Development of a Measurement Concept for Sensory Perception and Investigation of the Relationships with Marketing-Related Performance Indicators

Von der Wirtschaftswissenschaftlichen Fakultät der
Gottfried Wilhelm Leibniz Universität Hannover
zur Erlangung des akademischen Grades

Doktorin der Wirtschaftswissenschaften
– Doctor rerum politicarum –

genehmigte Dissertation

von

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geboren am 26.03.1989 in Hannover

2019

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Tag der Promotion: 22.02.2019

Table of contents

Abstract

Consumers perceive all kinds of information through their five senses. Sensory perception thus represents an essential construct for understanding consumers. It can significantly influence consumer behavior and is therefore of central interest for marketing management and research. According to the two-system approach of cognitive psychology, two forms of sensory perception (explicit and implicit) need to be investigated. However, marketing research lacks a holistic measurement concept for sensory perception (i.e., one that considers all five senses and both perception levels in a consistent manner). Marketing research states a need for sensory scales and for integrative measurement concepts that take into account both perception levels.

This dissertation aims to close this research gap. In detail, the research objectives are (1) to develop and validate a holistic measurement concept for sensory perception and (2) to apply the measurement concept in diverse contexts and investigate the relationships of sensory perception with marketing-related performance indicators. This dissertation consists of seven research papers, arranged in two modules that address the two research objectives. Accordingly, this dissertation provides two major contributions. Module 1 presents a holistic measurement concept for sensory perception. The measurement concept is based on the newly developed sensory perception item set (SPI), which contains the 20 most expressive adjectives (four per sense) to describe how well an object (e.g., product or brand) appeals to the consumer's senses. The SPI can be used both in a questionnaire to measure explicit sensory perception and in a response latency task to measure implicit sensory perception. Module 2 supports the relevance of the measurement concept in diverse contexts (gastronomy, perfume, beverages, industrial products, and food products) and provides empirical evidence for significant relationships of the sensory perception measures with several essential marketing-related variables (e.g., brand experience, brand image, brand satisfaction, brand loyalty, price premium, purchase intention, product design, attitude toward the product, attitude toward the ad, and ad content).

Keywords: sensory perception, sensory marketing, scale development

Zusammenfassung

Konsumenten nehmen sämtliche Informationen über ihre fünf Sinne auf. Die sensorische Wahrnehmung stellt somit ein wesentliches Konstrukt zum Verständnis der Konsumenten dar. Sie kann das Konsumentenverhalten maßgeblich beeinflussen und ist daher von zentralem Interesse für das Marketingmanagement und die Marketingforschung. Nach dem Zwei-Systeme-Ansatz der kognitiven Psychologie müssen zwei Formen der sensorischen Wahrnehmung (explizit und implizit) untersucht werden. Allerdings fehlt es der Marketingforschung an einem ganzheitlichen Messkonzept für die sensorische Wahrnehmung (d. h. das alle fünf Sinne und beide Wahrnehmungsebenen in einheitlicher Weise einbezieht). Die Marketingforschung identifiziert die Bedarfe an sensorischen Skalen und an einheitlichen Messkonzepten, welche beide Wahrnehmungsebenen berücksichtigen.

Diese Dissertation setzt an diesen beiden Bedarfen an und zielt auf die Schließung dieser Forschungslücke ab. Im Detail sind die Forschungsziele (1) die Entwicklung und Validierung eines ganzheitlichen Messkonzepts für die sensorische Wahrnehmung und (2) die Anwendung des Messkonzepts in verschiedenen Kontexten und die Untersuchung der Beziehungen von sensorischer Wahrnehmung mit marketingbezogenen Leistungsindikatoren. Diese Dissertation besteht aus sieben Forschungsarbeiten, eingeteilt in zwei Module, welche die beiden Forschungsziele adressieren. Entsprechend liefert diese Dissertation zwei wesentliche Beiträge für die Forschung. Modul 1 präsentiert ein ganzheitliches Messkonzept für sensorische Wahrnehmung. Das Messkonzept basiert auf dem neu entwickelten Sensory Perception Item Set (SPI), welches die 20 ausdrucksstärksten Adjektive (vier pro Sinn) enthält, um zu beschreiben, wie gut ein Objekt (z. B. Produkt oder Marke) die Sinne des Konsumenten anspricht. Der SPI kann sowohl in einem Fragebogen zur Messung der expliziten sensorischen Wahrnehmung als auch in einer Reaktionszeitaufgabe zur Messung der impliziten sensorischen Wahrnehmung eingesetzt werden. Modul 2 unterstreicht die Relevanz des Messkonzepts in diversen Kontexten (Gastronomie, Parfüm, Getränke, Industrieprodukte und Lebensmittel) und liefert empirische Evidenz für signifikante Zusammenhänge der sensorischen Wahrnehmung mit verschiedenen wesentlichen marketingbezogenen Variablen (z. B. Markenerlebnis, Markenimage, Markenzufriedenheit, Markentreue, Preispremium, Kaufabsicht, Produktdesign, Einstellung zum Produkt, Einstellung zur Werbung, Inhalt der Werbeanzeige).

Schlagwörter: sensorische Wahrnehmung, sensorisches Marketing, Skalenentwicklung

Preface

"No idea is conceived in our mind independent of our five senses."
Albert Einstein (German physicist, 1879-1955)

1. Motivation and research objectives

Sensory perception is a central element in understanding consumers. Consumers capture all stimuli in the environment through their senses, be it a product, a brand logo, a TV commercial, or the atmosphere in a store. Sensory perception encompasses five dimensions (sight, hearing, touch, smell, and taste) and is generally defined as the awareness or understanding of sensory information (Krishna, 2012). For example, the design of a product comprises numerous pieces of sensory information (e.g., color, shape, sound while using, haptic feeling of the surface, and aroma). These pieces of information are interpreted in the consumer's mind and can evoke a positive overall impression. Sensory perception can thus also positively affect attitude and behavior. Therefore, it plays an essential role in marketing management and research.

When investigating perception, the popular two-system approach of cognitive psychology must be taken into account. This approach states that there are two modes of information processing. The operations of System 1 are fast, automatic, effortless, associative, and intuitive. In addition, they are implicit (not available to introspection) and occur on a subconscious level. The operations of System 2 are slower, controlled, effortful, serial, and deliberate (Kahneman, 2003). Thus, they are explicit (available to introspection) and processed on a conscious level. Especially with regard to sensory perception, both modes of information processing are important, as sensory cues may be processed subconsciously (e.g., background music) and consciously (e.g., salient color). Accordingly, there are two forms of sensory perception (implicit and explicit). The explicit system often adopts the intuitive suggestions of the implicit system for efficiency reasons. This may lead to similar judgments (Kahneman, 2011). Depending on the context, however, the two systems can also cause absolutely different responses (Stanovich & West, 2002). For example, consumers may evaluate a product positively on the explicit level because they have consciously perceived it as beautiful but negatively on the implicit level because they have subconsciously perceived the shape as

inconvenient. In addition to different conscious and subconscious memory contents, social desirability can lead to differences in implicit and explicit measures (Fazio & Olson, 2003). For example, consumers may evaluate a product positively on the explicit level because their peer group sees it as stylish but negatively on the implicit level in conformity with their true opinion. To understand consumers accurately and thus to prevent flops due to insufficient information, both levels of perception need to be investigated.

In principle, for an investigation to be possible, a suitable measurement concept is required. According to the well-known quote of Peter Drucker "You can't manage what you can't measure", it is essential for marketing managers, who want to successfully implement sensory marketing activities, to measure the consumers' sensory perception. In marketing practice, there is often uncertainty about the success of a planned marketing activity. For example, it may be uncertain how a new product will perform on the market or how consumers will receive a new branding concept. As a result, marketing managers need a holistic measurement concept for sensory perception to determine whether and to what degree their activity appeals to the consumer's five senses, on both an explicit level and an implicit level. This need has also been identified in marketing research. Krishna (2012) states a need for sensory scales. Furthermore, Baumeister, Clark, Kim, and Lau (2017) call for integrative models that consider both modes of information processing. A comprehensive literature review (see research papers 1 and 2) has shown that marketing research lacks a holistic measurement concept for sensory perception.

The first research objective of this dissertation is therefore to develop and validate a holistic measurement concept for sensory perception that includes all five sensory dimensions (visual, acoustic, haptic, olfactory, and gustatory) and both cognitive levels (explicit and implicit). For this purpose, three basic requirements are identified that need to be fulfilled in the course of this dissertation. The measurement concept must be built on an item set that (1) features a uniform measurement of the five sensory dimensions to enable comparability across the senses, (2) is equally suitable for explicit and implicit measurement methods to enable comparability across both cognitive levels, and (3) is universally applicable to allow the use in diverse industries.

