases where they do not have a product, which they could classify as *most often bought*, either because they do not purchase in this category at all, or because various products are bought similarly often. On the other hand, the respondents were asked if they remembered seeing a product that was reduced in price. Again, possible answers were *yes*, *no* or *don't know*. And a follow-up question, when *yes* was chosen, asked to tick the box of the respective product category. Although chips is the only category where a price reduction is

indicated by the additional signs placed at the shelves (and then only for two of the four groups), it is possible to choose as many categories as seemed appropriate to avoid guessing behavior.

On the last page, questions 36-41, the respondents had to give some information about themselves: gender, age, education, income, whether they do most of the shopping in the household and in which stores they actually do their shopping (they indicated stores from a list). At the end they had the possibility to leave a message if they wanted to add something and then they were thanked for their participation.

4.6 Measurement

This section gives a description of the variables used to test the hypotheses, how they are measured and which way they are coded.

4.6.1 Dependent Variables

Based on the hypotheses, there are four dependent variables; a group of hypotheses test the effects of changes in the shelf layout on *attention*, *consideration* and *choice* and a smaller group of hypotheses inquire the results of shelf arrangement on consumers' *search duration* for a product.

Search duration is measured in seconds[10] from the time the stimulus material appears on screen until the product is found. Information about consideration and choice is extracted from the data in the questionnaire and coded as a binary variable for the individual respondents (i.e., for every SKU there are two yes/no variables indicating whether the product has been *considered* and *chosen*). But consideration and choice are also aggregated within each of the four groups and coded as a percentage of respondents who *considered* and *chose* the product. Obviously, every chosen product is also in the consideration set.

Since the measurement of attention is the central aspect of this thesis, attention is measured using multiple variables. A very basic concept of attention is the indication of whether a respondent saw the product at all, which is referred to as *noted* and a second variable, *revisited*, denominates when a respondent has

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[10] The numbers are reported in seconds, although the eye-tracker actually reports the data with a precision of tenths of milliseconds.

looked at a product at least twice. These variables have been used by Chandon et al. (2009) previously, yet it is argued that binary variables such as these are only poor representations of attention and thus the following variables are introduced as well: namely, the *# of fixations*, which states the exact number of fixations of a respondent on a specific SKU. Since fixations can be of various length, the next two variables sum up the total amount of time spent looking at an SKU, namely *FD in s* (fixation duration in seconds) giving the absolute duration and *FD in %* putting the fixation time in relation to total viewing time of the stimulus, since this can also vary greatly across respondents. An overview of the dependent variables used in the present study can be found in Table 10.

dependent variable	description
SD	search duration it took to find the designated SKU
considered	inclusion in the consideration set
chosen	chosen SKU
noted	SKU attended to at least once
revisited	SKU attended to at least twice
# of fixations	number of times the SKU has been looked at
FD in s	duration the SKU has been looked at in seconds
FD in %	duration the SKU has been looked at in relation to total time spent looking at the shelf

Table 10: Overview of the Dependent Variables

Principally, the variables *noted*, *revisited*, *considered* and *chosen* are binary variables, but they also appear in aggregated form for a specific SKU rather than for every respondent separately. In this case, they represent the proportion of people who *noted*, *revisited*, *considered* and/or *chose* a certain SKU out of the whole group (e.g., 75% for *noted*, when 15 out of 20 respondents, who saw the stimulus, noted this particular SKU). The remaining three attention variables are metric either way.

4.6.2 Independent Variables

The independent variables are to a large extent derived from the stimulus material and the accompanied manipulations, but some variables have to be extracted from the questionnaire.

4.6.2.1 Stimulus Material

Vertical Location

The vertical location of SKUs is defined in two different ways. On the one hand, for a pairwise comparison, it is simply discriminated whether they can be clearly assigned to either the top or lower half of the shelf, or whether they are placed in the middle and cannot be allocated to either half. This is the case for the one middle shelf board for both the category cereals and beer, but also for tea in case an SKU is placed on both the fourth and fifth shelf board, which can be found between the horizontal lines in Figure 21. Figure 21 shows a schematic representation of planogram 1 of the tea shelf (cf. Figure 5) and the blocks represent the areas in the shelf filled by different SKUs, those with red shading are attributed to the top half of the shelf and the green shading represents an affiliation to the lower half of the shelf, the three SKUs without shading are those which cannot be attributed to either half since they are placed on shelf boards that belong to both halves.
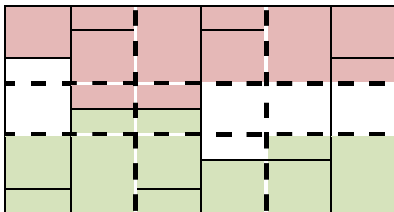
Figure 21: Vertical Measurement at the Tea Shelf

This classification is needed in order to test H1· about the vertical effects of location, since planogram 3 (cf. Figure 8 on page 39) is the horizontally mirrored equivalent of planogram 1 and thus the SKUs clearly attributed to the top half belong to the bottom half in the other planogram and can be directly compared.

The other categorization of location takes the horizontal position into account as well. The horizontal and vertical lines in Figure 21 indicate 9 different areas of the shelf (i.e., top-left, top-middle, top-right, center-left, and so on). These areas are represented by nine binary variables, which show whether an SKU is placed in this field or not. Since SKUs can be placed in multiple areas, they are not mutually exclusive and they are coded as to belong to all relevant locations. These variables will be used to control for the effects of location when analyzing the hypothesis concerning the results of the number of facings.
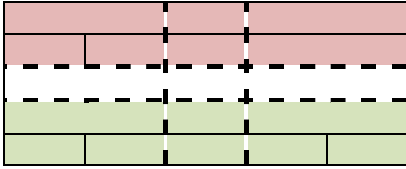
Figure 22: Vertical Measurement at the Cereals Shelf

The same procedure is repeated for the SKUs in the Cereals Shelf (Figure 22 based on planogram 2 in Figure 11) and the Beer Shelf (Figure 23 based on planogram 1 in Figure 14).
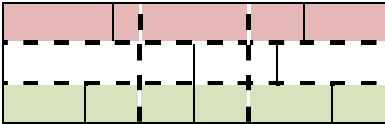
Figure 23: Vertical Measurement at the Beer Shelf

For tea, there are 20 SKUs relevant for the analysis of vertical effects, 10 SKUs for cereals and 8 for beer, hence overall 38 SKUs can be incorporated in the analysis.

Horizontal Location

Similar to the measurement procedure for the vertical location in the shelf, the horizontal position is measured in two ways as well. The colored shading in Figure 24 (based on planogram 2 in Figure 7) and following indicates that an SKU can be clearly attributed to either the left or the right half of the shelf, while the SKUs without shading are at least partly placed in the middle.
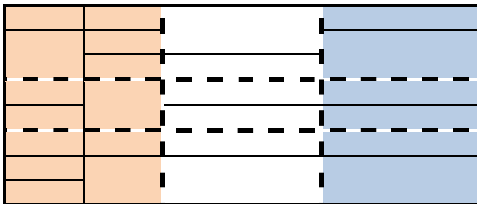
Figure 24: Horizontal Measurement at the Tea Shelf

For tea, there are 18 SKUs relevant to the analysis, 7 for cereals and 10 for beer, in sum 35 SKUs.
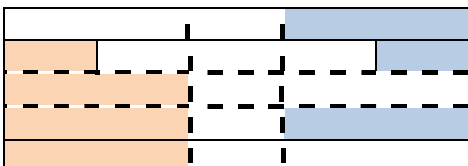
Figure 25: Horizontal Measurement at the Cereals Shelf
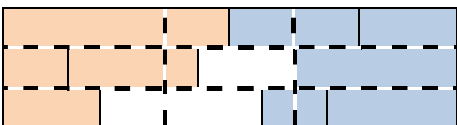
Figure 26: Horizontal Measurement at the Beer Shelf

The vertical and horizontal lines indicate again the assignment of the SKUs to the 9 different location variables. If an SKU is present in two locations, this is also indicated in the variable coding.

Saliency

For the present study, saliency is defined as a binary variable, distinguishing the five most prominent areas per shelf from the rest. The approach of using five areas is used by Jost et al. (2005) in their analysis of effects of color on saliency.

The five most salient regions on the stimulus material are calculated using software provided by Walther and Koch (2006), which identifies the order of the most salient locations in a picture. Since the areas indicated by the software do not necessarily match the locations occupied by the different SKUs, it is possible that more than 5 SKUs are indicated as being salient, while on the other hand, different areas of the same SKU can be included in the list twice as well, leaving only 4 salient SKUs for some stimuli. As can be seen in Table 11, overall there are 55 salient SKUs, which can be compared to the remaining 137 SKUs, which are not salient.

planogram	1	2	3	4	Σ
tea	4	5	5	5	19
cereals	4	5	4	5	18
beer	4	4	5	5	18

Table 11: Number of salient SKUs per planogram

Signage

The necessary measurement for the signage hypotheses is straightforward. The only manipulations are the differences between the groups and they are compared to determine if there are any effects of the additional signs.

Facings

The variable *facings* is a simple reproduction of the actual number of facings an SKU receives in the corresponding shelf. For tea, this can vary from 2 to 8 facings, cereals receive from 1 to 3 facings and, for beer, numbers fluctuate from 2 to 5 facings.

But since the number of facings and the size of the different products vary greatly across categories, the combined analysis relies on a variable called *SKU space*

instead. This variable measures the size of the screen that a certain SKU covers with all its facings.

Arrangement

The arrangement of the shelf is, like the signage manipulation, a basic group comparison. There are two different shelf designs for shampoo and the different results are compared. Additionally, H7 analyzes the search duration depending on the horizontal location of the SKUs; since four different SKUs are used for the search task, they are labeled from 2 to 5 starting with the SKU placed the furthest on the left side, based on the numbers of the brands in the planograms in Figure 19f.

4.6.2.2 Consumer Characteristics

Some of the hypotheses established an influence of certain consumer characteristics. This can either be a moderating effect as is the case of price sensitivity on vertical location or variety seeking behavior on the effects of saliency, but it can also be an interaction effect of consumer focus on preferred arrangement of the supermarket shelf.

Data to determine these variables are collected in the questionnaire.

Price Sensitivity

For each analyzed product category, respondents had to indicate on a 7-point scale whether brand or price is more important to them when purchasing products from the respective category. Those respondents, who ticked boxes 6 or 7 and thereby reporting that price is much more important than brand, are considered to be *price sensitive*. Participants, who answered with either number from 1 to 5 are labeled *not price sensitive*. This split rather than a median split is used because it was also employed by Chandon et al. (2009), where this scale is taken from.

Variety Seeking Behavior (VSB)

Variety seekers are defined based on questions from the questionnaire. For each product category, the respondents had to state on a 7-point scale, whether they are always buying the same product (end point 1) or whether they like to try something new (end point 7). Those respondents who chose either 6 or 7 are characterized as variety seekers.

Brand/Attribute Focus

Hypothesis 8i states that there could be an interacting effect of the consumers'
focus on ease of orientation at the supermarket shelf. In the questionnaire
(question 26 on page 125), respondents had to indicate how important brand and
attribute is for them when purchasing shampoo in two separate questions. Both
used a 7-point scale ranging from *not at all important* (1) to *very important* (7).
Those respondents who score higher on the brand question are labeled brand-
focused and those scoring higher on the attribute question as attribute-focused. In
case of a tie or incomplete answers, the respondents are excluded from this
analysis.

4.7 Summary

Table 13 presents an overview of the hypotheses and indicates which product
categories are used to test the relationships. The blue shading indicates the
hypotheses which are tested in experiment 1, analyzing location, facings and
saliency. Purple shading marks experiment 2, exploring the effects of additional
signs for which only the chips shelf will be used. Green shading concerns
experiment 3 focusing on the shampoo shelf, with which the consequence of the
overall arrangement on search duration is measured.

Table 12 gives an overview of the order of the stimulus material and its
assignment to the four groups.

experiment		group 1	group 2	group 3	group 4
exp. 1	tea	planogram 1	planogram 2	planogram 3	planogram 4
	cereals	planogram 2	planogram 4	planogram 3	planogram 1
exp. 2	chips	control group	Monatssparer	Tipp	Aktion
exp. 1	beer	planogram 1	planogram 2	planogram 3	planogram 4
exp. 3	shampoo	both planograms			

Table 12: Stimulus Material assigned to the Experimental Groups

Hypotheses		tea	cereals	chips	beer	shampoo

H1·	SKUs on the upper shelf boards …
	    a) receive more attention …
	    b) are considered more often …
	    c) are chosen more often …
	… than SKUs on the lower shelf boards.
		O	O	X	O	X

H1·m	Price-sensitive customers …
	    a) pay more attention to …
	    b) are more likely to consider …
	    c) are more likely to choose …
	… SKUs on the bottom shelves than other customers.
		O	O	X	O	X

H2·	SKUs on the left half of the shelf …
	    a) receive more attention ...
	    b) are considered more often ...
	    c) are chosen more often ...
	… than SKUs on the right half.
		O	O	X	O	X

H3·	Salient SKUs …
	    a) receive more attention …
	    b) are more likely to be considered …
	    c) are more likely to be chosen …
	… than non-salient SKUs.
		O	O	X	O	X

H3·m	Variety Seekers …
	    a) pay more attention to …
	    b) are more likely to consider …
	    c) are more likely to choose …
	… salient SKUs compared to other customers.
		O	O	X	O	X

H4·	Promoted SKUs with a price cut …
	    a) receive more attention ...
	    b) are more likely to be considered ...
	    c) are more likely to be chosen ...
	… than SKUs without promotion.
		X	X	O	X	X

Hypotheses		tea	cereals	chips	beer	shampoo

H5·	Promoted SKUs without a price cut …
	  a) receive more attention ...
	  b) are more likely to be considered ...
	  c) are more likely to be chosen ...
	 … than SKUs without promotion.
		X	X	O	X	X

H6·	SKUs with more facings …
	  a) receive more attention ...
	  b) are considered more often ...
	  c) are chosen more often ...
	 … than SKUs with fewer facings.
		O	O	X	O	X

H7	The search duration for SKUs on the left is shorter than for SKUs on the right.	X	X	X	X	O
H8	Vertical arrangement by brands will shorten search duration.	X	X	X	X	O
H8id	Vertical arrangement by brands will shorten search duration for brand-focused customers.	X	X	X	X	O
H8ie	Vertical arrangement by attributes will shorten search duration for attribute-focused customers	X	X	X	X	O

O … product category is used to test hypothesis; **X** … product category is not used

Table 13: Summary of the Hypotheses and the Product Categories

5   Data Collection

For data collection purposes, the present study was combined with another study conducted by a fellow master student. Data collection took place between July 9th and 24th 2012, Monday through Friday. The first 21 respondents came to the BWZ to participate in the study. From July 12th onwards, the study took place in a room of the Sprachenzentrum at the Campus of the University. A convenience sample was employed but it is not a student sample as can be seen in the description of the sample in chapter 6.1.

Respondents could only participate individually; therefore we offered the option to reserve a timeslot to avoid waiting times. In case we did not expect a participant for the following timeslot, we tried to recruit people, who spent time at the Campus at said time, to participate spontaneously. As an incentive, every participant was entered into a drawing for one of 10 gift coupons worth 20 € for either Amazon or a language course at the Sprachenzentrum of the University of Vienna. The participants who won could choose themselves which coupon they wanted to receive. 9 winners opted for the Amazon gift certificate and one decided to take a language course.

5.1   The Study

Once a participant had agreed to take part in the study, the person entered the room and was told to take a seat in front of the eye-tracking monitor. Participants were asked to sit centrally in front of the screen to make sure they could see everything properly. Unless they asked specifically about it, the fact that their eyes were tracked was not mentioned until the debriefing. Sometimes, participants needed to adjust their seating position in order for the eye-tracker to work properly.