Research objective 1: *Development and validation of a holistic measurement concept for sensory perception*

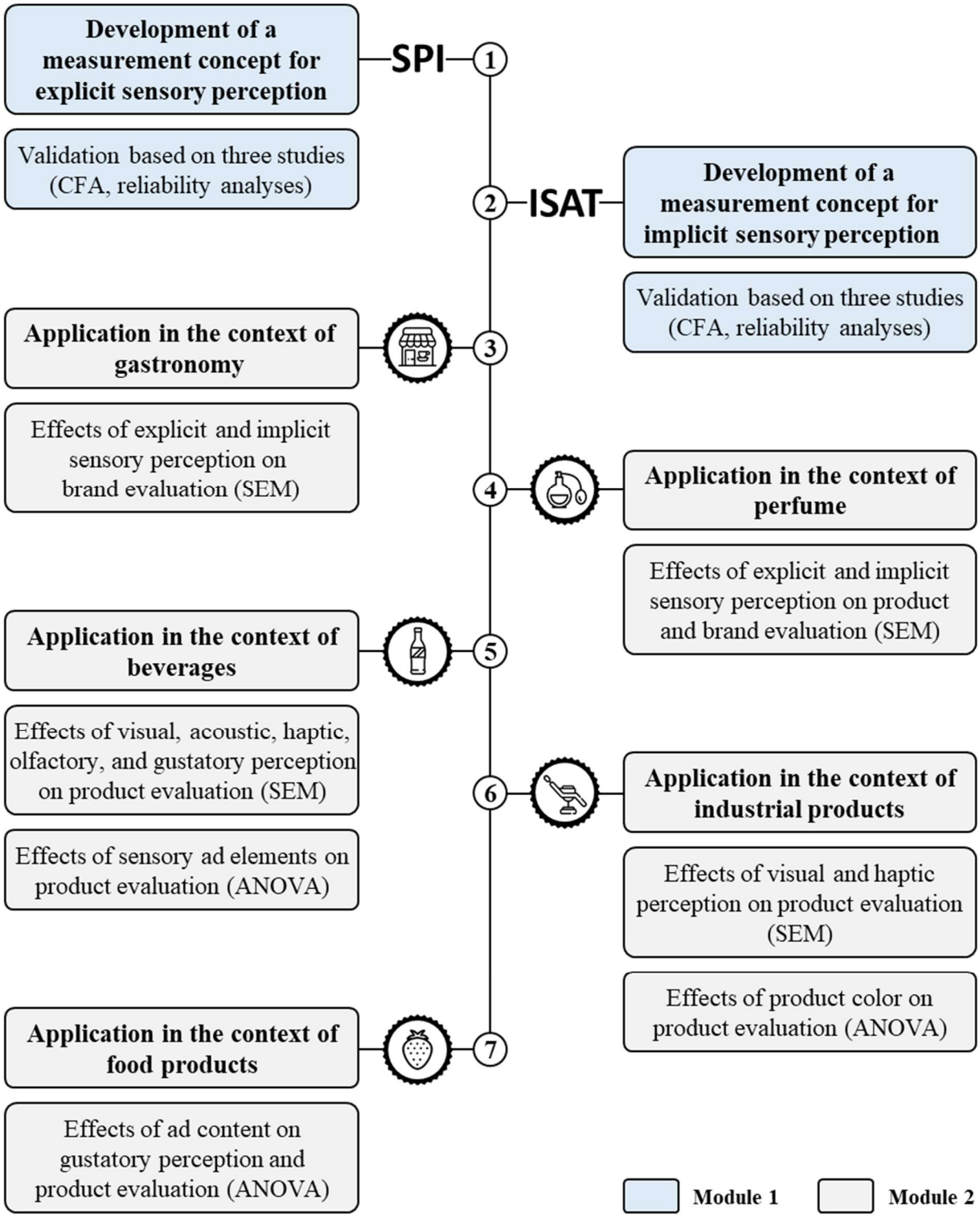
The second research objective of this dissertation is to apply the introduced measurement concept in diverse contexts and to examine whether it can provide insights into the field of marketing, and if so, what those insights are. The literature addresses the significant role of sensory perception in marketing (e.g., Hultén, 2011; Krishna, 2012; Krishna, Cian, & Sokolova, 2016). The aim is thus to investigate whether the developed sensory perception measures relate to marketing-related performance indicators in terms of consumer perception (e.g., attitude, perceived product design, brand image) and consumer behavior (e.g., brand loyalty, price premium, purchase intention), and if so, to what degree they relate.

Research objective 2: *Application of the measurement concept in diverse contexts and investigation of the relationships with marketing-related performance indicators*

This dissertation contains two modules, each addressing one of the abovementioned research objectives. Module 1 consists of two research papers and addresses the first research objective. Module 2 consists of five research papers and addresses the second research objective. The following chapter presents the two modules and the seven research papers in detail.

2. Description of the research papers

Figure 1 shows an overview of the research papers in module 1 (blue) and module 2 (gray). The boxes provide information on the basic contributions of each research paper.



Notes: CFA: confirmatory factor analysis; SEM: structural equation modeling; ANOVA: analysis of variance.

Figure 1: Overview of the modules and research papers

2.1. Module 1: Development and validation of a measurement concept for sensory perception

The first module presents the development and validation of a holistic measurement concept for sensory perception. In detail, two measurement approaches are developed, one for explicit sensory perception (research paper 1) and one for implicit sensory perception (research paper 2), both comprising all five sensory dimensions in a consistent manner. The approaches are built on the same basis, the newly developed sensory perception item set (SPI). The resulting measures are thus comparable across the five senses and both cognitive levels. In detail, ten variables can be computed (implicit and explicit visual, acoustic, haptic, olfactory, and gustatory perception). In addition, a second-order construct can be computed for each cognitive level, thus generating two variables (implicit and explicit sensory perception). The measurement approaches are each validated by three studies.

Research paper 1 "The sensory perception item set (SPI): An exploratory effort to develop a holistic scale for sensory marketing" introduces an item set to measure the consumers' sensory perception along the five senses. The SPI consists of 20 adjectives (four per sense) and provides information for each sensory dimension on the degree to which an object (e.g., product or brand) appeals to the consumer (e.g., how visually appealing it is). Implemented in a questionnaire, the SPI enables the measurement of explicit sensory perception. However, in scale development, it is already taken into account that the items are also suitable for use in the reaction time measurement to enable an analogous measurement of implicit sensory perception in the next research step. The SPI is developed along several process steps: item generation and refinement based on a literature search and expert evaluations, item reduction based on expert interviews, and validation based on three studies. The three studies apply the SPI in the context of diverse objects (laboratory study), gastronomy (field study), and beverages (online study). Confirmatory factor analyses and reliability analyses provide empirical evidence for the validity and reliability of the SPI.

Research paper 2 "The implicit sensory association test (ISAT): A measurement approach for sensory perception" introduces a response latency measurement that involves the SPI and thus measures implicit sensory perception. The ISAT captures the implicit associations between an object (e.g., product or brand) and the sensory perception items, that is, the degree to which that object appeals to the consumer's senses on an implicit level. In detail, a computer screen shows the object (e.g., name, logo, or picture) in combination with each of the sensory

perception items. The subjects are asked to intuitively decide whether the respective item fits the object, and only spontaneous responses given within 3000 ms count. The ISAT thus provides the counterpart to the self-report measurement for explicit sensory perception (see research paper 1) so that comparability across both cognitive levels is enabled. Three studies apply the ISAT in the context of diverse objects (laboratory study), gastronomy (field study), and perfume (laboratory study). Confirmatory factor analyses and reliability analyses provide empirical evidence for the validity and reliability of the ISAT measures. Furthermore, correlation analyses provide empirical evidence that both positive and negative relationships between implicit and explicit sensory perception may occur and that the implicit measures can thus give valuable insights in addition to the explicit measures.

2.2. Module 2: Application of the measurement concept in diverse contexts and investigation of the relationships with marketing-related performance indicators

The second module presents the application of the introduced measurement concept for sensory perception in diverse research contexts. The five research papers further support the relevance of the measurement concept and provide evidence for significant relationships of the sensory perception measures with several essential marketing-related variables. The first four research papers investigate sensory perception as the independent variable that has a significant effect on diverse factors of brand evaluation (research papers 3 and 4) and product evaluation (research papers 5 and 6). Those factors are manifold and contain both perception-related and behavior-related variables. The last research paper (research paper 7) provides additional insights by examining sensory perception as the dependent variable, influenced by advertising content.

Research paper 3 "Effects of consumer sensory perception on brand performance" examines the effects of explicit and implicit sensory perception on brand-related performance indicators (brand experience, brand image, brand satisfaction, brand loyalty, price premium, and buying intention). The data are collected through a field study in a coffee house that appeals to all five senses (e.g., it has a cozy and tradition-rich interior design, classic background music, soft-padded cushions, the smell of coffee, and chocolate truffles). Structural equation modeling provides empirical evidence for a significant (here, positive) effect of implicit sensory perception on explicit sensory perception. Furthermore, explicit sensory perception has a

positive direct effect on brand experience and thus indirect effects on brand image, brand satisfaction, brand loyalty, price premium, and buying intention. Implicit sensory perception shows no significant effect on brand experience and thus acts through explicit sensory perception on brand-related performance indicators. In addition, correlation analyses between the ten individual sensory perception dimensions and the four experience dimensions (sensory, affective, behavioral, and intellectual) provide new knowledge on which senses most strongly relate to which types of experiences.

Research paper 4 "Sensory stimuli in print advertisement – Analyzing the effects on selected performance indicators" investigates the effects of explicit and implicit sensory perception on brand-related performance indicators (brand experience, brand perception, and consumer behavior). In addition, this research paper goes a step further and also examines the effects on product design. Furthermore, in contrast to research paper 3, this paper presents a laboratory study and investigates the relationships in the context of a print advertisement for perfume. The print advertisement is supplemented by certain features to more strongly appeal to the subject's senses (i.e., a self-adhesive foil highlighting the perfume bottles and brand logo to achieve a haptic effect, a QR code directing the subject to the advertising jingle for acoustics, and the perfume sprayed on the advertisement to appeal to the olfactory sense). Structural equation modeling reveals a significant (here, negative) effect of implicit sensory perception on explicit sensory perception. Explicit sensory perception further shows positive direct effects on product design and brand experience and indirect effects on brand perception and consumer behavior. Implicit sensory perception not only has a negative indirect effect through explicit perception but also has a positive direct effect on brand experience. Thus, discrepancies between the two perception levels may lead to opposite effects. This emphasizes the importance of considering both perception levels.