As soon as the participants reached a suitable seating position which was also comfortable, they were asked to keep their head as steady as possible and only move their eyes to look at different parts of the screen. In the beginning of the experiment they had to follow a dot on the screen for calibration purposes. Five locations of the dot were used for calibration and four more locations for validation, to make sure the eye-tracker could anticipate the fixation location properly. As a cut-off value a deviation of 1° either on the x- or y-axis was employed. Morimoto and Mimica (2005, p. 21) state that accuracy below one degree of deviation is

"very good" and therefore this is used as a cut-off value during calibration. If either x- or y-values of a respondent is higher than one degree, the eye-tracking data are discarded.

While section 4.1 describes only the sequence of the experiment relevant to this study, the actual data collection included other elements as well and is thus described here, too. The first part of the study served as a distraction for those participants who had discovered that their eye movements were being recorded. Every participant had to look at five different advertisements. Individually, they could choose how long they wanted to look at the pictures and jump to the next one using the space bar at their own pace.

Afterwards, the pictures of the shelves followed. Every participant saw the shelves in the same order, namely boxed tea at first, followed by cereals, then bagged chips and at last the shelf with beer. But which one of the four planogram groups they saw was determined by chance. Numbers 1 to 4 indicating group membership were drawn randomly from an urn for each participant. To ensure that the sample size in each group was the same, tickets were only returned to the urn once every number had been selected. There were also separate urns for male and female participants to guarantee the same proportions of male to female participants in each group. Thus, after four female participants every group of stimulus material has been used once, but the order was determined randomly by drawing the tickets from the urn.

Before the participants saw the picture of the shelf, they received instructions. They were told to look at the shelves and, while browsing, name those products that they might consider buying. They could mention as many products as they liked per category. However, respondents were not forced to consider any products; if a product category was not interesting for them, they could skip the corresponding shelf.

They were also informed that once they had seen the shelf for long enough they could skip to the next one with the space bar. In order to see each shelf, they had to stare at a cross located in the center of the screen for 800 ms. This was also used by Milosavljevic et al. (2012) to ensure that all participants started their search process from the same spot of the screen.

As was already mentioned, all named products were recorded by the researchers in the online questionnaire and out of those products, the respondents made their final choice. This procedure was employed for all four supermarket shelves.

Afterwards, they had to perform the two search tasks. First they were shown the picture of the two facings of a shampoo SKU, the same way as it was pictured in the shelf following the memorization, and once they had remembered it properly, they could switch to the shelf and start searching for it. They indicated their finding with a mouse click on the SKU, which brought them to the next picture of shampoo bottles, which they had to find again, but this time the shelf was arranged differently.

Namely, for groups 1 and 2, the first shelf was arranged vertically by brand and group 1 had to search for the bottle of Brand 3 first and in the second shelf for the bottle of Brand 5. The numbers refer to the same brands shown in Figure 19 and Figure 20. Group 2 saw the shelves in the same order but had to search for the brands in reversed order. Group 3 and 4 saw the shelf first which was arranged by attributes and group 3 had to search for Brand 4 in the first exercise and Brand 2 in the second. Group 4 was again given the search tasks on the same shelfs but in the opposite order. Table 14 summarized the presented stimuli for the four groups.

	Group	1	2	3	4
Task 1	picture of Shampoo SKU they had to find	Brand 3	Brand 5	Brand 4	Brand 2
	shelf is vertically arranged by …	brand		attribute	
Task 2	picture of Shampoo SKU they had to find	Brand 5	Brand 3	Brand 2	Brand 4
	shelf is vertically arranged by …	attribute		brand	

Table 14: Order of Stimulus Material during the Search Tasks

The last part of the experiment was the stimulus material for the study of Daniela Pröll, which she collected for her Master thesis. The participants had to look at the single-page leaflet of a furniture store to help her discover whether special prices receive more attention and are therefore more often recalled than ordinary prices (Pröll, 2013). Since no results will be presented here, no further details will be given. The questionnaires were also combined and this serves as an explanation, why the questions presented in the appendix are not consecutively numbered, since her questions are not included in the Appendix.

After the eye-tracking experiment, participants were asked to fill in the questionnaire. The questionnaire was administered with the help of an online tool (www.soscisurvey.de), since answers from the eye-tracking experiment had to be integrated into the questionnaire, rendering a paper questionnaire futile. As was already mentioned, the considered products were entered into the questionnaire in order for the respondents to be able to make their final choice. After the eye-tracking experiment, the laptop was passed on to the participants and they could fill in the remainder of the questionnaire at their own pace. At least one of the researchers stayed in the room with the respondents to answer questions which arose every once in a while.

In the end, the participants could enter their name and e-mail address in a separate list to participate in the drawing for the gift certificates. They were informed about the purpose of the study and that their eye movements had been recorded. They signed the list acknowledging that they had been informed about the intent of the study and that they would let us use their eye-tracking data for our analysis.

5.2 Compilation of the Data

The data is merged from the two different sources; on the one hand, data needs to be extracted from the eye-tracker and on the other hand, every respondent answered a questionnaire.

Four different SPSS files were compiled. The data was split for the three experiments. Since experiment three about the search duration is treated differently throughout the study, it is also analyzed separately. Experiment two about the effects of signage is also a self-contained file. The other two SPSS files concentrate on experiment one and the remaining three product categories. One data sheet is a summary of the eye-tracking data with some general information from the questionnaires: it is indicated how often and how long respondents looked at the different SKUs and how often they were considered and chosen on average. See Figure 28 for an overview.

The file consists of 192 lines of data, because there are 48 SKUs per group (24 SKUs for tea, 12 SKUs for cereals and 12 SKU for beer) times four groups. The SKUs are listed four times because they are attributed with the different

manipulations of each group; that is, their vertical and horizontal position as well as the number of facings and whether or not they are salient is recorded.

The last SPSS sheet gives information about the individual respondents. It can be found in Figure 27. Every respondent has 48 lines of data (every respondent could have seen the 48 SKUs of one group), where it is recorded how often and how long they looked at each SKU and whether they considered and chose it. Again, this information is combined with the data extracted from the questionnaire, making, for example, a connection between variety seeking behavior and attention possible. In order to avoid confusion about which of the two data sets is used for an analysis, the letter "n" denoting the sample size will be replaced with "m" in instances where the analysis is based on the respondent file, depicted in Figure 27.

Figure 27: Screenshot of SPSS Sheet for Respondents in Experiment 1

	Nummer	respondent	SKU	planogramm	prod_	Marke	Sorte	Salienz	vertikal2	facings	noted	revisited	numbrFixations	FixTimeS	AnteilFixation	consideration	choice
1	34	1	1	vertikal1	tea	Milford	Schwarztee	not salient	top	4	noted	seen at least twice	9,00	1,70	2,80	not considered	not chosen
2	93	2	1	vertikal1	tea	Milford	Schwarztee	not salient	top	4	noted	seen at least twice	2,00	,18	,60	not considered	not chosen
3	154	3	1	vertikal1	tea	Milford	Schwarztee	not salient	top	4	noted	seen max once	1,00	,32	1,00	not considered	not chosen
4	213	4	1	vertikal1	tea	Milford	Schwarztee	not salient	top	4	noted	seen at least twice	2,00	,61	2,70	not considered	not chosen
5	273	5	1	vertikal1	tea	Milford	Schwarztee	not salient	top	4	noted	seen at least twice	2,00	,65	1,50	not considered	not chosen
6	334	6	1	vertikal1	tea	Milford	Schwarztee	not salient	top	4	noted	seen at least twice	4,00	1,18	2,20	not considered	not chosen
7	393	7	1	vertikal1	tea	Milford	Schwarztee	not salient	top	4	ignored	seen max once	,0	,0	,0	not considered	not chosen
8	453	8	1	vertikal1	tea	Milford	Schwarztee	not salient	top	4	ignored	seen max once	,0	,0	,0	not considered	not chosen
9	514	9	1	vertikal1	tea	Milford	Schwarztee	not salient	top	4	noted	seen at least twice	2,00	,54	4,00	not considered	not chosen
10	574	10	1	vertikal1	tea	Milford	Schwarztee	not salient	top	4	noted	seen at least twice	9,00	3,27	7,30	considered	not chosen
11	633	11	1	vertikal1	tea	Milford	Schwarztee	not salient	top	4	noted	seen at least twice	17,00	4,98	3,90	considered	not chosen
12	694	12	1	vertikal1	tea	Milford	Schwarztee	not salient	top	4	noted	seen at least twice	38,00	5,16	6,80	considered	not chosen
13	754	13	1	vertikal1	tea	Milford	Schwarztee	not salient	top	4	noted	seen at least twice	2,00	,30	,90	not considered	not chosen
14	814	14	1	vertikal1	tea	Milford	Schwarztee	not salient	top	4	noted	seen at least twice	2,00	,64	2,30	not considered	not chosen
15	874	15	1	vertikal1	tea	Milford	Schwarztee	not salient	top	4	noted	seen at least twice	2,00	,44	1,00	not considered	not chosen
16	933	16	1	vertikal1	tea	Milford	Schwarztee	not salient	top	4	ignored	seen max once	,0	,0	,0	not considered	not chosen
17	993	17	1	vertikal1	tea	Milford	Schwarztee	not salient	top	4	noted	seen at least twice	2,00	,63	1,00	not considered	not chosen
18	1054	18	1	vertikal1	tea	Milford	Schwarztee	not salient	top	4	noted	seen at least twice	8,00	2,19	4,10	considered	not chosen
19	1113	19	1	vertikal1	tea	Milford	Schwarztee	not salient	top	4	noted	seen at least twice	3,00	,64	2,00	not considered	not chosen
20	1173	20	1	vertikal1	tea	Milford	Schwarztee	not salient	top	4	noted	seen at least twice	4,00	,86	1,70	not considered	not chosen
21	1234	21	1	vertikal1	tea	Milford	Schwarztee	not salient	top	4	noted	seen at least twice	9,00	1,61	5,20	considered	chosen
22	1294	22	1	vertikal1	tea	Milford	Schwarztee	not salient	top	4	noted	seen at least twice	3,00	,98	2,70	not considered	not chosen
23	5433	91	1	vertikal1	tea	Milford	Schwarztee	not salient	top	4	not avail...	not available	not av...	--	not a...	not considered	not chosen
24	5653	93	1	vertikal1	tea	Milford	Schwarztee	not salient	top	4	not avail...	not available	not av...	--	not a...	not considered	not chosen

Datenansicht | Variablenansicht

Figure 27: Screenshot of SPSS Sheet for Respondents in Experiment 1

SKU	planogramm sosrtient	prod...	Marke	Sorte							vertikal2	Salienz	facings	Hitcount	Revisited Anteil	numbFix ations	FixTim...	AnteilFixati...	considerat ionAnteil	choiceAnt eil
1	vertikal1	tea	Milford	Schwarztee	1	0	0	0	0	0	top	not salient	4	86,40	63,64	6	1,22	2,40	18,52	3,70
2	vertikal1	tea	Twinnings	Schwarztee	0	0	0	1	0	0	bottom	salient	2	86,40	81,82	4	1,22	3,60	25,93	7,41
3	vertikal1	tea	Twinnings	Schwarztee	1	0	0	0	0	0	top	salient	2	59,10	31,82	2	,41	1,00	29,63	14,81
4	vertikal1	tea	Teekanne	Schwarztee	0	1	0	0	0	0	top	not salient	2	77,30	50,00	3	,66	1,60	25,93	14,81
5	vertikal1	tea	Spar	Schwarztee	0	0	1	0	0	0	top	not salient	6	95,50	81,82	7	1,74	4,10	7,41	,0
6	vertikal1	tea	Spar Bio	Schwarztee	0	0	1	0	0	0	top	not salient	4	59,10	27,27	3	,63	1,50	14,81	3,70
7	vertikal1	tea	Milford	Grüntee	1	0	0	0	0	0	middle	not salient	6	100,00	86,36	7	2,02	4,30	7,41	,0
8	vertikal1	tea	Twinnings	Grüntee	1	0	0	0	0	0	top	not salient	6	100,00	90,91	8	2,12	4,80	29,63	3,70
9	vertikal1	tea	Willi Dungl	Grüntee	0	0	0	0	0	0	top	not salient	2	86,40	59,09	3	,99	2,50	25,93	3,70
10	vertikal1	tea	Teekanne	Grüntee	0	1	0	0	0	0	top	salient	4	95,50	77,27	6	1,59	4,00	11,11	,0
11	vertikal1	tea	Spar	Grüntee	0	0	0	0	1	0	middle	not salient	4	95,50	63,64	5	1,76	3,80	7,41	,0
12	vertikal1	tea	Spar Bio	Grüntee	0	0	1	0	0	0	top	not salient	2	59,10	36,36	2	,66	1,80	11,11	,0
13	vertikal1	tea	Milford	Kräutertee	0	0	0	1	0	0	bottom	not salient	4	81,80	59,09	4	1,36	2,50	7,41	,0
14	vertikal1	tea	Willi Dungl	Kräutertee	0	0	0	0	1	0	bottom	not salient	6	95,50	86,36	7	2,19	5,20	22,22	3,70
15	vertikal1	tea	Willi Dungl	Kräutertee	0	1	0	0	0	0	top	not salient	6	86,40	81,82	7	1,67	3,80	14,81	3,70
16	vertikal1	tea	Teekanne	Kräutertee	0	0	0	0	1	0	middle	not salient	6	100,00	100,00	8	2,58	6,10	18,52	,0
17	vertikal1	tea	Spar	Kräutertee	0	0	0	0	0	0	bottom	not salient	2	68,20	40,91	2	,63	1,30	7,41	,0
18	vertikal1	tea	Spar Bio	Kräutertee	0	0	0	0	0	1	middle	not salient	4	90,90	72,73	5	1,53	3,50	25,93	,0
19	vertikal1	tea	Milford	Früchtetee	0	0	0	0	0	0	bottom	not salient	2	50,00	31,82	2	,49	1,00	14,81	3,70
20	vertikal1	tea	Twinnings	Früchtetee	0	0	0	0	1	0	bottom	salient	6	95,50	72,73	6	1,45	3,40	11,11	,0
21	vertikal1	tea	Willi Dungl	Früchtetee	0	0	0	0	0	1	bottom	not salient	2	54,50	31,82	1	,33	,90	22,22	14,81
22	vertikal1	tea	Teekanne	Früchtetee	0	0	0	0	0	1	bottom	not salient	4	86,40	63,64	3	,79	1,90	7,41	3,70
23	vertikal1	tea	Spar	Früchtetee	0	0	0	0	0	0	bottom	not salient	4	77,30	54,55	3	,74	1,80	7,41	3,70
24	vertikal1	tea	Spar Bio	Früchtetee	0	0	0	0	0	1	bottom	not salient	6	81,80	68,18	4	1,16	2,60	11,11	7,41

Datenansicht Variablenansicht

Figure 28: Screenshot of SPSS Sheet for SKUs in Experiment 1

67

6   Results

Before the hypotheses are tested, a more general picture about the data is given in the next sections. At first, a short description of the sample is offered followed by a descriptive section of the items from the questionnaire. Afterwards, the results of the 4 groups are compared to test whether there are any underlying differences between the groups which might distort the results of the experiment.

6.1   The Sample

The sample consists of 101 respondents. Everyone participated in the eye-tracking experiment and filled in the questionnaire afterwards. Due to missing values in the questionnaire or technical difficulties during the eye-tracking, for some analyses only a reduced sample could be used. For example, only the eye-tracking data of 88 respondents are usable for the analysis because for the remaining participants the calibration values were unsatisfactory.

57 % of the sample is female. The average age is 29 and age ranges from 16 to 65. 54 % have obtained a degree at a university, another 31 % have completed secondary education (i.e., the Austrian Matura or a foreign equivalent). 79 % of the participants are the main shopper in their household.

96 % of the respondents do at least some of their shopping in Spar stores (including Eurospar and Interspar). 73 % respondents ranked Spar among the top three of their shopping locations for groceries. The relevance of this finding stems from the fact that some of the products in the chips and tea product range are private labels from Spar.

6.2   Descriptives from the Questionnaire

The analysis of the questionnaire gives insights about the shopping intentions of the participants and what is important for them when shopping for tea, cereals, chips, beer and shampoo.