Research paper 5 "Sensory imagery in advertising: How the senses affect perceived product design and consumer attitude" addresses two research questions. On the one hand, it goes a step deeper and investigates the effects of the individual senses (on an explicit level) on product design and attitude. On the other hand, it examines the effects of sensory imagery on sensory perception and marketing-related performance indicators. The data are collected by means of an online experiment on an advertisement for lemonade. There are two versions of the advertisement, a simple one (showing the product and an advertising slogan) and an enhanced one (showing the product and the slogan, which are supplemented by visual elements that

appeal to the five senses, such as speech bubbles with the words ‘mmmh’ to evoke an impression about the good taste and ‘zisch’ to illustrate the sound when opening the sparkling beverage, in order to enhance the imagery processing in the consumer’s mind). Structural equation modeling reveals positive direct effects of the five sensory perception dimensions on the three product design dimensions (esthetics, functionality, and symbolism) and shows which senses most strongly affect which product design dimension. Furthermore, all five sensory perception dimensions have indirect effects on the attitude toward the ad and the attitude toward the product. In addition, analyses of variance (comparison of the control and experimental group) provide empirical evidence for the positive effects of sensory imagery on olfactory and gustatory perception, esthetics, and attitude toward the ad and toward the product.

Research paper 6 “It’s not all about function: Investigating the effects of visual appeal on the evaluation of industrial products using the example of product color” examines two research questions. First, it investigates whether product color as a visual and non-functional design element has a significant effect on attitude toward a product in an industrial context. Second, it analyzes underlying causal relationships, that is, the effects of visual and haptic perception on product design (esthetics, functionality, and symbolism) and on attitude toward the product. The research paper presents an online experiment in the dental market with a sample solely consisting of dentists. The product stimulus is a picture of a treatment chair varying in color (gray, blue, and green). The analysis of variance reveals a significant difference between the three groups. Blue leads to the best attitude, followed by gray and green. Structural equation modeling provides evidence for a positive effect of visual perception on haptic perception. Furthermore, visual perception positively affects all three product design dimensions. Haptic perception positively affects functionality and symbolism (esthetics is solely driven by visual perception). Both visual and haptic perception have an indirect positive effect on attitude toward the product. Overall, it is observable that the most effective path runs via visual appeal and aesthetics, while haptics and functionality play a minor role in the given context.

Research paper 7 “How to best promote my product? Comparing the effectiveness of sensory, functional and symbolic advertising content in food marketing” addresses the effects of different advertising content on gustatory perception and further product evaluation variables. The research paper presents two online experiments on an advertisement for strawberries. The first experiment incorporates three different advertising texts (containing sensory, functional, or symbolic messages). The second experiment combines the three texts with a product picture.

In both cases, analyses of variance are conducted to compare the three groups. The results for study 1 reveal no significant differences, which emphasizes the relevance of all three product benefits for food products. In contrast, the results for study 2 show significant differences. Advertising effectiveness increases with the complementarity of text and picture. The combination of the product picture and symbolic text consistently scores the best. The strongest effect is on gustatory perception. The expected taste is highest in the case of the symbolic text, followed by the functional and sensory text.

3. Conclusion and implications

3.1. Main contributions

This dissertation provides two major contributions. First, it introduces a holistic measurement concept for sensory perception. For this purpose, the sensory perception item set (SPI) was first developed. The SPI, which is established by profound scale development relying on a literature search, expert interviews, and several reliability and validity testing steps, contains the 20 most expressive adjectives (four per sense) to describe how well an object (e.g., product or brand) appeals to the consumer's senses. The SPI captures all five sensory perception dimensions (visual, acoustic, haptic, olfactory, and gustatory) in a consistent manner. The items can be used both in a questionnaire to measure explicit sensory perception and in a response latency task to measure implicit sensory perception. In this connection, this dissertation presents the implicit sensory association test (ISAT), a response latency measurement that represents the counterpart to the self-report measurement. These two measurement approaches provide ten variables (implicit and explicit visual, acoustic, haptic, olfactory, and gustatory perception), which can also be aggregated to two second-order constructs (implicit and explicit sensory perception). Both the implicit and explicit measures were validated by three studies in different contexts. The presented measurement concept represents a first solution for the holistic measurement of sensory perception (i.e., coverage of all five senses and both cognitive modes, comparability across the measures, and applicability to diverse products and industries).

Second, this dissertation provides empirical evidence for the significant relationships of sensory perception with diverse marketing-related performance indicators (e.g., brand experience, brand image, brand satisfaction, brand loyalty, price premium, purchase intention, product design, attitude toward the product, attitude toward the ad, and ad content). The studies provide new knowledge to the respective research fields. The results reveal insights on how to address the senses for the creation of positive brand experiences in the case of gastronomy; for effective advertising design in the case of perfume, beverages, and food products; and for positive product evaluation in the case of an industrial product. In addition, the introduced measurement concept was applied in various research contexts so that the practicability for different products and industries could be further confirmed.

3.2. Implications for management practice

This dissertation provides marketing managers with a holistic solution to measure the consumers' sensory perception, meaning their evaluation of an object (e.g., product or brand) in terms of its visual, acoustic, haptic, olfactory, and gustatory appeal. Differing from a simple overall measure of liking, the introduced measurement concept enables exact information on the effect on each individual sense on both the explicit and implicit levels. Thus, marketing managers who want to successfully implement or monitor sensory marketing activities are advised to conduct market research by employing the SPI in a questionnaire and a response latency task. For example, when planning to launch a new product or release a new commercial, a consumer survey testing how well the product or advertisement appeals to the consumers' senses may be beneficial. By this means, marketing managers can investigate whether their product or commercial has sensory appeal (i.e., if it performs well on all five sensory dimensions and both perception levels) or, if there is potential for improvement, which exact sensory dimension to improve (e.g., the haptic feeling of the product or the music in the commercial that may not be appealing). Furthermore, as the explicit and implicit sensory perception may substantially differ, it is especially important for companies to ensure that they perform well on both perception levels. Otherwise, consumers may not be fully convinced, and negative effects may be overlooked, which may ultimately lead to a flop on the market.

In addition, this dissertation provides valuable knowledge for marketing managers on the use of sensory cues to increase market success. Marketing managers can use sensory marketing to positively affect the consumer's sensory perception and thus the essential marketing-related performance indicators. In gastronomy, appeal to the senses strongly drives the creation of positive brand experiences and thus the entire brand evaluation. For the creation of specific types of experiences (sensory, affective, behavioral, or intellectual), marketing managers need to set different foci regarding the senses they appeal to (e.g., visual and haptic stimuli on both perception levels, which were found to be particularly appropriate in creating mental experiences). Furthermore, with regard to advertisements, marketing managers may not focus only on the visual sense, as the other senses have also proven to be important. The other senses can be addressed either by additional elements in a print advertisement (e.g., haptic foils or integrated scents) or by elements that evoke sensory imagery in the consumer's mind (e.g., speech bubbles or condensation drops on a bottle). Moreover, marketing managers should use a complementary combination of text and picture in advertisements (e.g., sensory picture and

symbolic text) to achieve the best possible product evaluation in terms of, for example, expected taste. With regard to the design of industrial products, marketing managers should focus not only on functional elements but also on visual elements (e.g., product color) that have proven to be primarily important for a positive product evaluation.

3.3. Implications for future research

The research limitations of this dissertation provide interesting starting points for future research. First, the presented studies were limited to specific contexts: gastronomy, perfume, beverages, industrial products, and food products. Thus, the usage and further validation of the measurement concept in different application areas would be interesting, for example, in diverse industries (e.g., fashion) or with respect to other media (e.g., commercials). Second, the SPI was originally established and validated in German. The English version must, therefore, be used and validated in several studies. Accordingly, the relationships between sensory perception and marketing-related performance indicators were only examined for German consumers. Future research can analyze these relationships in other countries and examine cultural differences to gain international insights. Third, this dissertation uses correlation analyses, structural equation modeling, and analyses of variance to investigate the relationships between sensory perception and marketing-related performance indicators. Future research may use further analysis methods (e.g., neural networks to test for non-linear effects). Fourth, the studies in this dissertation examined the relationships of sensory perception with a number of variables of consumer perception and behavior. Future research may analyze the relationships of sensory perception with further variables (e.g., individual importance of the senses as an independent variable or length of stay as a dependent variable). Fifth, this dissertation introduces a measurement concept for sensory perception that considers automatic (implicit)-cognitive processes and controlled (explicit)-cognitive processes. Future research might extend the measurement concept by considering further types of information processing. Camerer, Loewenstein, and Prelec (2005) differentiate not only between automatic and controlled processes but also between cognitive and affective processes, which they combine into four types of neural functioning. Thus, in addition to the cognitive level, marketing researchers could, for example, capture automatic-affective processes by facial expression recognition and controlled-affective processes by “go/no-go” questions. This may allow an even deeper understanding of the consumer’s sensory perception.

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Research papers

Module 1: Development and validation of a measurement concept for sensory perception

P1. **Haase, J.**, & Wiedmann, K.-P. (2018). The sensory perception item set (SPI): An exploratory effort to develop a holistic scale for sensory marketing. *Psychology & Marketing*, 35(10), 727-739.

P2. **Haase, J.**, & Wiedmann, K.-P. (2018). The implicit sensory association test (ISAT): A measurement approach for sensory perception. Submitted at *Journal of Business Research*.

Module 2: Application of the measurement concept in diverse contexts and investigation of the relationships with marketing-related performance indicators

P3. **Haase, J.**, Wiedmann, K.-P., & Labenz, F. (2018). Effects of consumer sensory perception on brand performance. *Journal of Consumer Marketing*, forthcoming.

P4. Labenz, F., Wiedmann, K.-P., Bettels, J., & **Haase, J.** (2018). Sensory stimuli in print advertisement – Analyzing the effects on selected performance indicators. *Journal of International Business Research and Marketing*, 3(2), 7-15.

P5. **Haase, J.**, Wiedmann, K.-P., & Bettels, J. (2018). Sensory imagery in advertising: How the senses affect perceived product design and consumer attitude. *Journal of Marketing Communications*, forthcoming.

P6. Wiedmann, K.-P., **Haase, J.**, Bettels, J., & Reuschenbach, C. (2018). It's not all about function: Investigating the effects of visual appeal on the evaluation of industrial products using the example of product color. *Journal of Product and Brand Management*, forthcoming.

P7. **Haase, J.**, Wiedmann, K.-P., Bettels, J., & Labenz, F. (2018). How to best promote my product? Comparing the effectiveness of sensory, functional and symbolic advertising content in food marketing. *British Food Journal*, 120(8), 1792-1806.

P1:

The sensory perception item set (SPI): An exploratory effort to develop a holistic scale for sensory marketing

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Psychology & Marketing

35(10), 727-739

DOI: 10.1002/mar.21130

RESEARCH ARTICLE

WILEY Psychology & Marketing

The sensory perception item set (SPI): An exploratory effort to develop a holistic scale for sensory marketing

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Abstract

Sensory marketing is increasingly gaining importance as a promising approach to effectively appeal to consumers. To predict and monitor the success of sensory marketing activities, it is necessary to assess consumers' perception of sensory cues. For this purpose, the authors present an exploratory effort to develop a holistic scale to measure consumers' sensory perception along the five dimensions of visual, acoustic, haptic, olfactory, and gustatory perception—the sensory perception item set (SPI). The SPI consists of 20 adjectives (four per sense) and is the first measurement tool that includes, and thus enables a consistent measurement with regard to, all five senses. In addition, the SPI is simple to employ and is applicable to diverse products and industries. Based on three studies, the authors provide evidence of the reliability and validity of the SPI. Further, the results show that the SPI is significantly correlated with three essential marketing-related outcome variables (attitude, word-of-mouth recommendation, and buying intention). Consequently, this paper presents an approach that marketing managers may employ to better understand the consumer and, hence, to receive valuable information for product design or brand communication.

KEYWORDS

consumer psychology, item set, measurement, scale development, sensory marketing, sensory perception

1 | INTRODUCTION

Attention to sensory marketing has recently grown exponentially (Krishna, Cian, & Sokolova, 2016). Today, the targeted use of sensory cues is becoming increasingly important for marketing managers to effectively appeal to consumers (Chang & Chieng, 2006; Wiedmann, Hennigs, Klarmann, & Behrens, 2013). However, the question arises of how marketing managers can conduct sensory marketing successfully. What needs to be done to ensure that the sensory cues actually appeal to the consumer?

To date, the main focus of marketing practice remains on the visual and, at most, acoustic channels. As the consumer's sensory perception results from the combination of sight, hearing, touch, smell, and taste, the content transmitted through the neglected senses is left to chance. Therefore, marketing management should apply a holistic communication concept, considering as many senses as possible to convey a message in a more coherent and powerful way (Lindstrom, 2005). Further, to manage sensory marketing effectively, it is crucial for marketing managers to understand the consumer effect evoked by a specific marketing activity. For example, there is often uncertainty about how a newly developed product will perform in the marketplace. Every product represents a conglomerate of several sensory cues (e.g., shape, haptic feeling of the surface, color, sound while using, and scent) that may or may not appeal to the consumer. Marketing managers can eliminate this uncertainty by determining the consumers' sensory perception of the product. In this manner, it can be ensured that the current product appeals to the consumer in all five sensory dimensions, or if not, the facet to address (i.e., which sensory dimension to improve) can be identified.

However, in marketing practice, managers often have a limited budget and must address the question of how to obtain holistic information concerning the consumers' sensory perception. Obviously, there is an urgent need for a holistic measurement approach. Therefore, this paper presents an exploratory effort to develop a new scale to capture consumers' sensory perception including all five senses—the sensory perception item set (SPI). The SPI represents a holistic measurement tool for the consumer's perception of a product or a brand with regard to its sensory appeal. The SPI enables the capture of the magnitude of each sensory dimension (i.e., visual, acoustic, haptic, olfactory, and gustatory), for example, to what degree the object of investigation is seen as visually appealing. As the presented approach comprises all five senses, all possible use cases are addressed, and the respective senses can be examined in a consistent manner. Further, the introduced measure is highly related to essential outcome variables of marketing

management (attitude, recommendation behavior, and buying behavior). Thus, the authors introduce a highly flexible and universally usable (i.e., for diverse products and industries) measurement tool for sensory marketing that is very simple to employ and highly relevant in the marketing context.

In the following sections, the authors first provide a brief literature review of existing measurement approaches. Then, the SPI is developed along five process steps. First, an initial item pool is generated and refined (process step 1). Second, the items are further reduced based on expert interviews (process step 2). Next, three studies confirm the reliability and validity of the SPI (process steps 3 through 5). The first two studies purify the scale and determine the optimal solution. The third study confirms the final four-item solution and provides evidence for the relationships between the SPI and marketing-related outcome variables. The paper closes with a discussion.

2 | REVIEW OF EXISTING MEASUREMENT APPROACHES

The marketing literature has already identified and addressed the challenge of investigating the perception of sensory stimuli; it offers numerous methods for measuring such perception. Hence, the following overview provides a basis for deliberations and identifies gaps that need to be closed within the existing set of methods. In the field of sensory evaluation, various approaches have been developed (see Table 1).

Fundamentally, there are three groups of test methods: discrimination testing, descriptive analysis, and hedonic testing (Lawless & Heymann, 2010). Discrimination testing focuses on differences between two or more products. This type of comparison can be limited to overall perception (e.g., duo-trio test, "A"–"not A" test) or amplified to include specific sensory attributes (e.g., paired comparison test, ranking; Meilgaard, Carr, & Civille, 2006). Descriptive analysis methods aim to identify and quantify the sensory attributes of products. This type of assessment can be either absolute for a single product (e.g., quantitative descriptive analysis, flavor profile method) or relative to other products (e.g., flash profiling, napping). Descriptive analysis is applicable to all five senses and may establish detailed product profiles (Dehlholm, Brockhoff, Meinert, Aaslyng, & Bredie, 2012; Hootman, 1992). Through the use of such methods, several item sets have been introduced (e.g., Drake & Civille, 2003; Drake, Karagul-Yuceer, Cadwallader, Civille, & Tong, 2003; Drake, McIngvale, Gerard, Cadwallader, & Civille, 2001; Faye et al., 2004; Leighton, Schönfeldt, & Kruger, 2010; Lotong, Chambers, & Chambers, 2000; Stampanoni, 1994; Verriele et al., 2012). However, the existing item sets are specified to particular senses or even products. Hedonic tests examine the acceptance of or preference for products as a whole (e.g., hedonic scale, paired comparison test) or concerning specific sensory attributes (e.g., just-about right scale; Meilgaard et al., 2006).

Indeed, these three existing methods are suitable for revealing the mere existence of a difference, for investigating specific attributes, and for capturing general liking, respectively. However, they lack the capability to bring together the different types of relevant information. Accordingly, it may be of interest to determine the reasons for

TABLE 1 Literature review

Reference	Method	Measure(s)
Discrimination testing		
ISO (2005)	Paired comparison test	Attribute difference/overall difference
ISO (2006)	Ranking	
ASTM (2011)	Same-different test	Overall difference
ISO (2004a)	Duo-trio test	
ISO (2004b)	Triangle test	
Meilgaard et al. (2006)	Two-out-of-five test	
ISO (1987)	"A"–"not A" test	
DIN (2015)	Difference-from-control test	
Descriptive analysis		
Stone, Sidel, Oliver, Woolsey, and Singleton (1974)	Quantitative descriptive analysis	Sensory attributes (absolute)
Brandt, Skinner, and Coleman (1963)	Texture profile method	
Cairncross and Sjostrom (1950)	Flavor profile method	
Muñoz and Civille (1992)	Spectrum descriptive analysis	
Williams and Langron (1984)	Free-choice profiling	
Larson-Powers and Pangborn (1978)	Time-intensity descriptive analysis	
Dairou and Sieffermann (2002)	Flash profile	Sensory attributes (relative)
Pagès (2005)	Napping	
Risvik, McEwan, Colwill, Rogers, and Lyon (1994)	Projective mapping	
Rosenberg, Nelson, and Vivekananthan (1968)	Free sorting	
Perrin et al. (2008)	Ultra-flash profile	
Moskowitz (1972)	Ideal profiling	Sensory attributes, ideal values (absolute)
Hedonic testing		
ISO (2005)	Paired comparison test	Overall preference
ISO (2006)	Ranking	
Jones et al. (1955)	Hedonic scale	Overall acceptance/attribute acceptance
Green, Shaffer, and Gilmore (1993)	General labeled magnitude scale	
Schutz and Cardello (2001)	Labeled affective magnitude scale	
Rothman and Parker (2009)	Just-about-right scale	Attribute acceptance

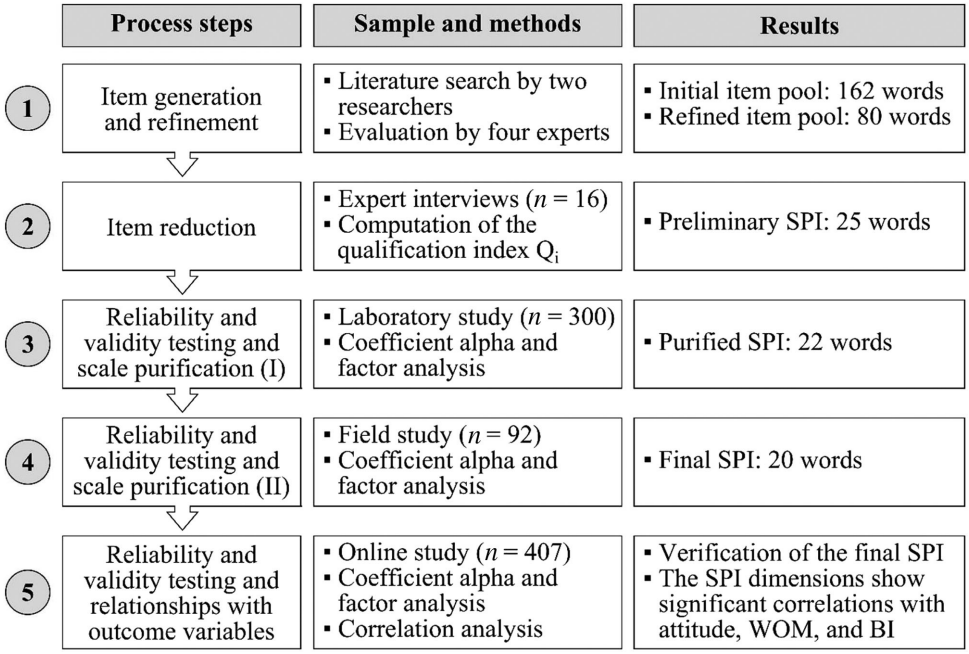

FIGURE 1 **Overview of the scale-development process**
Note: SPI, sensory perception item set; WOM, word of mouth; BI, buying intention.