6.2.1   Shopping Behavior

Table 15 gives an overview about the questions concerning the product categories and the corresponding shopping behavior. Lines 2-5 show the mean scores calculated from the seven-point scales and the description in the first column indicates the label of the end point 7 of the scale (e.g., the mean 6.68 for *tea* and *importance flavor/attribute* indicates that flavor is very important when purchasing

tea because of its proximity to the value 7). The exact wording of the questions can be found in the questionnaire on page 122 and following. For cereals and beer, not all questions have been asked, therefore there are missing values. The last two lines give the percentage of how many respondents fall into that category, i.e., how many out of the 101 respondents found their favorite product in the shelf and how many of them never use products from the respective categories. Obviously those last two rows are mutually exclusive, since respondents who stated that they never use a product category (last row in Table 15) cannot logically be included in the row above it (i.e., as a nonuser, they cannot have a favorite product).

(m=101) means and %	tea	cereals	chips	beer	shampoo
Importance Brand	3.62	-	3.88	-	4.87
Importance Flavor/Attribute	6.68	-	6.33	-	5.68
Importance Price (vs. Brand)	4.00	3.72	3.74	3.07	3.28
Variety Seeker (vs. always the same)	4.53	3.68	4.2	3.91	3.59
favorite product in shelf	38%	28%	43%	52%	25%
never use product category	6%	24%	21%	25%	3%

Table 15: Results of the Answers from the Survey concerning the Categories

For all three categories, flavor/attribute seems to be more important than brand and a dependent sample t-test shows for all three categories that the difference in mean of *importance brand* and *importance flavor/attribute* is statistically significant ($p<0.01$). Across all categories, the question *price vs. brand* indicates scores between 3 and 4, slightly leaning towards brand, but generally fairly undecided. The scores for the variety seeking behavior are scattered around 3.5 and 4.5. The results from those questions are needed for the analyses of the hypotheses with consumer specific information; that is the moderator hypothesis of price sensitive customers on vertical effects, the moderator hypothesis of variety seeking behavior on the effects of saliency and the interaction hypothesis linking the brand/attribute-focus of the customers to the preferred arrangement of a supermarket shelf.

The last two lines have to be regarded together. Collectively, they offer a good assessment of the product variety offered in the shelves. If a lot of respondents fall in neither of these categories, the offered product mix does not cover the preferences of the participants well. But if a lot of respondents, who are category

users, find their favorite product, the product mix should resemble the expected mix fairly well.

The beer category received the highest values for both questions, which indicates two things. On the one hand, 52% of the respondents found their preferred brand in the shelf. This is already a large percentage, but taking into account that 25% of the respondents do not drink beer, there are only 23% of respondents, who are beer drinkers but did not find their favorite beer on the shelves. This suggests that although only 12 brands were displayed, the selection matched the expectations of the respondents well, despite the fact that the beer shelf in a typical supermarket takes up a lot of space.

The numbers for chips are also both fairly high, but 36% of the respondents did not find their preferred bag of chips on the shelf. For the other product categories, the number of respondents who could not find their favorite product is higher with 56% for tea, 48% for cereals and 72% for shampoo.

6.2.2 Group Analysis

This section focuses on the four different stimuli groups in order to detect if there are any differences between the groups before the testing of the hypotheses. If there were great differences between the groups, such as one group considers a lot more SKUs on average than the other groups, this might suggest that the random allocation to groups failed to ensure homogeneity between the groups.

In order to be able to compare results across groups, individual tables for the four product categories are designed; they are all structured the same way. Information is given across all groups as well as separately for each group. The set-up of the table will be explained for Table 16 for tea. For each column, there are two different sample sizes due to the fact that the eye-tracking data of some participants could not be used; so while there is information about 101 respondents concerning their consideration behavior, for the duration spent looking at the stimulus only the data of 88 respondents could be used.

The first part of the table gives general information about the consideration behavior. It lists the percentage of respondents who have not considered a product in the respective category and how many products have been considered on average per category. The average number of considerations does not include

those respondents with zero considerations (i.e., those who are listed in the row above it per group). There is no detailed information about choice behavior because it can be extracted from the presented information. The same percentage of respondents, who did not consider any products, also did not choose a product and of those respondents who did consider any number of products the number of chosen products is always one.

An ANOVA comparing the means of the number of considered products across groups was calculated and there is a significant difference; group 1 has considered significantly more tea products than group 3 or 4.

Table 16 also gives the mean time the respondents spent looking at the stimulus material of the shelves in seconds. An ANOVA showed that there are no significant differences between the means for the tea shelves.

Additionally, the table also lists general information about the dependent variables used in experiment 1 and 2 about attention, consideration and choice. Since this information is SKU-based, yet another different sample size is indicated. How often the SKUs have been noted and revisited on average, how often and how long they have been looked at and how likely it is that an SKU is considered and chosen. Those numbers serve as a reference point for the analysis of the hypotheses.

	all groups (m=101/88)	group 1 (m=27/22)	group 2 (m=24/23)	group 3 (m=22/21)	group 4 (m=28/22)
no SKU in consideration set	16%	7%	25%	14%	18%
average number of considered SKUs	3.21	4.16	3.11	2.95	2.48
duration spent on stimulus in s	38.0	45.5	37.1	34.8	34.4
	all SKUs (n=96)	group 1 (n=24)	group 2 (n=24)	group 3 (n=24)	group 4 (n=24)
noted in %	77%	82%	78%	75%	72%
revisited in %	55%	63%	58%	49%	49%
# of fixations	3.76	4.34	3.90	3.43	3.35
FD in s	1.13	1.25	1.20	1.13	0.93
FD in %	3.12	2.89	3.28	3.32	2.98
consideration in %	11%	16%	10%	10%	8%
choice in %	3%	4%	3%	3%	3%

Table 16: General Descriptives for Tea

The same information is presented in Table 17 for the Cereals stimulus. The same tests were calculated and no statistical difference between the groups could be found. For Chips (shown in Table 18) the only difference to be found for the different durations of browsing the stimulus between group 3 and 4 ($p<0.05$) because the average duration for group 3 is really low with only 11.7 seconds compared to the others. Comparisons of the Beer stimulus (cf. Table 19) across groups reached no significant results.

	all groups (m=101/88)	group 1 (m=27/22)	group 2 (m=24/23)	group 3 (m=22/21)	group 4 (m=28/22)
no SKU in consideration set	32%	22%	42%	32%	32%
average number of considered SKUs	2.35	2.1	2.64	2.13	2.58
duration spent on stimulus in s	15.6	17.4	13.9	14.5	16.8
	all SKUs (n=48)	group 1 (n=12)	group 2 (n=12)	group 3 (n=12)	group 4 (n=12)
noted in %	83%	86%	85%	83%	80%
revisited in %	58%	67%	55%	56%	53%
# of fixations	3.75	4.43	3.44	3.54	3.60
FD in s	0.96	1.01	0.93	0.95	0.93
FD in %	6.20	5.71	6.36	6.70	6.04
consideration in %	13%	14%	13%	12%	15%
choice in %	6%	6%	5%	5%	6%

Table 17: General Descriptives for Cereals

	all groups (m=101/88)	group 1 (m=27/22)	group 2 (m=24/23)	group 3 (m=22/21)	group 4 (m=28/22)
no SKU in consideration set	20%	19%	13%	45%	7%
average number of considered SKUs	2.63	2.18	2.10	1.92	1.81
duration spent on stimulus in s	17.4	18.7	18.2	11.7	20.6
	all SKUs (n=48)	group 1 (n=12)	group 2 (n=12)	group 3 (n=12)	group 4 (n=12)
noted in %	81%	80%	86%	74%	84%
revisited in %	57%	56%	65%	44%	64%
# of fixations	3.93	4.20	4.14	2.76	4.62
FD in s	1.06	1.01	1.19	0.79	1.25
FD in %	6.12	5.67	6.32	6.63	5.87
consideration in %	13%	15%	16%	8%	14%
choice in %	7%	7%	8%	4%	8%

Table 18: General Descriptives for Chips

	all groups (m=101/88)	group 1 (m=27/22)	group 2 (m=24/23)	group 3 (m=22/21)	group 4 (m=28/22)
no SKU in consideration set	24%	22%	33%	32%	11%
average number of considered SKUs	2.88	2.57	3.06	3.53	2.64
duration spent on stimulus in s	15.5	15.4	16.4	13.7	16.3
	all SKUs (n=48)	**group 1 (n=12)**	**group 2 (n=12)**	**group 3 (n=12)**	**group 4 (n=12)**
noted in %	88%	90%	88%	87%	89%
revisited in %	66%	69%	68%	62%	66%
# of fixations	3.92	4.01	3.98	3.75	3.95
FD in s	0.94	0.92	0.97	0.95	0.90
FD in %	6.34	6.30	6.48	6.85	5.73
consideration in %	18%	17%	18%	19%	20%
choice in %	6%	6%	6%	5%	7%

Table 19: General Descriptives for Beer

The next section takes a closer look at the individual SKUs.

6.2.3 Consideration and Choice

Table 20 to Table 23 give an overview of the SKUs which are shown in the stimulus material and how often they were considered and chosen by the respondents.

Table 20 shows the details about the tea category. The attentive reader will notice that, for Twinings, black tea is listed twice, while there are two herb teas for Willi Dungl and, in return, both brands are missing what the other brand lists twice. This stems from the fact that there are no real herbal teas from Twinings and the same is true for Willi Dungl and black tea. For the two shelves that are sorted by brand this fact is basically ignored, but for the two shelves sorted by flavor, the vertical grouping of herbal tea shows both Willi Dungl teas and no Twinings products and vice versa for the vertical black tea grouping.

The numbers in the brackets next to the brand names indicate the overall numbers of considered and chosen products (i.e., the sum of the respective sub-table) and the brands are ordered from most often to least often considered.

Obviously, some brands and some flavors are more popular than others and that, of course, has nothing to do with the build-up of the shelves, but reflects certain tastes and preferences of the respondents.

(m=101)	Twinings (69/28)				Teekanne (59/19)				Willi Dungl (47/12)			
	black	green	black	fruit	black	green	herb	fruit	herb	green	herb	fruit
considered	17	30	15	7	21	13	13	12	9	21	7	10
chosen	12	12	4	0	10	5	1	3	3	4	1	4
	Spar Bio (35/8)				Milford (34/12)				Spar (29/6)			
	black	green	herb	fruit	black	green	herb	fruit	black	green	herb	fruit
considered	7	7	12	9	11	2	3	18	6	7	8	8
chosen	1	3	1	3	2	0	0	10	1	3	1	1

(sum of *considered* products for the brand/sum of *chosen* products for the brand)

Table 20: Frequency of Consideration and Choice for all Tea SKUs

While no market-share data is available to the author, it is reasonable to assume that not all SKUs are sold equally often. Twinings is both most often considered and chosen, while Spar teas are last in both those categories. The aggregated numbers for flavors show that green tea is the most popular (80/27), but is closely followed by black tea (77/30), which is the final choice more often. Fruit tea is less popular (64/21), but is still better received than herbal tea (52/7).

Table 21 shows the same information for the cereal products. Since only one brand was on the shelves, there are no summary scores. The SKUs are ordered by the decreasing number of considerations, indicating that Cornflakes are the most popular SKU while only one person considered Honey Pops, but did not choose it. Chocos and Frosties are chosen more often than Cornflakes. Choco Krispies Crunchy Rolls, the flavor that is not available in Austrian supermarkets, was considered 8 times and chosen once.

(m=101)	Cornflakes	Chocos	Frosties	Choco Krispies	Special K	Smacks
considered	29	28	20	17	15	13
chosen	10	14	11	6	10	3
	Crunchy Nut	Tresor	Froot Loops	Choco Krispies Crunchy Rolls	Honey Loops	Honey Pops
considered	9	9	8	8	5	1
chosen	2	6	3	1	3	0

Table 21: Frequency of Consideration and Choice for all Cereal SKUs

The SKUs in Table 22 are also ordered from the highest number of considerations to the lowest number. The first four brands have been considered by about a third of the respondents each and more than 60% of all beer choices were among those four brands. The last three brands, on the other hand, were only considered very

infrequently and never chosen. 43% of the respondents did not even know Schützenbräu.

(m=101)	Ottakringer	Wieselburger	Stiegl	Budweiser	Gösser	Hirter
considered	34	32	32	30	24	20
chosen	14	13	8	13	10	9
	Zipfer	**Zwettler Export**	**Puntigamer**	**Zwettler Stiftsbräu**	**Kaiser**	**Schützenbräu**
considered	15	9	9	8	5	4
chosen	4	4	2	0	0	0

Table 22: Frequency of Consideration and Choice for all Beer SKUs

The chips SKUs in Table 23 are ordered by their consideration frequency as well. There does not seem to be a clear preference for either salty or paprika chips. As is the case for the tea category, it is again the store brand that is the least favorable.

(m=101)	Naturals (42/21)		Crunchips (34/17)		Kelly's (32/15)		Chipsfrisch (30/14)		Oven lays (18/11)		Spar (6/3)	
	salt	paprika	salt	paprika	salt	paprika	salt	paprika	salt	paprika	salt	paprika
considered	23	19	11	23	19	13	15	15	9	9	5	1
chosen	11	10	3	14	8	7	7	7	7	4	3	0

Table 23: Frequency of Consideration and Choice for all Chips SKUs

6.3 Hypotheses Testing

This chapter uncovers the effects of the shelf layout on consumers' decision making. In the following sections, the hypotheses established in chapter 3 will be tested.

6.3.1 Location

A well researched factor is the location of a product in the shelf. Hypotheses 1 and 2 deal with the respective effects of the vertical and horizontal location of SKUs on attention, consideration and choice. The analysis of these effects is the topic of the following sections.

6.3.1.1 Effects of the Vertical Location of SKUs

To avoid inferences from brand popularity, saliency and other product characteristics, this analysis relies only on two of the four groups to determine effects of vertical placement on attention and consideration and choice likelihood. The two analyzed groups saw planograms that were identical but mirrored upside-down for one of the groups; hence if certain products are chosen more often in

planogram A than in planogram B, the vertical location is the most likely explanation for this difference, since all other factors remained constant.

For all SKUs in the categories tea, cereals and beer, which are clearly attributable to either the top or the bottom half (see section 4.6.2.1 on page 54 for details), χ^2-tests are calculated for the nominal variables (i.e., *noted*, *revisited*, *considered* and *chosen*) and independent t-tests are calculated for the metric variables (i.e., *# of fixations*, *FD in s* and *FD in %*). While the analysis was done for all five attention variables, as well as consideration and choice, Figure 29 (a), based on the planogram in Figure 5 and its mirrored counterpart in Figure 8, only shows the significant results for *noted* as an illustrative example. The grey-shaded areas indicate those four SKUs which have been excluded from the analysis because they are placed both on the top and the bottom half of the shelf. As can be seen, out of the 20 tests, only two yielded significant results. In both cases, the SKUs were noted more often in the planogram where they were on the top half of the shelf, as is in accordance with the hypothesis. In part (b) of Figure 29, the results for all dependent variables are shown together. Different sample sizes are indicated because the data from more respondents is available for the variables consideration and choice compared to the attention variables. Also the group sizes for planogram 1 and 2 are not identical indicated by the distinction between m_1 and m_2.

An "*" indicates that the difference between the two groups is significant ($p<0.05$, one-sided) and the results are in agreement with the hypothesis; for the SKU on the lower half of the shelf which is marked with an *, this means that it was attended to more often in the mirrored planogram, where it is actually placed on the top half. A "-" shows that the result is significant ($p<0.05$, one-sided), yet the SKU received more attention when it was placed on the lower half of the shelf. In case of multiple asterisks or minuses, several of the 7 tested dependent variables were significant.

Overall, 140 calculations (i.e., 20 SKUs times 7 dependent variables) were made, 118 were not significant; of the significant results, 12 followed the direction of the hypothesis and the remaining 10 are contradicting the hypothesis.
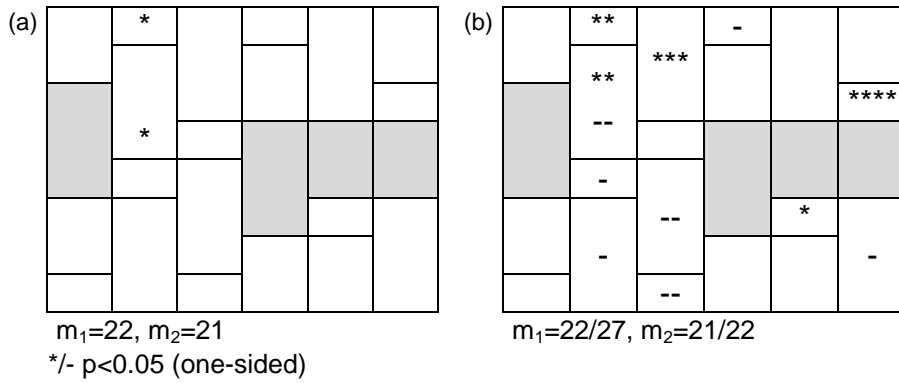
m₁=22, m₂=21 → $m_1=22$, $m_2=21$

*/- p<0.05 (one-sided)

$m_1=22$, $m_2=21$

$m_1=22/27$, $m_2=21/22$

*/- $p<0.05$ (one-sided)

Figure 29: Vertical Effects for the Tea Shelf for *noted* (a) and for all Variables (b)

The same analysis is calculated for the 10 SKUs in the Cereal Shelf pictured in Figure 30 (originally Figure 11 and Figure 13). In this case, the figure shows the significant results for all dependent variables; the lone result was achieved for the variable *consideration*.
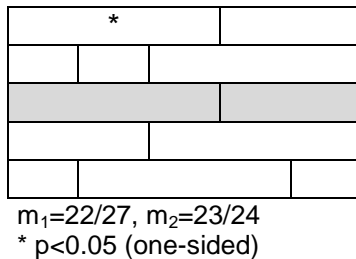

$m_1=22/27$, $m_2=23/24$

* $p<0.05$ (one-sided)

Figure 30: Vertical Effects for the Cereal Shelf for all Variables

For beer and its eight tested SKUs there are only two significant results across all dependent variables, as can be seen in Figure 31 (based on Figure 14 and Figure 16). Both are concordant to the hypotheses, one SKU was considered (*con* in the figure) significantly more often and one was chosen (*ch*) more often when placed on the top half of the shelf.

$m_1=22/27$, $m_2=21/22$
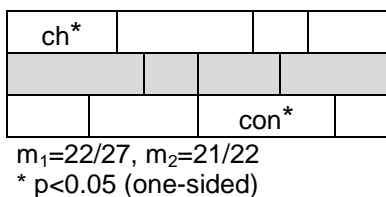
* $p<0.05$ (one-sided)

Figure 31: Vertical Effects for the Beer Shelf for all Variables

Based on these analyses, H1· has to be rejected. Although some comparisons yielded significant results in the direction expected by the hypotheses, there are, on the one hand, too few of them and, on the other hand, there are also contradicting significant results.

6.3.1.2 Moderation of Price Sensitivity on Vertical Effects

The literature suggested that there might be a moderating effect of consumers' level of price sensitivity. Hypothesis H1·m argues that price sensitive customers have learnt from previous shopping experiences that cheaper products tend to be located on the lower shelf boards, hence they should spend more time browsing these areas of the shelves. In order to test this assumption, the sample is split into price sensitive participants and those who are not (cf. page 57 for details) and their results are compared.

In order to test this hypothesis, the data from the 38 SKUs analyzed before is aggregated. Table 24 shows the summary scores for the attention variables, consideration and choice for SKUs on the bottom half of the shelf, comparing price sensitive consumers to those who are not price sensitive. Since the scores are consistently lower for the price sensitive respondents concerning the bottom half of the shelf, although they would be expected to be higher, no statistical tests are performed to detect statistical differences because the hypothesis cannot be supported.

bottom half of shelf (n=38)	noted in %	revisited in %	# of fixations	FD in s	FD in %	considered in %	chosen in %
price sensitive	75%	59%	3.08	0.89	3.27	12%	6%
not price sensitive	81%	68%	3.75	1.06	4.19	18%	6%

Table 24: Moderation of Price Sensitivity on Vertical Effects on ACC[11]

Arguably, the shelves in the study were not filled in a way to ensure that cheaper products are in fact located on the lower shelf boards; hence the problem with the previous analysis might be that the price sensitive participants adapted their search strategy after they discovered this inconsistency with their expectations. Hence, the analysis is repeated with the data from only the first five seconds for each stimulus picture. Jost and colleagues (2005) argue that this duration represents the initial phase and should therefore not be influence by new insights, such as an unexpected set-up of the supermarket shelf.

Since it is impossible to know, which products have already been considered during the first 5 seconds, the analysis is limited to the attention variables.

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[11] Since attention, consideration and choice are always jointly analyzed, the abbreviation ACC is used henceforth to summarize them.

Unfortunately, there is still no support that price sensitive customers distribute more of their attention to the lower shelves than other customers.

The analysis was repeated for the individual product categories, to see whether there might be any differences to be found. Only the first 5 seconds of the search process were used to avoid learning effects. For the products tea and cereals, no significant differences between price sensitive customers and the other group could be found. For beer, there is only one significant difference to be mentioned; namely, price sensitive customers fixate products on the bottom level significantly more often (2.42) than customers who are not price sensitive (1.25; $p<0.01$[12]). However, there are no differences for the duration variables, hence, the informative value of this significant result should not be over-interpreted. From a general perspective, no effects of price sensitivity on search behavior could be detected. Hence, hypothesis H1·m has to be rejected.

6.3.1.3 *Horizontal Location of Products*

While the previous analysis failed to provide the support for hypothesis 1, namely an advantage of a location in the upper half of the shelf, hypotheses H2a-c state that the left half of the shelf should be a preferable location for SKUs. To see whether or not SKUs on the left receive more attention, are considered more often and ultimately chosen more often, χ^2 tests and independent sample t-tests are calculated for the individual SKUs as has been done for the previous analyses.

$m_1=23, m_2=22$
*/- $p<0.05$ (one-sided)
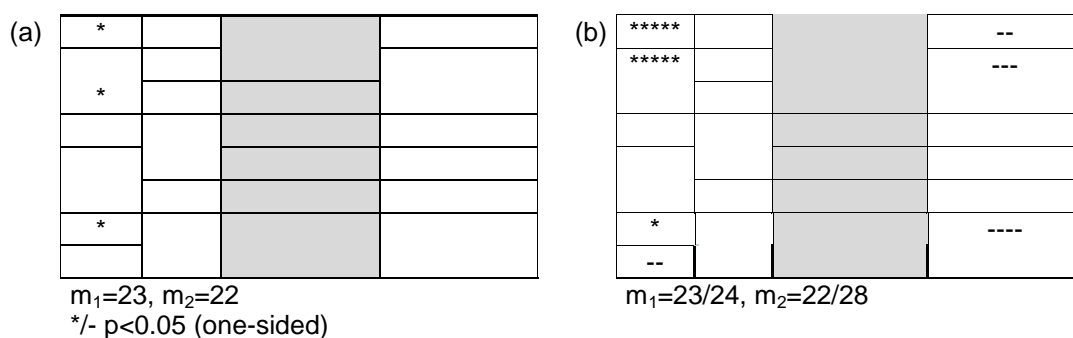
Figure 32: Horizontal Effects for the Tea Shelf for *noted* (a) and for all Variables (b)

For this analysis, the groups with the planograms, which were mirrored along a vertical axis, are used to compare whether SKUs receive more attention when

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[12] In instances where the Levene test showed a significant difference in variances the corresponding significance level was used instead. This restriction is naturally obeyed throughout the analysis.

they are placed on the left side compared to a location on the right. For tea, the two relevant planograms can be found in Figure 7 and Figure 9.

The grey-shaded areas in Figure 32 symbolize those SKUs that are not used for the analysis since they cannot be attributed to either the left or the right half of the shelf. In part (a) of Figure 32 only the significant results for the dependent variable *noted* are indicated. In all three instances, the SKU was noted more often in the planogram, where it was placed on the left side of the shelf. In part (b) all significant results are represented. Again, an "*" denotes a significant result for any of the seven dependent variables with an advantage for the SKU when it was placed on the left side, while a "−" shows that it received more attention or was considered/chosen more often, when it was located on the right side, irrespective of the side it is shown on in Figure 32. For the SKU on the top left of Figure 32 (b), 5 of the 7 tested dependent variables showed significant differences concerning the location on the left and on the right. In all 5 instances, the values were higher for the location on the left. For the SKU on the bottom left, 2 of the 7 calculations yielded significant differences, however, here the values were higher, when the SKU was placed on the right (i.e., in the mirrored planogram, which is not shown here).

$m_1=21/22$, $m_2=22/28$
- $p<0.05$ (one-sided)

Figure 33: Horizontal Effects for the Cereal Shelf for all Variables

For the SKUs in the Cereal Shelf, the analysis was repeated the same way. The relevant planograms can be found in Figure 10 and Figure 12. Only for one SKU, there was a difference between placement on the left and on the right; however, in this case the position on the right proved to be advantageous, as can be seen in Figure 33; the results were even significant for 5 of the 7 dependent variables. For the Beer Shelf, shown in Figure 34 (based on Figure 15 and Figure 17), the attention pattern distinguishes between left and right for 5 SKUs. For four of them, the left side turned out to be better, but one SKU received more attention when it was placed on the right side instead.

m₁=23/24, m₂=22/28

*/- p<0.05 (one-sided)

Figure 34: Horizontal Effects for the Beer Shelf for all Variables

Overall, the results are very similar to the outcomes of the vertical effects; most comparisons did not lead to a significant difference between the two groups and of those, which are significant, there are no clear tendencies, whether the hypothesis is supported or has to be rejected. Out of the 245 calculations, only 41 were significant and of those approximately half follow the proposed direction of the hypothesis and the other half point in the other direction. Therefore it has to be concluded that hypothesis 2· cannot be supported.

6.3.2 Saliency

For the effects of saliency, there are two different sets of hypotheses. On the one hand, there is assumed to be a general effect of saliency on attention, consideration and choice and additionally, hypothesis 3·m suggests that this effect is moderated by the variety seeking behavior of the customer.

6.3.2.1 General Effects of Saliency

Hypothesis H3· states that salient SKUs receive more attention and are considered and chosen more often than non-salient SKUs. In order to test these postulations, the means for all variables are compared.

For this analysis, the data of all four groups are used. Of the 192 SKUs shown to the respondents across the four groups and three product categories, 55 are defined as salient and the remaining 137 are not.

	noted in %	revisited in %	# of fixations	FD in s	FD in %	considered in %	chosen in %
salient (n=55)	85%	72%	4.16	1.09	5.90	16%	7%
not salient (n=137)	80%	64%	3.64	1.02	4.21	12%	4%
sig.	**	**	*	n.s.	***	*	**

*** p<0.001,** p<0.01, * p<0.05 (one-sided)

Table 25: Effects of Saliency on ACC

As can be seen in Table 25, saliency has a significant effect on all tested variables apart from *FD in s*, but even here the fixation duration for salient products is longer than for non-salient products; generally, salient SKUs receive more attention and

they are also considered and chosen more often than other SKUs. This supports hypotheses H3a-c.

Yet, it is also interesting to see if this effect works for the product categories individually as well. Therefore the analysis is split and Table 26 presents the numbers for the categories separately. There are again many significant results, but not all results are significant across all product categories. While cereals follow the same path with all results significant, there are no significant results for the category tea at all. For beer, there are only significant effects on the fixation duration variables, but none for the number of times the SKUs have been attended to. There are no effects of consideration although the difference (21% vs. 16% for salient and non-salient SKUs respectively) is quite large, but salient SKUs are chosen significantly more often than their counterparts.

		noted in %	revisited in %	# of fixations	FD in s	FD in %	considered in %	chosen in %
tea	salient (n=19)	78%	64%	3.74	1.06	2.99	11%	3%
	not salient (n=77)	76%	62%	3.76	1.14	3.14	11%	4%
	sig.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
cereals	salient (n=18)	89%	78%	4.68	1.19	7.67	17%	9%
	not salient (n=30)	80%	61%	3.24	0.83	5.36	11%	4%
	sig.	**	***	***	**	**	*	**
beer	salient (n=18)	90%	76%	4.09	1.02	7.22	21%	8%
	not salient (n=30)	87%	74%	3.74	0.87	5.80	16%	5%
	sig.	n.s.	n.s.	n.s.	*	*	n.s.	*
F-value – category		***	**	n.s.	n.s.	***	***	***
F-value – saliency		*	*	*	*	***	*	**
F-value – interation		n.s.	*	*	*	**	n.s.	**

*** p<0.001,** p<0.01, * p<0.05 (one-sided)

Table 26: Effects of Saliency on ACC for the Various Categories

The results of the calculated MANOVAs can be seen in the last rows of Table 26; the significance of the individual F-values for category and saliency are indicated as well as a possible interacting effect of the two independent variables

Overall, saliency shows a strong effect on attention and purchase likelihood, yet it cannot be recommended to generalize results to different product categories; there are already different degrees of effects for the analyzed categories and without further research it is impossible to say how saliency could work for other categories, which have not been analyzed here.

6.3.2.2 Moderation of Varity Seeking Behavior on Saliency

To test whether VSB (variety seeking behavior) moderates the effects of saliency on attention, consideration and choice, only the data of salient products will be compared to see if the effects are stronger for one group.

Since respondents stated their variety seeking behavior for all product categories separately, they can have up to 4 different degrees of VSB, since they answered the question with a certain product category in mind and do not necessarily employ a similar purchase pattern for the various product categories (Givon, 1984). For the analysis, the products were matched with the respective variety-seeker score for the analysis.

The numbers in Table 27 show that, while salient SKUs attract a lot of attention, as has been tested in the previous section, the moderating effect of VSB is not as clear-cut as has been expected. There is a statistically significant effect of VSB on *noted*, *revisited* and *consideration*, but for *# of fixations* and *FD in s*, the values are significantly higher for those respondents who are not classified as variety seekers; therefore the asterisks are in brackets. Hence, variety seekers noticed more salient products on average, but the other respondents spent more time looking at them. However, the effect carried through to purchase likelihood only for the first group.

only salient products (n=55)	noted in %	revisited in %	# of fixations	FD in s	FD in %	considered in %	chosen in %
variety seeker	90%	80%	4.03	1.04	5.90	22%	7%
no variety	84%	71%	4.73	1.27	5.82	15%	6%
sig.	***	***	[**]	[**]	n.s.	*	n.s.

* p<0.05; ** p<0.01; *** p<0.001 (one-sided), […] significant but against hypothesis

Table 27: Effects of VSB on ACC for Salient Products

In summary, the prevalent influence of saliency is to some extent (i.e., consideration) even stronger for variety seekers. Thus, hypothesis H3bm can be supported, but H3am and H3cm, the influence on attention and choice, must be rejected.

6.3.3 Signage

So far the saliency of the appearance of products or rather their packaging has been tested. But another way to create saliency is the usage of signs on the supermarket shelf. The effects of those signs will be the topic of this chapter.

Up until now only the product categories tea, cereals and beer have been used for the analysis. But the manipulation concerning signage has been done with the chips category within experiment 2, while all other factors (i.e., location, number of facings) have been held constant. Therefore, only the data from the chips shelves can be used for hypotheses H4· and H5·.

As a short reminder of the methodology, one group served as control group (group 1), while group 2 and 4 saw two different versions of discount signs and group 3 saw a "Tipp"-sign. All signs advertised 4a and the sign for group 2 also advertised the adjacent 4b. The comparison of the "Tipp"-group with the control group will be the topic of the next section, but first the effects of the signs with discounts are going to be discussed.