and intensities of a difference so that marketing management can be advised whether and how to improve a product. Moreover, beyond the description in terms of specific characteristics, it may be useful to determine the personal responses of consumers to the sensory appearance of a product (Stone, 2015). Furthermore, as all five senses are involved in the consumer's sensory perception, a limitation to particular senses may be inadequate. Additionally, being constrained to certain products or services can hamper benchmarking. Therefore, to make their offerings comparable, companies need a universal approach that can be applied to each of the five senses. Consequently, the overall aim emerging from the research gaps is to develop a new measurement tool for sensory perception that is holistic (i.e., including all five senses) and universally applicable (i.e., not limited to specific industries or sensory attributes).

3 | DEVELOPMENT OF THE SENSORY PERCEPTION ITEM SET (SPI)

The literature review has shown that existing approaches do not provide a holistic and universal solution for the measurement of the consumer's sensory perception, that is, to what degree a random product or brand appeals to the consumer's five senses. The authors have the goal of addressing this deficiency and provide an initial approach to develop a holistic scale to capture sensory perception, which considers all five sensory dimensions (i.e., visual, acoustic, haptic, olfactory, and gustatory perception) in a consistent manner and not limited to a specific industry. In agreement with prior research, the authors followed established scale-development procedures (e.g., Bloch, Brunel, & Arnold, 2003; Churchill, 1979; Froehle & Roth, 2004; Homburg, Schwemmle, & Kuehnl, 2015; Sweeney & Soutar, 2001). Figure 1 shows an overview of the scale-development process. The SPI is developed in five process steps beginning with the generation of an initial item pool of 162 words, which is refined to a reliable and valid scale of 20 words (parsimonious with four words for each dimension) that is significantly correlated with marketing-related outcome variables.

3.1 | Item generation and refinement (process step 1)

Establishing the basis for the measurement tool requires the development of an item selection capturing the consumer's evaluation of sensory stimuli. As marketing managers need methods that are simple to employ and marketing researchers need scales that are easy to integrate in a questionnaire and easy for subjects to understand, the study focuses a priori on single-word items (i.e., adjectives and substantives). In addition, to facilitate the potential future integration of the scale into measurement tools other than a questionnaire (e.g., response latency measurement), where phrases or full sentences may not be suitable, it seems beneficial to use single words in data collection.

Moreover, to attain high reliability and to capture all facets of the consumer's sensory perception, multi-item measures are useful (Baumgartner & Homburg, 1996; Peter, 1979). In addition, Churchill (1979) recommends using multi-item measures as they diminish three major measurement difficulties: the specificity of items can be averaged out, fine distinctions among people are enabled, and the measurement error can be decreased. Hence, the aim is to establish an item set with a definite number of items per sense. Furthermore, the eventual purpose is to examine the effectiveness of specific sensory marketing activities rather than to provide information about particular product attributes or the overall liking of products. Hence, the items should be positive and specific to a sense (e.g., tasty, instead of sweet or pleasant). Moreover, the objective is to set reflective measurement

models, which are characterized by equally valid indicators that are interchangeable (Jarvis, MacKenzie, & Podsakoff, 2003). Therefore, the items shall have similar meanings per sense.

Language per se yields a finite number of useable words, providing a natural pool of possible items. Consequently, using lexicons, word-finding dictionaries, and additional glossaries, the authors gathered a list of 162 words searching independently of one another. In the next step, four experts in the field of sensory marketing were asked to rate the overall qualifications of these words based on the relevant criteria: clearly positive, unambiguously assignable to one sense, and universally applicable. Thus, all of the criteria had to be fully satisfied. Each item was rated on a three-point rating scale (1 = qualified, 2 = undecided, 3 = not qualified). The ones rated as not qualified by the majority were eliminated, leading to a refined item pool of 80 words for the following expert interviews.

3.2 | Item reduction (process step 2)

For scale purification, the authors conducted expert interviews. A total of 16 subjects participated, one half from science and the other half from business, all working in the field of sensory research or sensory marketing. The questionnaire was standardized and comprised open-ended (in the introductory part) and closed-ended questions (in the main part). After some introductory inquiries (e.g., relevance of sensory marketing, duration and area of expertise), the subjects were asked to evaluate the 80 words from the refined item pool. The main part of the questionnaire consisted of two blocks for each sense. In the first step, a list of the items associated with the respective sense was presented, and the task was to check all the words assessed as being universally applicable. In the second step, only those items checked in the previous question were presented in a further list. The next task was to select the top five items according to their expressive power to describe sensory stimuli appealing to the respective sense. Finally, basic socio-demographic data were gathered.

For data analysis, SPSS 24 and Excel 2013 were used. To determine the best items for each sense, a qualification index for each word (Q_i) was computed. Universal applicability serves as a necessary condition; expressive power represents a sufficient condition. More precisely, the number of mentions ($n_{m,i}$) within the top five and the mean placement ($\bar{x}_{p,i}$) are decisive. Hence, the qualification index was calculated as the product of the share of the mentions across the sample and the mean placement in rescaled form so that it can take values in the interval 0 to 1 (see Equation (1)).

$$Q_i = \frac{n_{m,i}}{n} * \frac{p_{max} - \bar{x}_{p,i}}{p_{max} - p_{min}} \quad (1)$$

where Q_i is the qualification index of word *i*, $n_{m,i}$ is the number of mentions of word *i*, *n* is the sample size (here: $n = 16$), p_{max} is the last place in the top list (here: $p_{max} = 5$), p_{min} is the first place in the top list (here: $p_{min} = 1$), and $\bar{x}_{p,i}$ is the mean placement of word *i*.

Regarding the decision concerning the number of items, Nosek, Greenwald, and Banaji (2005) state that including at least four items per category is ideal. Froehle and Roth (2004) limited the number of items to four per construct to ensure a higher completion rate, adequate incentive levels, and higher quality responses. Following this and considering pragmatic concerns regarding the questionnaire, in a first step, the number of items per sense is set at five to establish a preliminary SPI with the eventual goal of empirically reducing the scale to four items per sense.

Taking into account the highest qualification indices, substantives appeared negligible across all senses, so 25 adjectives were selected to constitute the preliminary SPI. The original SPI was established in German. However, to facilitate the usage of the items at an international level, the procedure of parallel translation as recommended by Malhotra, Agarwal, and Peterson (1996) was applied. To ensure the accuracy of the translation, four bilingual speakers who spoke English as their native language (three of them working in the field of linguistics) completed the translation. In addition, all of the translators were briefed and supported with regard to the sensory content of the words.

3.3 | Study 1: Laboratory study (process step 3)

3.3.1 | Methods

For the evaluation of the scale with regard to reliability and validity, the authors conducted an initial laboratory study. The main purpose was a first application of the sensory perception items within a questionnaire and thus an assessment of a wide range of objects.

Prior to the main study, to increase the quality of data collection, the authors performed a pretest (Hunt, Sparkman, & Wilcox, 1982). The specific aim was to identify objects that made a substantial impression on the senses and were thus appropriate for testing the SPI in a first attempt. Beforehand, three sensory experts preselected five stimuli per sense. The stimuli were chosen with respect to their particular expressiveness for the respective dimension (e.g., 3D-sound for acoustic perception or colorful pictures for visual perception) and their collective ability to represent a wide range (e.g., food and beverages covering all five basic flavors for gustatory perception). To further reduce the number of stimuli for the main study, ten subjects (i.e., two per sense) participated in a preliminary survey. Subsequently, the test persons were exposed to a stimulus, with the other senses being controlled and were then asked to rate it on two global measures–one for the intensity of its appeal to the specific sense and one for overall liking using the 9-point hedonic scale by Jones, Peryam, and Thurstone (1955). To obtain one decisive index, both thermometer items were combined by multiplication. According to that index, three stimuli for visual (i.e., picture of sunset, optical illusion, fairytale scene), acoustic (i.e., film music, opera singing, paper rustling), haptic (i.e., heat pack, steel sculpture, fleece ball), olfactory (ground coffee, rose soap, squeezed oranges), and gustatory perception (e.g., milk chocolate, savory cheese, potato chips) were finally selected.