6.3.3.1 Effects of Promotional Signs with Price Cut

Hypotheses H4a-c compares the results of the planogram of the control group with no additional signs to the two groups who saw a shelf with either the "Monatssparer" (group 2) or the "Aktion" sign (group 4). Both signs offer a price cut of 50 cents (1.49 € instead of 1.99€). The signs as well as the depth of the price cut are employed by the Spar supermarket chain. While the "Aktion" sign promoted only paprika-flavored Crunchips, the "Monatssparer" sign advertised all flavors for brand 4; in this case paprika and salted because no other flavors are present in the shelf.

As can be seen in Table 28, three groups are compared for the paprika flavored chips, hence an ANOVAs was calculated for each of the dependent metric attention variables. The only significant result was found for *FD in %,* but a post-hoc Scheffe test could not distinguish between the groups. For the nominal variables, a series of χ²-tests were calculated. The information in the last column of the table, which merely gives information about for how long the sign itself was attended to on average, was not analyzed. The fact that the "Monatssparer" sign was looked at more than twice as long on average as the "Aktion" sign might explain why, although not significantly different, the numbers for this shelf are higher for all variables. Apart from consideration likelihood, the numbers for the "Aktion" sign are all higher compared to the control group as well, but the difference is smaller.

	group	noted in %	revisited in %	# of fixations	FD in s	FD in %	considered in %	chosen in %	FD on sign in s
4a	control (m=22/27)	86%	73%	5.00	1.17	6.95	22%	4%	-
	Monatssparer (m=23/24)	96%	91%	6.78	2.12	12.26	35%	17%	0.39
	Aktion (m=22/28)	91%	77%	5.05	1.56	7.13	14%	7%	0.18
	χ²-square/ F-value					*			-
4b	control (m=22/27)	86%	68%	5.59	1.40	8.11	11%	7%	-
	Monatssparer (m=23/24)	100%	91%	5.39	1.58	9.26	26%	0%	0.39
	χ²-square/ F-value	*	*						-

* p<0.05 (one-sided)

Table 28: Comparison of the Effects of Signs with Price Cut on ACC

Since there are only two groups to be compared for the salted chips, the ANOVAs are replaced with independent sample t-tests, everything else remains the same. The only significant differences detected here are for *noted* and *revisited*. For the other variables there is no group consistently ahead. While the *# of fixations* and *choice likelihood* are higher for the control group, the *FD* (absolute and relative) and *consideration likelihood* are higher for the other group.

For H4a and the effects on attention, all variables show the expected tendencies and some differences are statistically significant too; thus H4a is at least partly supported. H4b+c, however, cannot be supported because no result is significant and not even the tendencies are consistent.

The question in the questionnaire about whether one of the products was reduced in price or not reveals that only one respondent gave the correct answer; another respondent also indicated that there was a price reduction for a product in the chips category, but this person also indicated that for all other product categories SKUs were on sale, disqualifying the answers. While the literature suggests that not all customers remember whether their purchases were on sale or not, this extreme outcome is surprising and might be an explanation for the absence of an effect on purchase likelihood. It is also possible that the signs were too small on the screen to attract much attention.

6.3.3.2 Effects of Promotional Signs without Price Cut

Similar to the previous analysis, the results for the group, who saw a "Tipp" sign, will be compared to the results from the control group. The numbers in the first row of Table 29 are, of course, the same as in Table 28 and as can be seen the numbers are consistently lower compared to the "Tipp"-group; the only exception is the consideration frequency, which is the same for both groups at 22%. Although the sign itself was attended to on average (0.21 seconds) as long as the "Aktion" sign, the effects on attention and ultimately choice seem to be stronger even though there was no price reduction offered. For the nominal variables χ^2-tests were calculated and for the metric attention variables independent sample t-tests.

group	noted in %	revisited in %	# of fixations	FD in s	FD in %	considered in %	chosen in %	FD on sign in s
control (m=22/27)	86%	73%	5.00	1.17	6.95	22%	4%	-
Tipp (m=21/22)	95%	76%	5.38	1.76	15.76 **	22%	22% *	0.21

* p<0.05, ** p<0.01

Table 29: Comparison of the Effects of Signs without Price Cut on ACC

Overall, only three respondents looked at the sign itself; hence it was ignored by a majority of the respondents. Yet, it is possible that it drew attention towards the product without receiving any direct attention. After all, the *FD in %* shows a significant difference between the two means. The respondents in the Tipp-group looked significantly longer at the advertised chips. While there are no effects on consideration behavior, every single respondent who included the SKU 4a in their consideration set also chose it, when they had to indicate their choice.

Similar to the hypotheses about the promotions with price cut, there are tendencies visible for the attention variables and one of them even shows a statistically significant difference, also there is no effect on consideration, but due to the 100% conversion rate from consideration set to choice for the "Tipp" shelf, there is a significant influence on choice. Thus, H5a is partly supported, H5c is supported as well, only H5b has to be rejected.

6.3.4 Facings

For hypotheses H6a-c, it needs to be determined whether there are positive effects of additional facings on attention, consideration and choice. Yet, there are different ways to model the postulated relationship. Based on the literature it was

established that the relationship is not linear but rather that the marginal benefits of additional facings decrease eventually. It is, however, not known up to what point additional facings are still beneficial, nor if there can even be too many facings, indicated not just by a relative decrease of the effects, but rather a super-saturation effect, an absolute decrease of the effects. In that case, the saturation point would be especially important to know.

In order to test whether it is indeed a quadratic model, which best represents the relationship between the number of facings and the amount of attention received by an SKU as well as consideration and choice likelihood, the following basic model is proposed:

$$y = \beta_0 + x * \beta_1 + x^2 * \beta_2 \qquad [1]$$

In formula [1], y denotes the dependent variable (e.g., *# of fixations*) and x stands for the number of facings. x appears twice, once in quadratic form because of the assumed quadratic relationship between x and y. Yet, in the design of the experiment, the numbers of facings are not varied independently, but only in combination with location. Hence it is necessary to introduce binary variables (L_i) designating the SKUs to their position within the shelf. The coding of these location variables has been introduced in the Measurement section on page 54 and following. A three by three grid is drawn across the shelves and, depending on its location, the SKU is assigned to the respective variables. Since SKUs can be placed in multiple, adjacent areas, these variables are not mutually exclusive and are therefore all used in the regression. This leads to the following model:

$$y = \beta_0 + x * \beta_1 + x^2 * \beta_2 + \sum_{i=1}^{9} L_i * \gamma_i \quad [2]$$

Table 30 shows the results of the regression analysis. The model explains about 50% of the variation. Since this is not the final model to analyze the effects of the number of facings, the location variables will not be interpreted at this point.

# of fixations (n=192)	standardized coefficients
facings	0.57 **
facings²	-0.12
top left	0.13 *
top middle	0.26 ***
top right	0.07
center left	0.23 ***
center middle	0.36 ***
center right	0.12 *
bottom left	0.06
bottom middle	0.15 **
bottom right	0.07
R Square	0.48
Durbin Watson	1.37
F	15.07 ***

Table 30: Effects of Facings – Results of the Quadratic Model

Note that β_2 (facings²) is not significant but has the expected sign ($\beta_2 < 0$); therefore model [2] is rejected. The next possibility to model the relationship between facings and the dependent variables is a multiplicative model. An advantage of a multiplicative model is the fact that the unstandardized coefficients for facings can be interpreted as elasticity scores, while the location variables serve as lift factors. Additionally, the analysis will focus on the product categories separately, in order to discern whether the results are similar enough to calculate the effects of the facings together across product categories. Hence, the multiplicative model is established as such:

$$y = \beta_0 * x^{\beta_1} * \prod_{i=1}^{9} \gamma_i^{L_i} \qquad [3]$$

The lift factors L_i are binary variables ($L_i \in \{0,1\}$), γ_i have to be positive and β_1 as elasticity score is expected to be between 0 and 1 since previous research suggests that additional facings lead to more attention but the relationship is generally expected to be inelastic (e.g., Curhan, 1972; Drèze et al., 1994).

In order to be able to calculate this model, [3] is logarithmized and then a linear regression can be run with this model:

$$\ln y = \ln \beta_0 + \beta_1 * \ln x + \sum_{i=1}^{9} L_i \ln \gamma_i \qquad [4]$$

Table 31 shows the results of the proposed multiplicative model for the three analyzed product categories. The values for the constant and facings are the non-

standardized coefficients taken from the regression output along with their respective significance levels. For the location variables, the table does not show the original coefficients, rather it is necessary to use the exponentiated values in order to be able to interpret them. Additionally, only those values are mentioned that are statistically significant. For a complete table with all coefficient scores, please refer to Table A. 2 in the appendix on page 132.

# of fixations		tea	cereals	beer
lift factors and elasticity scores	constant	0.30 *	0.72 ***	0.97 ***
	facings	0.79 ***	0.56 ***	0.39 ***
	top left			
	top middle			
	top right			0.75 *
	center left			
	center middle	1.32 *		1.30 **
	center right			0.79 *
	bottom left	0.73 *		
	bottom middle			
	bottom right	0.63 **		
R Square		0.59 ***	0.70 ***	0.48 ***
n		96	48	48

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

Table 31: Effects of Facings – Results of the Multiplicative Model for the Product Categories for [4]

The values in Table 31 indicate that the effects of the number of facings are highly significant for each product category. Beyond that, the location variables are to a large extend not significant and therefore not shown in this reduced table. Those location scores, which are significant, show that the center of the shelf is a preferable location, while the corners of the shelf are rather unfavorable for the SKUs placed there.

Since the outcome of these three regressions is fairly similar, they will be pooled for an overall analysis of the effects of facings across categories. But instead of using the actual number of facings, the *SKU space* of the individual SKUs will be used instead. That way, the different package sizes of the categories are taken into consideration and the fact that the variation in facings differs across categories[13] as well. Thus, the x in the model in formula 5 does not denote the actual number of facings as before but instead the space of the respective SKU.

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[13] For tea, facings vary from 2 to 8, for cereals from 1 to 3 and for beer from 2 to 5.

Since the categories are analyzed together, two additional dummy variables are introduced for two of the categories and the resulting model can be seen below:

$$y = \beta_0 * x^{\beta_1 + \beta_2 Cereals + \beta_3 Beer} * \prod_{i=1}^{9} \gamma_i^{L_i} \quad [5]$$

Through the introduction of the dummies cereals and beer, tea will serve as a reference category. The model is again logarithmized and this is the resulting model used for the regression analysis:

$$\ln y = \ln \beta_0 + \beta_1 * \ln x + \beta_2 * \ln x * Cereals + \beta_3 * \ln x * Beer + \sum_{i=1}^{9} L_i \ln \gamma_i \quad [6]$$

The variable ln x is now the logarithmized version of the *SKU space* variable described above and, in order to receive the necessary category dummy variables needed for this equation, it was multiplied with the respective binary dummy variables for cereals and beer.

Due to space constraints, the previous analyses focused only on one of the dependent variables, namely *# of fixations*, but since this is the final model used to analyze the effects of *facings/SKU space*, all dependent variables will be discussed now.

In Table 32, β_1 symbolizing the general effect of *facings/SKU space* has been replaced with tea, since it is the reference category. The elasticities of beer and cereals are not the original numbers from the regression output, but rather the combined scores of $\beta_1 + \beta_2$ for Cereals or $\beta_1 + \beta_3$ for Beer.

For *# of fixations*, the elasticity score for tea is 0.62 (i.e., a 100 % increase in SKU space is estimated to result in a 62% increase in the *# of fixations*), for cereals, it is 0.59 and for beer, it is 0.57. All three values are inelastic, that means that increases in SKU space lead to an increase in the *# of fixations*, but to a lesser extent. Overall, the model for *# of fixations* explains 49% of the variation, which is already a high value for a cross sectional study, and the R²-value for the *FD in %* variable is even higher with 65% of explained variance.

The significance level for the tea variable shows whether changes in SKU space lead to changes for the dependent variables at all; significant results for cereals and beer signal that there is a difference between the respective product category and tea. Hence, although the score for cereals and *noted in %* is not significant,

(n=192)			noted in %	revisited in %	# of fixations	FD in s	FD in %	considered in %	chosen in %
elasticities	constant	ln β_0	2.24 ***	-0.54	-5.20 ***	-6.33 ***	-3.98 ***	-4.25 **	-3.57 *
	Tea	β_1	0.20 ***	0.44 ***	0.62 ***	0.61 ***	0.48 ***	0.18	-0.01
	Cereals	$\beta_1 + \beta_2$	0.20	0.43	0.59 ***	0.57 ***	0.53 ***	0.2	0.04 **
	Beer	$\beta_1 + \beta_3$	0.20 **	0.41 **	0.57 ***	0.54 ***	0.50 *	0.22	0.04 *
lift factors	top left	γ_1							
	top middle	γ_2	1.08 *	1.17 *	1.22 **		1.29 **		
	top right	γ_3	0.92 *	0.81 **			0.83 *		
	center left	γ_4		1.23 *	1.25 **	1.36 ***	1.45 ***		1.70 *
	center middle	γ_5	1.16 ***	1.36 ***	1.49 ***	1.48 ***	1.67 ***		
	center right	γ_6							
	bottom left	γ_7						0.57 **	
	bottom middle	γ_8	1.08 *	1.18 *					
	bottom right	γ_9		0.80 **					
R Square			0.41 ***	0.41 ***	0.49 ***	0.43 ***	0.65 ***	0.10 *	0.10 *

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

Table 32: Effects of Facings – Results of the Multiplicative Model [6] across Categories

this does not mean that there is no effect of *SKU space* for cereals, rather it means that the relationship is the same as for tea.

The models for *considered in %* and *chosen in %* are only significant on a 10% p-level and there is apparently no effect of *SKU space* on purchase likelihood.

The location lift factors shown in Table 32 have been calculated the same way as in the previous analysis. For complete information, please refer to Table A. 3 in the appendix on page 132. In the appendix, the unstandardized coefficients for the location variables are listed.

For easier comparison of horizontal positions, locations on the left have been highlighted with blue shading, while locations on the right are indicated by red shading. Values above 1 signal an improvement compared to the locations without significant results; while values below 1 show that these positions get less attention. When taking a closer look at the values listed for *FD in %*, 1.29 indicates that a position on the *top middle* of the shelf leads to a 29% increase in the *FD in %* an SKU receives, while placing the SKU in the top right corner of the shelf (0.83) decreases the *FD in %* by 17%.

When comparing the 9 locations with each other, the best location is obviously *center middle*, followed by top and bottom middle; there are more significant results for top middle than for bottom middle, supporting H1· that a location on the top half of the shelf is better than on the bottom half. A placement on the *center left* also increases attention, while placing products on the *top* or *bottom right* decreases the amount of attention an SKU receives. This left-right discrepancy supports H2·, which states that SKUs on the left should receive more attention than SKUs on the right.

Overall, the *SKU space* and, with it, the *number of facings* have an influence on attention, but no effect on consideration and choice could be found. Hence, while hypothesis H6a can be supported, H6b+c have to be rejected.

6.3.5 Arrangement

The last block of hypotheses focuses on the arrangement of the shelf rather than individual decisions on the SKU level. On the one hand, it is analyzed whether SKUs on the left are indeed found faster than SKUs further on the right and on the

other hand, arrangement of the shelf by brand is compared to arrangement by attribute.

The data from experiment 3 about the shampoo shelf are used for the following analyses.

6.3.5.1 Search Pattern

H7 states that SKUs on the left are likely to be found faster because the expected search pattern follows a left-to-right zig-zag strategy (van der Lans et al., 2008).

To test this hypothesis, the data from experiment 3, the shampoo search tasks, are used. In Figure 35, the search duration (SD) for the individual SKUs are shown. As has already been mentioned, every participant had to search for shampoo SKUs twice, therefore the results are split into shelf 1 and shelf 2, indicating the order the participants searched for the bottles. However, Figure 35 only shows the results of the first search task. Details about the second search task can be found in Figure A. 36 on page 133 in the Appendix. Some data points had to be excluded for different reasons: some respondents did not memorize the picture carefully and hence were not able to find it in the shelf and other respondents picked the wrong bottle.