To test the preliminary SPI by means of the 15 stimuli, the authors then conducted the main study. As in the pretest, it took place in a laboratory to control for disruptive effects. In addition, the neutral and silent room was further equipped with partition panels to separate the subject from the interviewer. A total of 100 test persons (i.e., 20 per sense) participated in the study. The principal task was to sense the stimuli and assess them via a web-based questionnaire. More precisely, the data collection comprised three parts. The first section

TABLE 2 Demographic profile of the sample (study 1)

Variable	Characteristics	*n*	%
Age	18–21 years	147	49
	22–30 years	135	45
	> 30 years	18	6
Gender	Female	150	50
	Male	150	50
Marital status	Single	282	94
	Married	15	5
	Divorced	3	1
Education	Junior high school diploma	9	3
	Senior high school diploma	201	67
	University degree	90	30
Occupation	Trainee	6	2
	Student	246	82
	Full-time employee	39	13
	Part-time employee	9	3
Income	Very low income (< 1,000 €)	90	30
	Low income (1,000–2,000 €)	63	21
	Middle income (2,000–3,000 €)	57	19
	High income (3,000–4,000 €)	39	13
	Very high income (> 4,000 €)	36	12
	No answer	15	5
Total sample size		**300**	**100**

stated introductory questions. In the second and main section, the three stimuli were presented successively for 20 seconds each. During the stimulus contact, possible bias resulting from interactions of the senses (Krishna, 2006; Spence, 2011) was controlled for (e.g., using eye masks to test haptic, olfactory, or gustatory perception). Following each contact period, the subjects were asked to rate the object in terms of the preliminary SPI. More precisely, the subjects were asked if they associate the object under investigation with the following attributes. Then, the items were presented in blocks, each dealing with one sense, thereby measuring one dimension of the SPI (i.e., visual, acoustic, haptic, olfactory, or gustatory perception). To preclude response bias due to order effects, first, the five items were rotated in randomized order within the blocks and second, the blocks were presented in randomized order within the questionnaire (Rahim, 1988). Finally, the subjects answered on five-point Likert scales (1 = strongly disagree, 5 = strongly agree). Furthermore, for eventual external validation, all five sensory dimensions were additionally measured by a global item (Greenwald, Nosek, & Banaji, 2003; Wiedmann, Hennigs, Schmidt, & Wüstefeld, 2011). In this case, the subjects responded on eleven-point semantic differentials (e.g., 1 = very negative visual appearance, 11 = very positive visual appearance). Each global item was inquired right next to the connected item block. Subsequently, the next two stimuli were presented, and the procedure was rerun for both. The order of the three stimulus blocks was randomized, similar to the order of the questions within the blocks. Finally, the last section inquired about social demographics. Table 2 shows the characteristics of the sample.

Ages ranged from 18 to 60 years, with an average age of 23.7 years. The gender distribution was even (i.e., 50% women and 50% men). With regard to the other demographic parameters, most of the participants were single (94%), had graduated from senior high school (67%), were students (82%) and had a monthly income lower than 1,000 € (30%). As the subjects answered the same questions for three objects and the related variables can thus be arranged below each other in the dataset, the sample size for further analysis increases to 300.

3.3.2 | Results

For the evaluation of the measurement models, the authors check several quality criteria for each sensory dimension and item using SPSS 24. To test for reliability, Cronbach's alpha is computed; to test for validity, factor analyses, and correlation analyses with the respective global measure are conducted. Cronbach's alpha (α), representing the most prevalent measure of internal consistency, usually must exceed a value of 0.7; in the early stages of basic research, however, a value of 0.6 may suffice (Churchill, 1979; Peterson, 1994). Additionally, the requirement for the Kaiser-Meyer-Olkin measure of sampling adequacy (MSA) is a value of at least 0.7 for a middling level or 0.6 for a mediocre level (Kim & Mueller, 1978). Furthermore, the average variance extracted (AVE) as well as the factor loadings are supposed to be higher than 0.5 (Bagozzi & Yi, 1988; Hulland, Chow, & Lam, 1996). Moreover, items with factor loadings between 0.4 and 0.7 may be removed from the scale if this leads to an increase in reliability and validity (Hair, Ringle, & Sarstedt, 2011). Finally, the items should be significantly correlated with the global measure, preferably with high coefficients (r), for external validity (Greenwald et al., 2003; Wiedmann, Hennigs, Schmidt, & Wuestefeld, 2011). Table 3 gives the results for the stated quality criteria.

In the first step, for each factor (i.e., each sensory dimension), all five items are included. In those cases, the authors already find prevailing affirmation. With a minimum Cronbach's alpha of 0.79, MSA of 0.69, and AVE of 0.59, all of the requirements are met. In addition, all items are significantly correlated with the respective global measure at least at $P \leq 0.05$. The factor loadings are mostly above 0.7, and only in the case of "aromatic" as an indicator for olfactory perception are insufficient values found. Moreover, two of the 25 indicators show factor loadings in the interval of 0.4 to 0.7. For this reason and, as stated above, for increased practicability, the measurement models may be reduced. To achieve a parsimonious scale as recommended by various researchers (e.g., Batra, Lenk, & Wedel, 2010; Homburg et al., 2015; Park, MacInnis, Priester, Eisingerich, & Iacobucci, 2010), the goal is to detect the four items with the strongest explanatory power for their respective sense. In a successive refinement, first, only the indicators not fulfilling the requirements are eliminated (i.e., stylish, aromatic, and delicious). The results of the purified solution now reveal satisfactory values without exception; Cronbach's alpha reaches a minimum of 0.83, MSA of 0.69, and AVE of 0.67. As the remaining correlation coefficients have not been affected by the item reduction, there are still significant correlations at least $P \leq 0.05$. Regarding the height of the coefficients, the results predominantly indicate strong relationships. In contrast, the other measures for reliability

TABLE 3 Reliability and validity testing (study 1)

	Preliminary SPI	α	MSA	AVE	Factor loadings	*r*
Visual	Aesthetic	0.823	0.801	0.594	0.715	0.594***
	Attractive				0.816	0.317*
	Beautiful				0.863	0.572***
	Pretty				0.812	0.590***
	Stylish				0.624	0.430***
Acoustic	Euphonic	0.948	0.884	0.829	0.909	0.724***
	Good-sounding				0.931	0.687***
	Harmonious				0.907	0.560***
	Melodic				0.953	0.699***
	Sonorous				0.847	0.727***
Haptic	Comfortable	0.900	0.845	0.717	0.884	0.627***
	Handy				0.851	0.598***
	Soothing				0.890	0.658***
	Temperate				0.742	0.437***
	Well-shaped				0.858	0.728***
Olfactory	Aromatic	0.786	0.685	0.618	0.182	0.319*
	Fragrant				0.915	0.735***
	Nice-smelling				0.910	0.756***
	Perfumed				0.929	0.696***
	Scented				0.729	0.535***
Gustatory	Appetizing	0.887	0.810	0.699	0.885	0.833***
	Delicious				0.658	0.451***
	Flavorful				0.858	0.770***
	Palatable				0.903	0.814***
	Tasty				0.852	0.805***
	Purified SPI	α	**MSA**	**AVE**	**Factor loadings**	*r*
Visual	Aesthetic	0.827	0.785	0.668	0.733	0.594***
	Attractive				0.798	0.317*
	Beautiful				0.891	0.572***
	Pretty				0.841	0.590***
Acoustic	Euphonic	0.948	0.884	0.829	0.909	0.724***
	Good-sounding				0.931	0.687***
	Harmonious				0.907	0.560***
	Melodic				0.953	0.699***
	Sonorous				0.847	0.727***
Haptic	Comfortable	0.900	0.845	0.717	0.884	0.627***
	Handy				0.851	0.598***
	Soothing				0.890	0.658***
	Temperate				0.742	0.437***
	Well-shaped				0.858	0.728***
Olfactory	Fragrant	0.898	0.686	0.767	0.916	0.735***
	Nice-smelling				0.911	0.756***
	Perfumed				0.932	0.696***
	Scented				0.728	0.535***

TABLE 3 (continued)

	Purified SPI	α	MSA	AVE	Factor loadings	r
Gustatory	Appetizing	0.904	0.795	0.786	0.915	0.833***
	Flavorful				0.869	0.770***
	Palatable				0.917	0.814***
	Tasty				0.843	0.805***

Note: α, Cronbach's alpha; MSA, Kaiser-Meyer-Olkin measure of sampling adequacy; AVE, average variance extracted; r, Pearson correlation with the global measure; *indicates significance at the $P \leq 0.05$ (** $P \leq 0.01$; *** $P \leq 0.001$) level of confidence (two-tailed).

and validity are basically improved through the item reduction; in particular, Cronbach's alpha and the AVE are enhanced throughout. Furthermore, the factor loadings are now all above 0.7. Accordingly, a purified SPI comprising 22 words is established.

3.4 | Study 2: Field study (process step 4)

3.4.1 | Methods

For further evaluation of the SPI in a different context and for further purification to an eventual parsimonious solution, the authors conducted a field study. The study occurred in a popular and well-established coffee house serving gastronomic specialties (e.g. homemade pastries) and offering an outstanding atmosphere (e.g. vintage furnishings). The primary objective was to investigate the sensory perception of the coffee house; that is, how well the particular senses of the consumers are addressed. The gallery was closed for the study so that the subjects did not feel disturbed or observed but had a perfect view of the seating area and the counter display. Moreover, on a separate table, pastries were served on étagères. In total, 92 test subjects participated. This time, each one was confronted with and questioned about all of the five senses. The basic task was to absorb the stimuli in the coffee house and to rate the brand once more by means of a web-based questionnaire. The data collection was structured similarly to the laboratory study; again, it consisted of three parts. The first one raised introductory questions (e.g. liking of pastries, visit frequency). The second section involved the direct stimulus contact and its assessment. Therefore, the subjects were invited to eat a pastry and have a seat right at the balustrade. Furthermore, the mission was to touch, smell, and eat the product as well as to inspect the café, that is, to look around, listen to the ambient sound, feel the furniture, etc., for one minute. After that, the test persons were asked to fill out the questionnaire. In this context, next to the purified SPI, one global measure per sense was captured (e.g., taste adventure). The final section covered social demographics. Table 4 presents the characteristics of the sample.

The subjects' ages varied from 18 to 67, with an average age of 25.7 years. Moreover, the two sexes were almost equally represented (i.e., 55.4% women and 44.6% men). With regard to the other demographic parameters, most participants were single (92.4%), had graduated from senior high school (57.6%), were students (75%) and had a monthly income lower than 1000 € (42.4%).