The order of the shampoo brands in Figure 35 indicate their order from left to right in the shelf. The bars which are framed with a black line show that the SKU was placed in the shelf sorted by brands. While the expected trend for shelf 1 is already visible in Figure 35, the average numbers for shelf 2 do not follow expectations. Hence, only an ANOVA for shelf 1 is calculated to test the hypothesis. The ANOVA shows that there are indeed significant differences between the mean search durations ($p<0.05$); a post-hoc analysis indicates that the means of Brand 2 and 5 differ significantly ($p=0.05$). Hence, H7 can be supported.
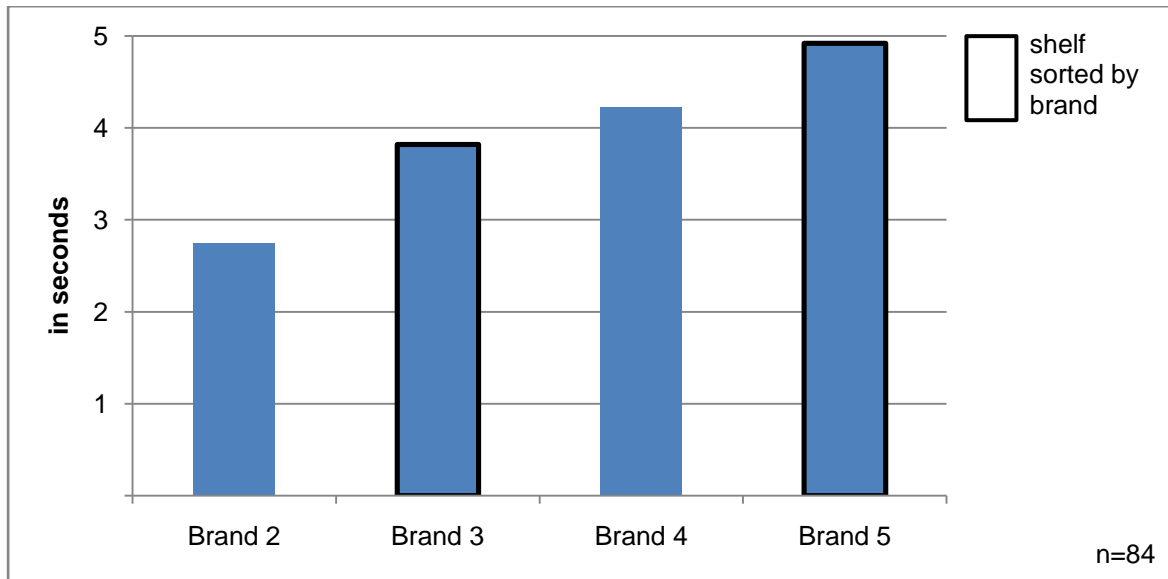
Figure 35: SD in s for SKUs from left to right during first Search Task

The fact that a similar relationship could not be found for shelf 2 could be based on prior knowledge due to the first search task. Although the shelves were stacked differently, they contained, to a large extent, the same products. It is also possible that some respondents saw the SKU relevant to the second search task already during the first search and returned to the same location when looking at the second shelf; this would have resulted in a very short search, since the SKUs used in the search task are placed on the exact same spot in both shelves. Other respondents might have been confused due to the different set-up of the shelf and this could have increased their search time disproportionately. One of these explanations clearly shortens the search duration, while the other one increases it; yet both are feasible and necessary to explain the stark differences of the search durations found in the second search task compared to the first one.

Based on the results from the first search task, it is reasonable to conclude that products on the left are indeed found faster than products placed further on the right. Although further research would be necessary to see if this is also true in a more natural shopping setting, when the SKU is not predefined by the experiment, but can be chosen freely instead.

6.3.5.2 Vertical Arrangement of the Shelf

Based on the literature, it has been established that a vertical arrangement of products in the shelf is to be preferred. The following analysis attempts to discover on what criterion the arrangement should be based. Analysis focuses again on the

data from the shampoo shelves, since search duration can be determined here most accurately.

Hypothesis 8 states that a vertical arrangement by brand should shorten search time; in order to test this assumption, a repeated measurement t-test is calculated comparing the search time of respondents for the two different shelves; i.e., the search duration of the shelf arranged by brand versus the shelf arranged by attribute. As can be seen in Table 33, the search durations are very similar, and the t-test does not show a significant difference between the two means. Hence, hypothesis 8 cannot be supported.

shelf sorted by …	SD in s
brand	3.8
attribute	3.6
n=76	

Table 33: Mean SD in s for the two different Shampoo Shelves

Yet, it has also been hypothesized that there could be an interacting effect of the consumers' focus. Based on the questionnaire, 46 respondents are qualified as attribute shoppers and 20 respondents as brand shoppers; 31 respondents consider brand and attribute equally important and the remaining 4 did not answer the question. Only the data from respondents, who qualified either as brand or attribute shoppers were used. For those 66, there should be two available data points each since everyone had to perform two search tasks, but some data points could not be used for the analysis; for example, some respondents clicked on the wrong shampoo bottle. Therefore the analysis is based on 51 respondents, who all either qualified as brand or attribute shopper and found the right shampoo bottle in both search tasks.

Apart from the limitations of the available data listed above, the analysis relies on the same information as has been used to test H7. This time, however, the data is not split into chronological order but by shelf design. The shelf with the vertical arrangement of the brands is analyzed separately from the shelf with the attribute arrangement, independent of the whether it was used in the first or second search task.

Figure 36 shows the different means split first by the characteristics of the respondents, whether they are brand or attribute shoppers, and second by the way

the shelf was arranged. As can be seen, there seems to be an interacting effect; in both cases, the search duration is shorter when shopping behavior and shelf arrangement match.
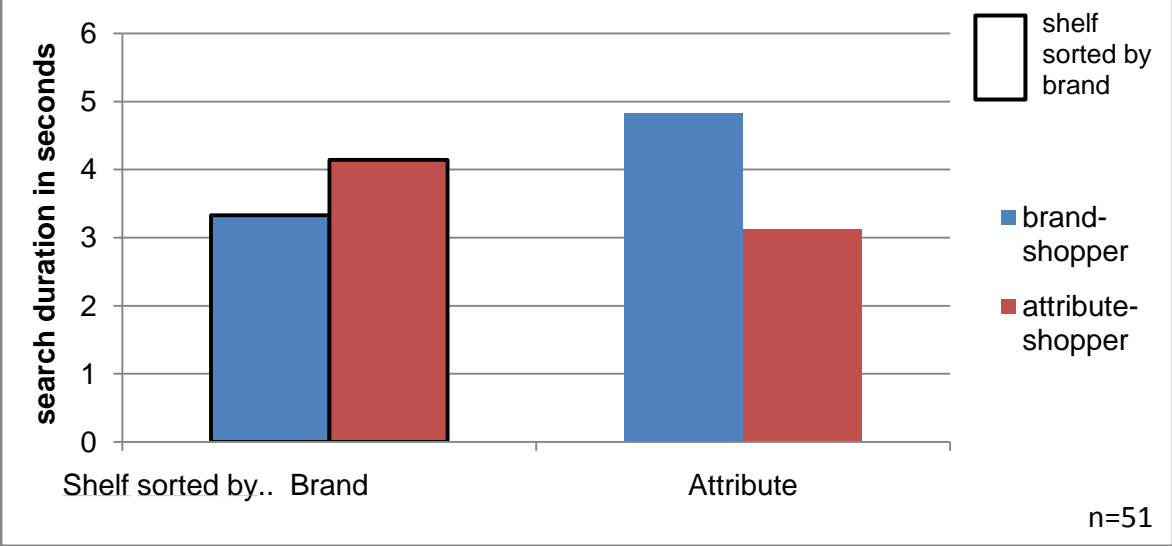

Figure 36: SD in s for Shampoo

To determine the statistical relevance of these findings, a repeated measure ANOVA was calculated with shopper focus as a between subject factor. While there is still no significant effect of the mere arrangement manipulation, the interaction of arrangement and shopping focus ($F=4.62$, $p<0.05$) is significant. Thus H8i can be supported; participants find products faster, when the vertical arrangement resembles their shopping focus.

7   Overview of Results

This chapter gives an overview of the tested hypotheses and the results. Table 34 presents the findings of all hypotheses individually, while Figure 37 adapts Figure 2 from page 27. Black arrows indicate that the postulated relationship between independent and dependent variables could be found, whereas grey arrows show that a hypothesis could not be supported; arrows with a dashed line illustrate that the respective hypotheses could be partly supported, for example, the moderating effect of VSB on saliency could only be detected for the variable *consideration*. This more detailed information can be found in Table 34.
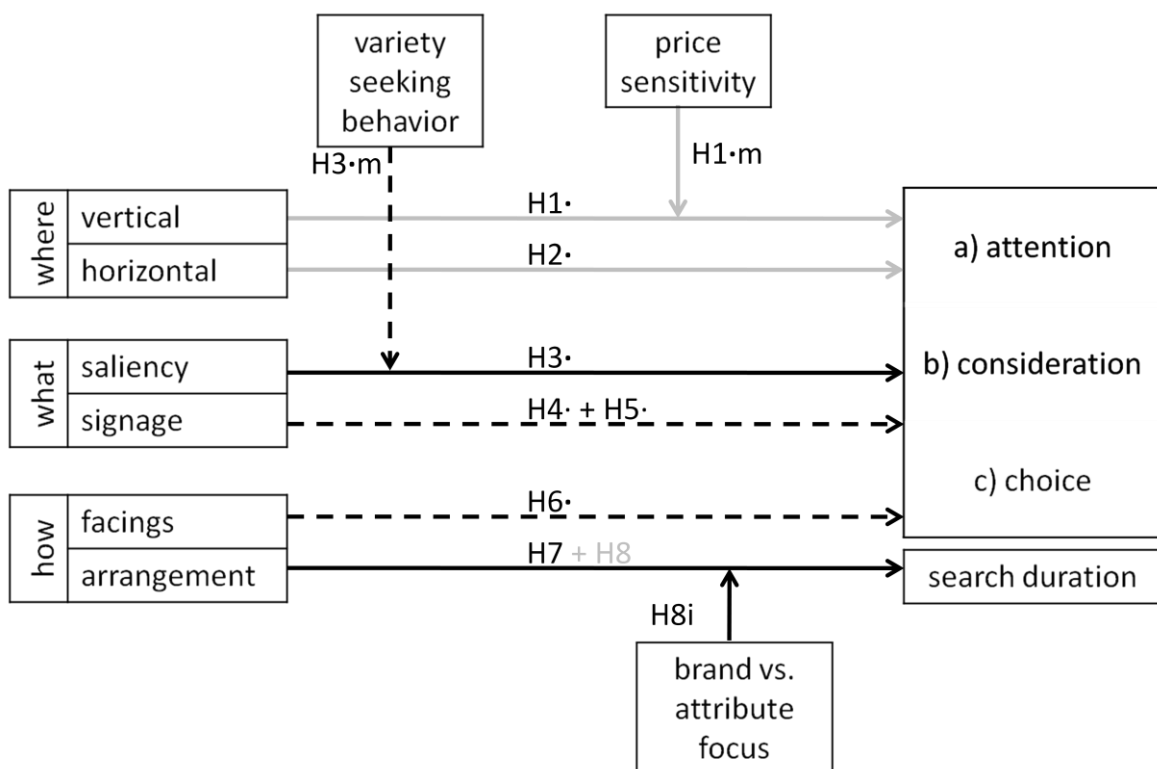

Figure 37: Summarized Results of the Hypotheses

The first two columns in Table 34 indicate the corresponding hypothesis (for a list with text refer to page 111), the next column gives the result for the overall analysis across all applicable product categories if the analysis included more than one product category; the remaining columns specify the individual product categories, which were used for the analysis as well, and how the results may differ from the overall analysis.

Neither a position in the top half or the left half of the shelf increased the amount of attention an SKU received nor the consideration and choice likelihood as was

postulated in H1· and H2·. However, the analysis of the effects of facings, which included the location of an SKU as lift factor, showed that a central location catches much more attention than SKUs placed in other areas of the shelf.

The effects of saliency influenced attention, consideration and choice and are consequently the strongest force among the analyzed elements. The number of facings, on the other hand, only had an effect on attention, but not on consideration and choice likelihood.

To sum up the results of experiment 1, in order to increase attention towards specific SKUs, they can either be placed in the center of the shelf, receive more facings or be equipped with a salient packaging.

For experiment 2, the results for signage are fairly weak and inconsistent; further research is necessary to determine the real effect sizes.

In experiment 3, the search duration could be shortened, on the one hand, by placing SKUs further on the left side of the shelf and by vertically arranging the shelf based on the shopping focus of the customers. However, this is not as straightforward as it may sound, since not all customers are either brand- or attribute-focused when shopping for a certain product category. Rather, it has to be determined which group is larger and then arrangement should be based on their preferences.

ind. v.	Hs	overall	tea	cereals	chips	beer	shampoo
location	H1a	**x**	**x**	**x**	-	**x**	-
	H1b	**x**	**x**	**x**	-	**x**	-
	H1c	**x**	**x**	**x**	-	**x**	-
	H1am	**x**	-	-	-	-	-
	H1bm	**x**	-	-	-	-	-
	H1cm	**x**	-	-	-	-	-
	H2a	**x**	**x**	**x**	-	**x**	-
	H2b	**x**	**x**	**x**	-	**x**	-
	H2c	**x**	**x**	**x**	-	**x**	-
saliency	H3a	✓	**x**	✓	-	~	-
	H3b	✓	**x**	✓	-	**x**	-
	H3c	✓	**x**	✓	-	✓	-
	H3am	**x**	-	-	-	-	-
	H3bm	✓	-	-	-	-	-
	H3cm	**x**	-	-	-	-	-
signage	H4a	-	-	-	✓	-	-
	H4b	-	-	-	**x**	-	-
	H4c	-	-	-	**x**	-	-
	H5a	-	-	-	~	-	-
	H5b	-	-	-	**x**	-	-
	H5c	-	-	-	✓	-	-
facings	H6a	✓	✓	✓	-	✓	-
	H6b	**x**	**x**	**x**	-	**x**	-
	H6c	**x**	**x**	**x**	-	**x**	-
arrange-ment	H7	-	-	-	-	-	✓
	H8	-	-	-	-	-	**x**
	H8i	-	-	-	-	-	✓

✓ = supported, x = rejected, ~ =likely/partly,- =not tested

Table 34: Overview of the Results of the Hypotheses

8   Conclusion

The goal of the present study was to determine in how far changes to the layout of the supermarket shelf affect consumer behavior. On the one hand, it was noted how participants attended to the SKUs placed in the shelf and whether they considered and chose them within the experiment. And on the other hand, it was also analyzed whether the arrangement of the shelf had any effects on how fast respondents were able to find certain SKUs.

Overall, there are numerous ways to direct customers' attention towards particular SKUs; they can either be placed in the center of the shelf, or they receive multiple facings, or signs are used to highlight their position. Also the saliency of the packaging can attract attention. However, the effects of the shelf layout on consideration and choice are limited; the strongest effects could be found for saliency and some effects for signs.

The results of the study lead to numerous managerial implications, which will be discussed in the following section, yet there are also certain limitations, which will be pointed out afterwards, and those lead, among others, to suggestions for further research.

8.1   Managerial Implications

From the retailers' perspective, the most important findings of this study are the possible ways to guide a customer's attention towards certain SKUs in the supermarket shelf. This can be achieved by either giving an SKU a more prominent place in the shelf, such as the center of the shelf, by placing more facings of the same SKU next to each other or by highlighting the products with the use of signage. The inherent salience of a product, or rather its packaging, has to be taken into account, although the influence of the retailer is limited since the decision lies with the manufacturer. Yet, if there are many SKUs with a similar packaging and one of them should stand out more than the others, it should be grouped with products of different colors rather than hiding it among its same-colored competitors. Saliency is especially important because it directly influences consideration and choice

While the findings of the influence of facings are interesting, a discussion of the results of this study with practitioners has shown that they might not be applicable

in many cases. Some retailers have such a large number of SKUs in stock that there simply is no room for additional facings for some of the products. Hence, they need to rely more on the other factors influencing shopping behavior.

From the manufacturers' perspective the findings about saliency are most relevant, since the saliency of the products can be modified most easily, while convincing the retailer to treat the products more favorably might be more difficult, at least for less popular brands.

From the customers' perspective, however, the arrangement of the supermarket shelf as a whole is more important. The results support that a horizontal search pattern from left to right is employed while scanning the shelf and therefore a vertical arrangement is to be preferred. The question, whether to sort the shelf by attribute or brand depends on the preference of the customers; within the framework of this study, it was discovered that for chips, tea and shampoo the attributes are more important than the individual brands and therefore attributes should be used as the sorting variable in those cases. It is, however, unclear if this preference for attributes can be generalized to other categories.

8.2 Limitations

While a lot of interesting findings could be discovered, there are certain limitations to this study. On the one hand, it is yet unclear to what extent the results show external validity, since the respondents were placed in a rather artificial context. On the one hand, they could not interact with the products, since they only saw the stimulus material on the screen and the products were also quite small compared to the presentation in a supermarket. Yet, those issues might not be so problematic, since the respondents were still able to read the name of the products and previous research has shown that there is generally very little product contact before the ultimate choice is made (Alba et al., 1991). On the other hand, the problem, which probably matters most concerning the stationary design, is the limited mobility of the respondents in order for the eye-tracker to be able to track their eye-movements. This constraint could have exaggerated the advantage of central placement in the shelf. Since a 22-inch screen is much smaller than a real-life supermarket shelf, less head and eye movements are necessary in order to see the whole shelf and this might also be a reason, why the proposed effects of location could not be found.

The fact that the respondents sat in front of a screen might also be a possible explanation why the hypothesized vertical advantage of the top shelf boards did not materialize. Since the respondents were required to sit in front of the screen as centrally as possible for best eye-tracking results, for them eye-level was the center, while in a supermarket context eye-level is typically assumed to be higher.

Another limitation is the fact that saliency was only measured as a binary variable. It would be preferable to have a metric variable indicating the degree of saliency, yet this was not possible with the available statistical software.

It would also have been a valuable addition if the respondents had been forced to actually purchase one of the considered or chosen products. Then it could have been argued that more realistic purchase behavior was recorded. With the inclusion of monetary action, the respondents might have put more effort into their consideration and choice behavior. This lack of actual purchase might also be an explanation why the signs did not show the expected effects. On the one hand, why choose a price reduced product if one does not have to pay anything anyway, and on the other hand, respondents might not even have paid attention to the prices in general, but based their choices solely on their preferences instead.

Due to the small sample size, it is possible that existing effects could not be detected, which could have been found with a larger sample.

One difficulty of designing the study was the fact that the chosen product categories are normally populated by a large number of brands and/or a similarly extensive number of variants. Hence, it was impossible to show all necessary products in order to represent a realistic product arrangement.

The design of experiment 1, analyzing the effects of vertical and horizontal location, saliency and facings was very complex with the set-up of the different planograms, manipulating these variables together. It might have been more straightforward if these factors would have been analyzed in separate experiments as well. That way, if only a single factor is manipulated at a time, there are no concurrent explanations for established effects.

8.3 Further Research

Based on these limitations, there are recommendations for further research.

The limited external validity and the problems with eye-level could be overcome with the usage of a mobile eye-tracker instead of the stationary one. Of course, it would be necessary to present the products on real shelves and simulate a more realistic shopping environment. Should the results be similar and hence the issue of missing external validity refuted (maybe even with a field study), the stationary eye-tracker is certainly the more convenient method for this type of research.

It would also be interesting to see if the results are generalizeable to other product categories, which would require the replication of this study but using other categories.

While many of the analyzed factors showed only small effects on consideration and choice directly, previous research suggests that there could be an indirect relationship via attention (e.g., Milosavljevic et al., 2012; Pieters & Warlop, 1999; Shimojo, Simion, Shimojo, & Scheier, 2003). The causal relationship between attention and choice is established by Armel et al. (2008, p. 402) who state that "[v]isual attention matters because it affects the integration process that is used to construct the relative value variable that is used to make choices".

Since the search duration has only been measured and compared based on a search task, a follow-up study with a different set-up should be able to substantiate the findings. In a later study, participants should not be told which product to search for; instead they should be able to choose for themselves, similar to the other tasks in this study, since this would be a more realistic setting.

Overall, this study has been able to support many findings from previous studies and add some interesting findings, which had not been researched before, but there are still many unanswered questions concerning the layout of a supermarket shelf and its effect on consumer behavior, which will hopefully be answered by future endeavors in this field.

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Appendix

Hypotheses

H1·	SKUs on the upper shelf boards …
	    a) receive more attention …
	    b) are considered more often …
	    c) are chosen more often …
	… than SKUs on the lower shelf boards.

H1·m	Price-sensitive customers …
	    a) pay more attention to …
	    b) are more likely to consider …
	    c) are more likely to choose
	… SKUs on the bottom shelves than other customers.

H2·	SKUs on the left half of the shelf …
	    a) receive more attention ...
	    b) are considered more often ...
	    c) are chosen more often ...
	… than SKUs on the right half.

H3·	Salient SKUs …
	    a) receive more attention …
	    b) are more likely to be considered …
	    c) are more likely to be chosen …
	… than non-salient SKUs.

H3·m	Variety Seekers …
	    a) pay more attention to …
	    b) are more likely to consider …
	    c) are more likely to choose …
	… salient SKUs compared to other customers.

H4·	Promoted SKUs with a price cut …
	    a) receive more attention ...
	    b) are more likely to be considered ...
	    c) are more likely to be chosen ...
	… than SKUs without promotion.

H5·	Promoted SKUs without a price cut …
	    a) receive more attention ...
	    b) are more likely to be considered ...
	    c) are more likely to be chosen ...
	… than SKUs without promotion.

H6·	SKUs with more facings …
	    a) receive more attention ...
	    b) are considered more often ...
	    c) are chosen more often ...
	… than SKUs with fewer facings.

H7	The search duration for SKUs on the left is shorter than for SKUs on the right.
H8	Vertical arrangement by brands will shorten search duration.
H8id	Vertical arrangement by brands will shorten search duration for brand-focused customers.
H8ie	Vertical arrangement by attributes will shorten search duration for attribute-focused customers

Table A. 1: Overview of the Hypotheses

Stimulus Material

The following pictures show the stimulus material used in this study.

Figure A. 1: Stimulus for Planogram 1 for Tea

Figure A. 2: Stimulus for Planogram 2 for Tea

Figure A. 3: Stimulus for Planogram 3 for Tea

Figure A. 4: Stimulus for Planogram 4 for Tea

Figure A. 5: Stimulus for Planogram 1 for Cereals

Figure A. 6: Stimulus for Planogram 2 for Cereals

Figure A. 7: Stimulus for Planogram 3 for Cereals

Figure A. 8: Stimulus for Planogram 4 for Cereals

Figure A. 9: Stimulus for Planogram 4 for Chips

Figure A. 10: Stimulus for Planogram 4 for Chips

Figure A. 11: Stimulus for Planogram 3 for Chips

Figure A. 12: Stimulus for Planogram 4 for Chips

Figure A. 13: Signs used for the Chips Shelf

Figure A. 14: Stimulus for Planogram 1 for Beer

Figure A. 15: Stimulus for Planogram 2 for Beer

Figure A. 16: Stimulus for Planogram 3 for Beer

Figure A. 17: Stimulus for Planogram 4 for Beer

116

Figure A. 18: Stimulus for Planogram 1 for Shampoo

Figure A. 19: Stimulus for Planogram 2 for Shampoo

Questionnaire

On the following pages the screen shots from the online questionnaire can be found. The end of the individual pages as they were presented to the respondents are indicated by the editorial line "Daniela Pröll & Magdalena Zimprich, Lehrstuhl Marketing, Universität Wien". The answers on page 1 of the questionnaire lead to the questions on page 3, asking for a choice among the considered products.

ID	1
Stimulus – Gruppe	

nach welchem Shampoo wurde gesucht?

- ◉ Gr. 1: Nivea Shampoo 250ml Diamond
- ○ Gr. 2: Syoss Shampoo 500ml Moisture
- ○ Gr. 3: Fructis Shampoo 250ml Schuppen
- ○ Gr. 4: El Vital Shamp.250ml Colorgl.

nach welchem Shampoo wurde gesucht?

- ◉ Gr. 1: Syoss Shampoo 500ml Moisture
- ○ Gr. 2: Nivea Shampoo 250ml Diamond
- ○ Gr. 3: El Vital Shamp.250ml Colorgl.
- ○ Gr. 4: Fructis Shampoo 250ml Schuppen

Welche Teesorten kommen in die nähere Auswahl?

☐ W.Dungl Magenfreund	☑ Teekanne Earl Grey Tee	☐ Milf.Tee Earl Grey	☐ Twinings Earl Grey Tea	☐ SPAR Tee Kamillen	☐ SPAR Bio Tee Gruener
☐ W.Dungl Gute Laune	☐ Teekanne Gruentee	☑ Milf.Tee Feinst.Gruen	☐ Twinings Green Tea&Lemon	☑ SPAR Tee Gruen	☐ SPAR Bio Tee Schwarzer
☐ W.Dungl Halsfreund	☐ Teekanne Fixnessel Tee	☐ Milf.Tee 9-Kraeuter nat.	☑ Twinings Engl. Breakfast	☐ SPAR Tee Waldbeeren	☐ SPAR Bio Tee Kamille
☐ W.Dungl Fuehl dich wohl	☐ Teekanne Fixapfel Tee	☐ Milf.Tee Beerenauslese	☐ Twinings Lady Grey Tea	☐ SPAR Tee Earl Grey	☐ SPAR Bio Tee Blutorange

Figure A. 20: Questionnaire: page 1, part 1

Welche Cerealien kommen in die nähere Auswahl?

☐ Choco Krispies	☐ Frosties
☑ Choco Krispies Crunchy Rolls	☐ Honey Loops
☐ Chocos	☐ Honey Pops
☑ Cornflakes	☐ Smacks
☐ Crunchy Nut	☐ Special Ks Classics
☑ Froot loops	☐ Tresor

Welche Chips-Produkt kommen in die nähere Auswahl (Consideration)?

☐ Kellys Chips Classic	☑ Kellys Chips Paprika
☐ Lays Oven Chips Natur	☑ Lays Oven Chips Paprika
☑ Lorenz Naturals Classic	☐ Lorenz Naturals Paprika
☑ SPAR RiffleChips gesalzen	☐ SPAR RiffleChips Paprika
☑ FF Chipsfrisch gesalzen	☐ FF Chipsfrisch ungarisch
☐ Crunchips salzig	☐ Crunchips Paprika

Welche bier-Sorten kommen in die nähere Auswahl (Consideration)?

☐ Budweiser	☐ Schützenbräu
☐ Gösser Märzen	☑ Stiegl Goldbräu
☐ Hirter Privat- Pils	☑ Wieselburger Gold
☐ Kaiser Fasstyp	☐ Zipfer Urtyp
☐ Ottakringer	☐ Zwettler Export Lager
☐ Puntigamer	☐ Zwettler Stiftsbräu

Anmerkungen

Weiter

Figure A. 21: Questionnaire: page 1, part 2

Liebe Teilnehmerin, lieber Teilnehmer,

vielen herzlichen Dank für Ihre Teilnahme an dieser Studie!

Die Beantwortung der folgenden Fragen ist für meine Masterarbeit sehr wichtig. Es gibt keine richtigen oder falschen Antworten, es wird ausschließlich nach Ihren Erfahrungen und Einschätzungen gefragt. Die Antworten werden selbstverständlich anonym ausgewertet und können nicht mit Ihrer Person in Verbindung gebracht werden.

[Weiter]

Daniela Pröll & Magdalena Zimprich, Lehrstuhl Marketing, Universität Wien

Figure A. 22: Questionnaire: page 2

9. Das sind die Teesorten, die Sie überlegt haben zu kaufen. Wenn Sie sich für eine entscheiden müssten, welche würden Sie wählen?

○ Teekanne Earl Grey Tee
○ Milford Tee Feinster Grüntee
○ Twinings English Breakfast
○ SPAR Tee Grün

10. Das sind die Cerealiensorten, die Sie überlegt haben zu kaufen. Wenn Sie sich für eine entscheiden müssten, welche würden Sie wählen?

○ Kellogg's Choco Krispies Crunchy Rolls
○ Kellogg's Cornflakes
○ Kellogg's Froot loops

Figure A. 23: Questionnaire: page 3, part 1

11. Das sind die Chipssorten, die Sie überlegt haben zu kaufen. Wenn Sie sich für eine entscheiden müssten, welche würden Sie wählen?

- ○ Kellys Chips Paprika
- ○ Lays Oven Chips Paprika
- ○ Lorenz Naturals Classic
- ○ SPAR RiffleChips gesalzen
- ○ Funny-frisch Chipsfrisch gesalzen

12. Das sind die Biermarken, die Sie überlegt haben zu kaufen. Wenn Sie sich für eine entscheiden müssten, welche würden Sie wählen?

- ○ Stiegl Goldbräu
- ○ Wieselburger Gold

[Weiter]

Daniela Pröll & Magdalena Zimprich, Lehrstuhl Marketing, Universität Wien

Figure A. 24: Questionnaire: page 3, part 2

13. Wie oft verwenden/konsumieren Sie ...

	nie				sehr häufig
Tee	○	○	○	○	○
Cerealien/Frühstücksflocken	○	○	○	○	○
Chips	○	○	○	○	○
Bier	○	○	○	○	○
Shampoo	○	○	○	○	○

[Weiter]

Daniela Pröll & Magdalena Zimprich, Lehrstuhl Marketing, Universität Wien

Figure A. 25: Questionnaire: page 4

Bitte beantworten Sie die folgenden Fragen zur Produktkategorie Tee.

14. Wenn ich Tee kaufe, ist mir ...

	überhaupt nicht wichtig						sehr wichtig
die Geschmacksrichtung	○	○	○	○	○	○	○
die Marke	○	○	○	○	○	○	○

15. Wenn ich Tee kaufe, ...

○	○	○	○	○	○	○
kaufe ich immer das gleiche Produkt						probiere ich gerne etwas Neues aus

16. Wie sehr stimmen Sie der folgenden Aussage zu?

	stimme gar nicht zu						stimme voll zu
	0	1	2	3	4	5	6
Wenn ich Tee kaufe, ist mir der Preis wichtiger als die Marke.	○	○	○	○	○	○	○

Weiter

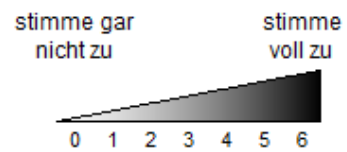Daniela Pröll & Magdalena Zimprich, Lehrstuhl Marketing, Universität Wien

Figure A. 26: Questionnaire: page 5

122

Bitte beantworten Sie die folgenden Fragen zur Produktkategorie Cerealien.

17. Wenn ich Cerealien kaufe, ...

○　　　○　　　○　　　○　　　○　　　○　　　○

kaufe ich immer das gleiche Produkt　　　　　　　　　　　probiere ich gerne etwas Neues aus

18. Wie sehr stimmen Sie der folgenden Aussage zu?

	stimme gar nicht zu					stimme voll zu
	0	1	2	3	4	5	6
Wenn ich Cerealien kaufe, ist mir der Preis wichtiger als die Marke.	○	○	○	○	○	○	○

19. Bitte geben Sie an, wie vertraut Sie mit den folgenden Produkten von Kellogg's sind.

	kenne ich nicht	kenne ich, aber habe ich noch nicht probiert	habe ich probiert
Choco Krispies	○	○	○
Choco Krispies Crunchy Rolls	○	○	○
Chocos	○	○	○
Cornflakes	○	○	○
Crunchy Nut	○	○	○
Froot loops	○	○	○
Frosties	○	○	○
Honey Loops	○	○	○
Honey Pops	○	○	○
Smacks	○	○	○
Special Ks Classics	○	○	○
Tresor	○	○	○

Weiter

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Figure A. 27: Questionnaire: page 6

Bitte beantworten Sie die folgenden Fragen zur Produktkategorie Chips.