TABLE 4 Demographic profile of the sample (study 2)

Variable	Characteristics	*n*	%
Age	18–21 years	9	9.8
	22–30 years	76	82.6
	> 30 years	7	7.6
Gender	Female	51	55.4
	Male	41	44.6
Marital status	Single	85	92.4
	Married	7	7.6
Education	Junior high school diploma	6	6.5
	Senior high school diploma	53	57.6
	University degree	33	35.9
Occupation	Trainee	4	4.4
	Student	69	75.0
	Full-time employee	10	10.9
	Part-time employee	4	4.3
	House wife/husband	2	2.2
	Unemployed	3	3.3
Income	Very low income (< 1,000 €)	39	42.4
	Low income (1,000–2,000 €)	18	19.6
	Middle income (2,000–3,000 €)	12	13.0
	High income (3,000–4,000 €)	9	9.8
	Very high income (> 4,000 €)	6	6.5
	No answer	8	8.7
Total sample size		**92**	**100**

3.4.2 | Results

To evaluate the measurement models, the data analysis follows the procedure described in the previous chapter; thus, it includes the abovementioned quality criteria. Table 5 shows the results.

In the first step, the purified solution generally indicates confirmation. Cronbach's alpha, the MSA, and the AVE meet the requirements in all cases with a minimum of 0.76, 0.73, and 0.52, respectively. In addition, all the items feature a significant correlation with the associated global measure at least $P \leq 0.001$. The only exclusion is "temperate" as an indicator for haptic perception. This may be explained by the formulation of the respective global measure, addressing the pleasure of touch in this case. However, temperature is not directly touchable; therefore, the global item chosen here may not be fully adequate to address all aspects of haptic perception and thus may not be absolutely challenging the item itself. Additionally, factor loadings predominantly surpass the limit of 0.7; in the case of "temperate," an insufficient value was found. Furthermore, three of the 22 indicators have factor loadings between 0.4 and 0.7. Based on this, the measurement models may again be reduced to achieve a parsimonious solution. Therefore, for each dimension that continues to include indicators not fulfilling

TABLE 5 Reliability and validity testing (study 2)

	Purified SPI	α	MSA	AVE	Factor loadings	*r*
Visual	Aesthetic	0.835	0.777	0.672	0.757	0.403***
	Attractive				0.871	0.589***
	Beautiful				0.853	0.669***
	Pretty				0.794	0.457***
Acoustic	Euphonic	0.873	0.840	0.666	0.892	0.611***
	Good-sounding				0.868	0.635***
	Harmonious				0.644	0.535***
	Melodic				0.843	0.650***
	Sonorous				0.809	0.438***
Haptic	Comfortable	0.756	0.726	0.518	0.575	0.517***
	Handy				0.888	0.428***
	Soothing				0.513	0.421***
	Temperate				0.073	0.083
	Well-shaped				0.874	0.485***
Olfactory	Fragrant	0.899	0.783	0.776	0.895	0.559***
	Nice-smelling				0.894	0.577***
	Perfumed				0.918	0.613***
	Scented				0.814	0.636***
Gustatory	Appetizing	0.807	0.759	0.646	0.866	0.388***
	Flavorful				0.756	0.460***
	Palatable				0.840	0.635***
	Tasty				0.747	0.493***
	Final SPI	α	**MSA**	**AVE**	**Factor loadings**	*r*
Visual	Aesthetic	0.835	0.777	0.672	0.757	0.403***
	Attractive				0.871	0.589***
	Beautiful				0.853	0.669***
	Pretty				0.794	0.457***
Acoustic	Euphonic	0.888	0.817	0.750	0.908	0.611***
	Good-sounding				0.860	0.635***
	Melodic				0.863	0.650***
	Sonorous				0.832	0.438***
Haptic	Comfortable	0.791	0.713	0.620	0.764	0.517***
	Handy				0.775	0.428***
	Soothing				0.740	0.421***
	Well-shaped				0.864	0.485***
Olfactory	Fragrant	0.899	0.783	0.776	0.895	0.559***
	Nice-smelling				0.894	0.577***
	Perfumed				0.918	0.613***
	Scented				0.814	0.636***
Gustatory	Appetizing	0.807	0.759	0.646	0.866	0.388***
	Flavorful				0.756	0.460***
	Palatable				0.840	0.635***
	Tasty				0.747	0.493***

Note: α, Cronbach's alpha; MSA,Kaiser-Meyer-Olkin measure of sampling adequacy; AVE, average variance extracted; *r*, Pearson correlation with the global measure; *indicates significance at the $P \leq 0.05$ ($^{**}P \leq 0.01$; $^{***}P \leq 0.001$) level of confidence (two-tailed).

TABLE 6 Sensory perception item set (SPI)

Visual	Acoustic	Haptic	Olfactory	Gustatory
Aesthetic (ästhetisch)	*Euphonic* (klangschön)	*Comfortable* (komfortabel)	*Fragrant* (wohlriechend)	*Appetizing* (schmackhaft)
Attractive (attraktiv)	*Good-sounding* (wohlklingend)	*Handy* (handlich)	*Nice-smelling* (gutriechend)	*Flavorful* (geschmackvoll)
Beautiful (schön)	*Melodic* (melodisch)	*Soothing* (guttuend)	*Perfumed* (wohlduftend)	*Palatable* (wohlschmeckend)
Pretty (ansehnlich)	*Sonorous* (klangvoll)	*Well-shaped* (wohlgeformt)	*Scented* (duftend)	*Tasty* (köstlich)

Note: German terms are given in brackets.

the requirements (i.e., acoustic and haptic perception), the indicator with the lowest factor loading (i.e., harmonious and temperate) was removed. Then, further factor analyses test the four-item solution and determine if the remaining items meet the requirements. The findings now reveal satisfactory values in every respect; Cronbach's alpha reaches a minimum of 0.79, MSA of 0.71, and AVE of 0.62. The remaining correlation coefficients are still significant at least $P \leq 0.001$ and primarily indicate medium to strong relationships. As a consequence of the item reduction, the measures for reliability and validity are primarily enhanced; in particular, the AVE has increased in all cases. Finally, all factor loadings exceed a value of 0.7. An additional deletion step would not lead to further improvement of the quality criteria. As a result, the SPI as a four-item solution provides an adequate and parsimonious solution to capture the five dimensions of sensory perception. Table 6 shows the final SPI.

3.5 | Study 3: Online study (process step 5)

3.5.1 | Methods

To evaluate the final SPI with regard to reliability and validity and its relationships with marketing-related outcome variables, the authors conducted an online study. The object of investigation is an advertisement promoting lemonade. To address as many senses as possible, the advertisement was enhanced by elements appealing to the five senses through mental imagery processing (e.g., condensation drops running down the bottle to communicate freshness, speech bubbles with the words "mmmh" to make the consumer imagine the good taste, and "zisch" to illustrate the sound when opening the sparkling beverage). Subsequent to presenting the stimulus, data collection to capture the SPI (i.e. the final four-item solution) was performed. Additionally, there were questions concerning three outcome variables: attitude toward the product, word-of-mouth recommendation behavior, and buying intention. To measure attitude, the authors used nine-point semantic differential scales with the anchors "negative/positive," "dislike/like," and "unfavorable/favorable" based on Grohmann (2009). To measure word-of-mouth recommendation and buying intention, the authors used the items "I would recommend the product to other people" relying on Kim, Han, and Park (2001) and "I intend to buy the product in the future" based on Esch, Langner, Schmitt, and Geus (2006), respectively. The items were rated on five-point Likert scales (1 = strongly disagree, 5 = strongly agree). A total of 407 subjects participated in the study. Table 7 shows the characteristics of the sample.

Ages ranged from 16 to 77 years, with an average age of 30.6 years. The gender distribution was well-balanced (i.e. 55.3% women and 44.7% men). Furthermore, the majority of the participants were single (77.9%), had a university degree (56.0%), was students (42.3%), and had a monthly income lower than 1,000 € (35.6%).

TABLE 7 Demographic profile of the sample (study 3)

Variable	Characteristics	*n*	%
Age	16–21 years	45	11.1
	22–30 years	249	61.2
	> 30 years	113	27.8
Gender	Female	225	55.3
	Male	182	44.7
Marital status	Single	317	77.9
	Married	74	18.2
	Divorced	15	3.7
	Widowed	1	0.2
Education	Pupil	6	1.4
	Junior high school diploma	45	11.0
	Senior high school diploma	128	31.4
	University degree	228	56.0
Occupation	Scholar	6	1.5
	Trainee	12	2.9
	Student	172	42.3
	Full-time employee	164	40.3
	Part-time employee	29	7.1
	Housewife/-husband	10	2.5
	Retired	12	2.9
Income	Very low income (< 1,000 €)	145	35.6
	Low income (1,000–2,000 €)	86	21.1
	Middle income (2,000–3,000 €)	59	14.5
	High income (3,000–4,000 €)	30	7.4
	Very high income (> 4,000 €)	34	8.4
	No answer	53	13.0
Total sample size		**407**	**100.0**

3.5.2 | Results

To test the final four-item solution of the SPI, the data analysis follows the procedure used for the previous two studies and thus includes the quality criteria mentioned previously. Table 8 shows the results. The values fulfill all quality criteria and clearly exceed the respective critical values. Cronbach's alpha, MSA, and AVE have minimums of 0.79, 0.67, and 0.61, respectively. Moreover, all items are significantly correlated with the respective global measure at $P \leq 0.001$, with predominantly high correlation coefficients. Finally, all factor loadings are above 0.7,

TABLE 8 Reliability and validity testing (study 3)

	Final SPI	α	MSA	AVE	Factor loadings	*r*
Visual	Aesthetic	0.895	0.841	0.763	0.863	0.660***
	Attractive				0.877	0.687***
	Beautiful				0.907	0.716***
	Pretty				0.846	0.704***
Acoustic	Euphonic	0.894	0.840	0.760	0.903	0.556***
	Good-sounding				0.840	0.557***
	Melodic				0.852	0.477***
	Sonorous				0.891	0.551***
Haptic	Comfortable	0.786	0.673	0.612	0.746	0.406***
	Handy				0.831	0.529***
	Soothing				0.839	0.518***
	Well-shaped				0.706	0.461***
Olfactory	Fragrant	0.890	0.790	0.752	0.901	0.635***
	Nice-smelling				0.835	0.691***
	Perfumed				0.888	0.606***
	Scented				0.843	0.518***
Gustatory	Appetizing	0.910	0.848	0.790	0.897	0.746***
	Flavorful				0.876	0.680***
	Palatable				0.910	0.725***
	Tasty				0.872	0.691***

Note: α, Cronbach's alpha; MSA, Kaiser-Meyer-Olkin measure of sampling adequacy; AVE, average variance extracted; *r*, Pearson correlation with the global measure; *indicates significance at the $P \leq 0.05$ (** $P \leq 0.01$; *** $P \leq 0.001$) level of confidence (two-tailed).

supporting the explanatory power of all of the final 20 items. As a result, the SPI is shown to provide a highly reliable and valid measurement of the consumer's sensory perception for all five senses.