20. Wenn ich Chips kaufe, ist mir ...

	überhaupt nicht wichtig						sehr wichtig
die Marke	○	○	○	○	○	○	○
die Geschmacksrichtung	○	○	○	○	○	○	○

21. Wenn ich Chips kaufe, ...

○	○	○	○	○	○	○
kaufe ich immer das gleiche Produkt						probiere ich gerne etwas Neues aus

22. Wie sehr stimmen Sie der folgenden Aussage zu?

	stimme gar nicht zu						stimme voll zu
	0	1	2	3	4	5	6
Wenn ich Chips kaufe, ist mir der Preis wichtiger als die Marke.	○	○	○	○	○	○	○

Weiter

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Figure A. 28: Questionnaire: page 7

Bitte beantworten Sie die folgenden Fragen zur Produktkategorie Bier.

23. Wenn ich Bier kaufe, ...

kaufe ich
immer das
gleiche
Produkt

probiere ich
gerne etwas
Neues aus

24. Wie sehr stimmen Sie der folgenden Aussage zu?

stimme gar nicht zu — stimme voll zu

0 1 2 3 4 5 6

Wenn ich Bier kaufe, ist mir der Preis wichtiger als die Marke.

25. Bitte geben Sie an, wie vertraut Sie mit den folgenden Produkten sind.

	kenne ich nicht	kenne ich, aber habe ich noch nicht probiert	habe ich probiert
Budweiser	○	○	○
Gösser Märzen	○	○	○
Hirter Privat- Pils	○	○	○
Kaiser Fasstyp	○	○	○
Ottakringer	○	○	○
Puntigamer	○	○	○
Schützenbräu	○	○	○
Stiegl Goldbräu	○	○	○
Wieselburger Gold	○	○	○
Zipfer Urtyp	○	○	○
Zwettler Export Lager	○	○	○
Zwettler Stiftsbräu	○	○	○

Weiter

Figure A. 29: Questionnaire: page 8

Bitte beantworten Sie die folgenden Fragen zur Produktkategorie Shampoo

26. Wenn ich Shampoo kaufe, ist mir ...

	überhaupt nicht wichtig						sehr wichtig
die Sorte (z.B. gegen Schuppen, für mehr Volumen)	○	○	○	○	○	○	○
die Marke	○	○	○	○	○	○	○

27. Wenn ich Shampoo kaufe, ...

○   ○   ○   ○   ○   ○   ○

kaufe ich immer das gleiche Produkt   probiere ich gerne etwas Neues aus

28. Wie sehr stimmen Sie der folgenden Aussage zu?

	stimme gar nicht zu						stimme voll zu
	0	1	2	3	4	5	6
Wenn ich Shampoo kaufe, ist mir der Preis wichtiger als die Marke.	○	○	○	○	○	○	○

[Weiter]

Daniela Pröll & Magdalena Zimprich, Lehrstuhl Marketing, Universität Wien

Figure A. 30: Questionnaire: page 9

Die folgenden Fragen beziehen sich auf die Produkte, die Sie zuvor in den Regalen gesehen haben.

29. Beantworten Sie bitte folgende Fragen:

	ja	nein	weiß ich nicht
War das Produkt dabei, das Sie aus der Kategorie **Tee** am häufigsten kaufen?	○	○	○
War das Produkt dabei, das Sie aus der Kategorie **Cerealien** am häufigsten kaufen?	○	○	○
War das Produkt dabei, das Sie aus der Kategorie **Chips** am häufigsten kaufen?	○	○	○
War das Produkt dabei, das Sie aus der Kategorie **Bier** am häufigsten kaufen?	○	○	○
War das Produkt dabei, das Sie aus der Kategorie **Shampoo** am häufigsten kaufen?	○	○	○

30. Aktion

	ja	nein	weiß nicht
War eines oder mehrere der Produkte, die Sie überlegt haben zu kaufen, in Aktion?	○	○	○

falls ja, in welcher Produktkategorie war das verbilligte Produkt?
es können mehrere Antwortmöglichkeiten gewählt werden

☐ Tee
☐ Cerealien
☐ Chips
☐ Bier
☐ Shampoo

Weiter

Daniela Pröll & Magdalena Zimprich, Lehrstuhl Marketing, Universität Wien

Figure A. 31: Questionnaire: page 10

Abschließend gibt es noch ein paar Fragen zu Ihrer Person.

36. Welches Geschlecht haben Sie?

○ weiblich

○ männlich

37. Wie alt sind Sie?

Ich bin [____] Jahre alt

38. Welchen Bildungsabschluss haben Sie?

Bitte wählen Sie den höchsten Bildungsabschluss, den Sie bisher erreicht haben.

○ Pflichtschule

○ Lehre

○ berufsbildende mittlere Schule

○ Matura

○ Universität/FH

○ Anderer Abschluss, und zwar: [_____]

Figure A. 32: Questionnaire: page 11, part 1

39. Wie hoch ist ungefähr Ihr monatliches Nettoeinkommen?

Gemeint ist der Betrag, der sich aus allen Einkünften zusammensetzt und nach Abzug der Steuern und Sozialversicherungen übrig bleibt.

○ unter 250 €

○ 250 € bis unter 500 €

○ 500 € bis unter 1000 €

○ 1000 € bis unter 1500 €

○ 1500 € bis unter 2000 €

○ 2000 € bis unter 3000 €

○ 3000 € bis unter 4000 €

○ 4000 € bis unter 5000 €

○ 5000 € und mehr

○ Diese Frage möchte ich nicht beantworten

40. Sind Sie Links- oder Rechtshänder(in)?

○ Linkshänder

○ Rechtshänder

	ja	nein
Tätigen Sie die meisten Einkäufe in Ihrem Haushalt selbst?	○	○

Figure A. 33: Questionnaire: page 11, part 2

41. Bitte reihen Sie die folgenden Supermarktketten nach der Häufigkeit, in der Sie dort Ihre Einkäufe tätigen.

Die Reihung können Sie vornehmen, indem Sie das Kärtchen an den entsprechenden Platz ziehen, oder durch Doppelklicken, um es an die nächste, freie Stelle zu setzen. Sollten Sie in eine der Ketten gar nicht einkaufen, sortieren Sie diese bitte nicht ein.

Billa

Hofer

Lidl

Merkur

Pennymarkt

Spar, Eurospar, Interspar

Zielpunkt

andere

1

2

3

4

5

6

7

8

Figure A. 34: Questionnaire: page 11, part 3

130

42. Möchten Sie zu dieser Befragung noch etwas anmerken?

[text input box]

[Weiter]

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Figure A. 35: Questionnaire: page 11, part 4

Additional Tables and Figures

		tea	cereals	beer
lift factors and elasticities	constant	0.30 *	0.72 ***	0,97 ***
	facings	0.79 ***	0.56 ***	0,39 ***
	top left	-0.06	-0.03	-0,13
	top middle	-0.08	0.24	0,06
	top right	-0.26	0.01	-0,29 *
	center left	0.16	0.34	-0,05
	center middle	0.28 *	0.17	0,26 **
	center right	-0.02	0.32	-0,24 *
	bottom left	-0.31 *	0.07	-0,27
	bottom middle	-0.18	0.05	0,09
	bottom right	-0.46 **	0.12	-0,10
R Square		0.59 ***	0.70 ***	0.48 ***
n		96	48	48

* p<0.1; ** p<0.05; *** p<0.01

Table A. 2: Effects of Facings – Complete Results of the Multiplicative Model

(n=192)		noted in %	revisited in %	# of fixations	FD in s	FD in %	considered in %	chosen in %
elasticities	ln β_0	2.238 ***	-0.541	-5.195 ***	-6.334 ***	-3.981 ***	-4.249 **	-3.573 *
	β_1	0.204 ***	0.436 ***	0.621 ***	0.613 ***	0.482 ***	0.181	-0.014
	β_2	-0.002	-0.011	-0.029 ***	-0.039 ***	0.047 ***	0.021	0.050 **
	β_3	-0.009 **	-0.025 **	-0.056 ***	-0.073 ***	0.017 *	0.034	0.049 *
lift factors	top left	0.00	-0.03	0.03	-0.02	-0.11	-0.29	-0.15
	top middle	0.08 *	0.15 *	0.20 **	0.14	0.25 **	-0.02	0.21
	top right	-0.08 *	-0.20 **	-0.07	-0.14	-0.18 *	-0.27	-0.27
	center left	0.07	0.21 *	0.23 **	0.31 ***	0.37 ***	0.16	0.53 *
	center middle	0.15 ***	0.31 ***	0.40 ***	0.39 ***	0.51 ***	-0.14	-0.28
	center right	0.01	0.09	0.12	0.18	0.11	-0.22	-0.16
	bottom left	-0.06	-0.16	-0.07	-0.08	-0.16	-0.56 **	-0.20
	bottom middle	0.08 *	0.17 *	0.13	0.09	0.13	0.21	0.22
	bottom right	-0.05	-0.23 **	-0.08	-0.08	-0.11	-0.16	-0.12
R Square		0.41 ***	0.41 ***	0.49 ***	0.43 ***	0.65 ***	0.10 *	0.10 *

* p<0.1; ** p<0.05; *** p<0.01

Table A. 3: Effects of Facings – Complete Results of the Multiplicative Model across Categories
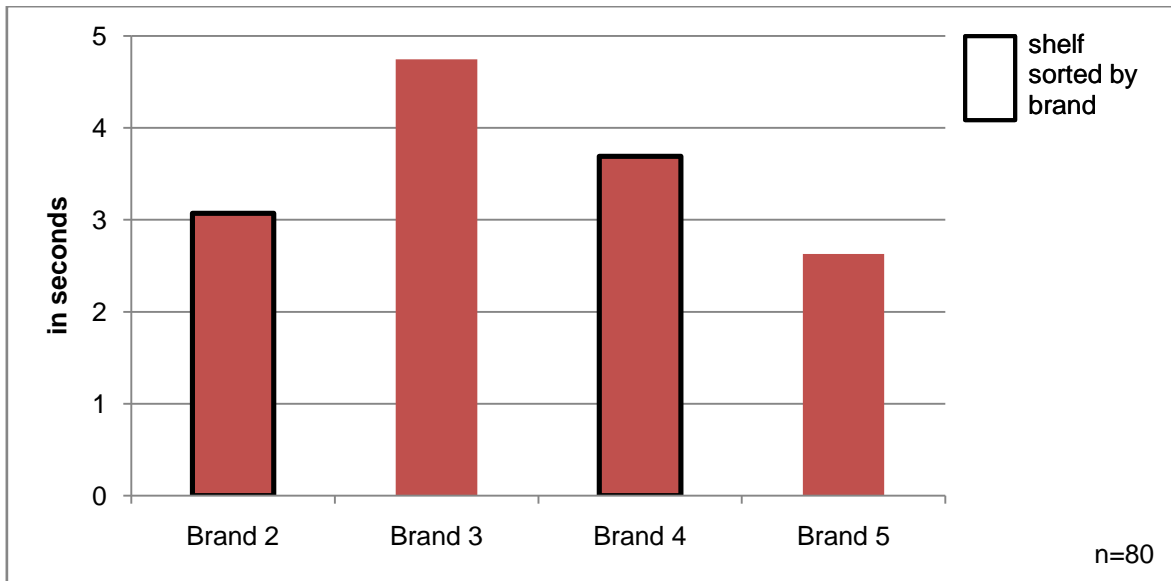
Figure A. 36: SD in s for SKUs from left to right during second Search Task

English Summary

Retail shelf space is a scarce resource and hence a thorough planning of the shelving is necessary. The interests of retailers, manufacturers and customers all need to be taken into account when designing the shelf layout. On the one hand, it has to be decided where the individual products are placed in the shelf, and how often it is supposed to be present, but on the other hand, it is also important how the shelf will be arranged overall (e.g., will products be sorted by brand or by flavor).

The present study investigates those research questions with the help of a stationary eye-tracker. That way, it is possible to measure the attention of the participants and analyze which parts of the shelf get more attention than others. And through manipulations it is also possible to find out which factors contribute to guiding customers' attention towards certain products. Additionally to attention, changes in purchase likelihood based on changes in the shelf layout are researched as well. Furthermore, another important question to be answered is which shelf arrangement makes it easier for customers to orient themselves.

Contrary to expectations, neither a placement on the top half of the shelf nor a location on the left side led to the expected positive effects on attention and purchase likelihood. However, saliency, the use of multiple items of the same products and additional signs increased the amount of attention a product received. Saliency even directly affected purchase likelihood, which could not be found for the other factors.

When taking the shelf layout as a whole into account, products are indeed found faster, when they are placed further on the left. Furthermore, search duration could be decreased when the shopper focus of the customer was matched with the way the shelf was arranged; brand shoppers found their products faster when the shelf was vertically arranged by brand and the opposite is true for attribute shoppers.

Overall, the study could show that there are numerous ways to guide consumers' attention across the supermarket shelf, but direct effects on purchase likelihood are scarce.

German Summary

Regalfläche ist eine sehr beschränkte Ressource im Supermarkt und daher ist es wichtig sie durchdacht zu füllen. Die Sichtweise der Händler, der Hersteller und der Konsumenten sollten alle in die Erstellung des Regallayouts fließen. Einerseits geht es zum Beispiel darum, wo die einzelnen Produkte im Regal platziert werden sollen und wie oft ein Produkt vertreten sein soll, aber andererseits auch wie das Regal im Ganzen aufgebaut ist (z.B. sind die Produkte nach Marken oder Sorten sortiert).

Die vorliegende Studie untersucht diese Fragestellung mit Hilfe einer Augenkamera. Somit ist es möglich die Aufmerksamkeit der Probanden zu messen und festzustellen, welche Areale im Regal mehr Aufmerksamkeit bekommen als andere und auch, welche anderen Faktoren dazu beitragen, die Aufmerksamkeit zu lenken. Neben der Aufmerksamkeit wird auch erforscht, wie sich die Kaufwahrscheinlichkeit der Produkte aufgrund der Manipulationen im Regal verändert. Des Weiteren wird untersucht, bei welchem allgemeinen Aufbau des Regals sich die Probanden besser zurechtfinden.

Während sich die Erwartungen, dass sich eine Platzierungen auf den höheren Regalbrettern oder auf der linken Seite des Regals als vorteilhaft erweist, nicht bestätigen ließen, gibt es doch einen positiven Effekt von einer Mehrfachplatzierung eines Produktes auf die Aufmerksamkeit. Auch wenn ein Produkt eine auffällige Verpackung aufweist, führt das zu mehr Aufmerksamkeit. Die Verwendung von zusätzlicher Beschilderung zeigte nur schwache Effekte.

Bezüglich der Gestaltung des gesamten Regals hat sich gezeigt, dass die Probanden Produkte auf der linken Seite schneller finden als Produkte weiter rechts. Außerdem unterscheidet sich das Suchverhalten je nachdem ob die Konsumenten eher Marken- oder Sortenkäufer sind. Basierend auf den eigenen Präferenzen sollte das Regal also entweder nach Marken oder Sorten vertikal sortiert sein um die Suchdauer zu verringern.

Generell hat die Studie gezeigt, dass es verschiedene Wege gibt die Aufmerksamkeit der Konsumenten zu lenken, aber die Effekte auf die Kaufwahrscheinlichkeit direkt sind gering.

Curriculum Vitae

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Education

In Austria

2013   University of Vienna: Graduation, Major: Business Studies
                         with a specialization in Marketing and International Marketing
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2008   University of Vienna: Graduation, Major: English (Mag.)
                         Diploma Thesis "Language Attitudes towards English among
                         Flemish and Walloon Students in Belgium" graded "excellent"
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Abroad

11/2007   Field Study in Belgium

09/2006 – 02/2007   Exchange Semester in Ghent, Belgium

08/2001 – 06/2002   Exchange Student in Minnesota, US

08/2000   4 weeks of Language School in Vancouver, Canada

Further Qualifications

Languages: German (Mother Tongue)
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Publications

Zimprich, Magdalena (2013). "Post Partner – Die Alternative zur traditionellen
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