Next, as the study expanded by also including three marketing-related outcome variables (attitude toward the product, word-of-mouth (WOM) recommendation behavior, and buying intention (BI)), the authors provide further evaluation referring to the relevance of the SPI in connection with these three essential outcome variables. For this purpose, the final five measures (i.e. visual, acoustic, haptic, olfactory, and gustatory perception) were saved as variables within the factor analyses. In addition, the SPI was computed as a second-order construct within a further factor analysis (Rindskopf & Rose, 1988) to verify the performance of the SPI as a whole. For evaluation, correlation analyses for the SPI (i.e., the five dimensions and the second-order factor) with all three marketing-related target variables were performed (see Table 9). All coefficients reveal highly significant positive correlations at $P \leq 0.001$. The strength ranges from 0.29 to 0.63 for the single senses and from 0.63 to 0.68 for the second-order factor. Consequently, the SPI appears to be adequate for analyzing relationships in the context of product advertising, product design, or similar marketing management issues.

TABLE 9 Relationships with outcome variables (study 3)

	Attitude	WOM	BI
Visual	0.598***	0.564***	0.605***
Acoustic	0.307***	0.287***	0.288***
Haptic	0.540***	0.520***	0.452***
Olfactory	0.421***	0.396***	0.375***
Gustatory	0.633***	0.529***	0.593***
SPI	0.683***	0.627***	0.632***

Note: Pearson correlation; WOM, word of mouth; BI, buying intention; SPI, sensory perception item set (second-order factor); *indicates significance at the $P \leq 0.05$ (** $P \leq 0.01$; *** $P \leq 0.001$) level of confidence (two-tailed).

4 | DISCUSSION

4.1 | Contribution

This paper presented an exploratory effort to introduce a new scale to capture consumers' sensory perception in a holistic way—the sensory perception item set (SPI). The SPI, established by profound scale development relying on the literature search, expert interviews, and several reliability and validity testing steps, contains the 20 most expressive adjectives (i.e., four per sense) to describe how well a product or a brand appeals to the consumer's senses. The SPI captures all five sensory dimensions (i.e., visual, acoustic, haptic, olfactory, and gustatory perception) in a consistent manner, is simple to employ by marketing managers and researchers and is applicable to diverse products and industries.

To evaluate the SPI with regard to reliability and validity and relationships with marketing-related outcome variables, the paper presented three studies (laboratory, field, and online), each applying the scale in a different context. Based on the first two studies, the scale

could be purified from 25 to 20 items (i.e. from a five-item to a four-item solution per sense). The third study confirmed the quality of the final solution. Thus, the SPI represents a first approach for a measurement tool that enables the reliable, valid, and consistent measurement of all five sensory dimensions.

Furthermore, the authors provided evidence for the significant relationships of the SPI with marketing-related outcome variables (i.e., attitude, word-of-mouth recommendation, and buying intention). Accordingly, the SPI may be used as an appropriate measurement tool to examine the effects of sensory marketing activities and to predict the success of such activities in the marketplace.

4.2 | Managerial implications

This paper provides not only marketing researchers but also marketing managers with a holistic solution to measure consumers' sensory perception, meaning their evaluation of a product or brand based on associated visual, acoustic, haptic, olfactory, and gustatory stimuli. Different from a simple overall measure of appeal or impression, the SPI enables exact information on the effect on each individual sense. In this manner, comprehensive and profound information concerning the consumers' appreciation of applied sensory stimuli can be obtained. Thus, it is advised that marketing managers who want to successfully implement and monitor sensory marketing activities conduct marketing research employing the SPI measurement. For example, when planning to launch a new product or release a new commercial, a consumer survey testing how well the product or advertisement appeals to the human senses may be beneficial. By this means, marketing managers can obtain valuable insights concerning possible improvements to design products or convey brand messages that perfectly appeal to consumers. This may enhance the chances of success of the specific sensory marketing activity.

Further, the SPI was developed in view of its feasibility for marketing practice (i.e. single-word items that can easily be implemented in a questionnaire). Thus, marketing managers can easily investigate if their product or brand has sensory appeal (i.e. if it performs well on all sensory dimensions), or, if there is still potential for improvement, which exact sensory dimension must be improved (e.g. the haptic feeling of the product or music in the commercial that may not be appealing). In this manner, companies can actually acquire the consumer and realize further positive effects on marketing-related success factors such as attitude, recommendation behavior, and buying behavior.

4.3 | Limitations and further research

In view of the pioneering approach of this paper, the findings should be complemented and supported by further research. Based on the limitations of this paper, diverse suggestions for future research can be identified. First, the SPI already performed well for the examination of products. The field study had the goal of moving to a brand level and showed good results; however, it involved direct contact with the product. Concerning a mere brand context, the items may work associatively. Further research including not direct contact with the product but contact just with components of brand presence (e.g., in terms of brand logo, corporate sound, corporate smell) would be revealing.

Second, the studies were limited to specific contexts: diverse objects (study 1), gastronomy (study 2) and lemonade (study 3). Thus, the usage and further validation of the measurement concept in different application areas would be interesting, for example, in diverse industries (e.g. cosmetics, fashion) or with respect to various media (e.g. print advertising, commercials).

Third, the presented studies aimed to test the SPI measurement models in a first step on a limited and relatively homogeneous sample. For this purpose, in accordance with Dawar and Parker (1994), student respondents were chosen, because they show similar levels of age, education, professional aspirations, income, and additional socio-demographic characteristics. Future research could be extended to a broader audience regarding sample size and diversification, especially considering cultural differences.

Fourth, the SPI was originally established in German. Although it was soundly translated, the English version must be applied and evaluated in several studies.

Fifth, this paper already provided valuable insights into the relationships between the SPI and relevant marketing-related outcome variables (i.e. attitude, word-of-mouth recommendation, and buying intention) based on correlation analyses. Further investigations could combine the SPI measures with other success parameters that are essential for marketing management (e.g. customer perceived value, willingness to pay) and include them in advanced data analyses (e.g. structural equation modeling).

Sixth, the SPI measures the effect for each single sense to enable concrete recommendations for marketing practice (i.e. to provide information about which exact sensory dimension to adjust when there is potential for improvement). In fact, the SPI provides five measurement models that can be applied separately, one for each sensory dimension, just as several scales from prior research that consider senses separately (e.g. Drake et al., 2001, 2003; Leighton et al., 2010; Lotong et al., 2000; Verriele et al., 2012). To go a step further, interaction effects among the senses may be considered in subsequent data analyses. For example, when the descriptive analysis has detected that the olfactory perception of a product (e.g., a cheese) is inferior, marketing managers will know that they must improve the perceived scent. One possible method is to address the direct cause (e.g., the aromatic substance); another is to optimize factors that interact with olfaction, which may be found in other sensory dimensions, such as visual perception (e.g., fresh appearance). For this purpose, further analyses (e.g., correlation or regression) dealing with interaction effects between the senses may be revealing.

Seventh, the authors focused on the controlled (conscious) form of consumers' sensory perception captured by self-report measures. For an even deeper understanding of the consumer, marketing researchers and practitioners might consider both modes of cognitive information processing as discussed by Kahneman (2003). It might be insightful to also consider the automatic (subconscious) form of consumers' sensory perception, as sensory stimuli may be processed subconsciously (e.g. background music) and consciously (e.g. salient color). For this reason, it may be valuable to expand the measurement concept by including reaction time measurement to capture a more spontaneous reaction toward the adjectives. In addition to the cognitive level,

it would be interesting to explore the affective level as discussed by Camerer, Loewenstein, and Prelec (2005). Accordingly, further techniques, such as electroencephalography (EEG) or facial expression recognition, may be used.

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How to cite this article: Haase J, Wiedmann K-P. The sensory perception item set (SPI): An exploratory effort to develop a holistic scale for sensory marketing. *Psychol Mark*. 2018;35: 727–739. https://doi.org/10.1002/mar.21130

P2:

The implicit sensory association test (ISAT): A measurement approach for sensory perception

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Journal of Business Research

Under review

The implicit sensory association test (ISAT): A measurement approach for sensory perception

Abstract

In the field of sensory marketing, implicit consumer information processing plays an important role, because a large proportion of sensory stimuli is perceived subconsciously. Consumer research currently calls for integrative models that consider both subconscious and conscious processes. This paper introduces the implicit sensory association test (ISAT) – a novel response latency measurement approach for implicit sensory perception. The ISAT provides a counterpart to the recently developed measurement approach for explicit sensory perception based on the sensory perception item set. Thus, the ISAT enables the measurement of all five sensory dimensions (i.e., implicit visual, acoustic, haptic, olfactory, and gustatory perception). In three studies, we provide empirical evidence that the ISAT measures (1) are valid and reliable, (2) show highly significant relationships with essential marketing-related outcome variables, and (3) can give valuable insights in addition to explicit measures, finding both positive and negative relationships between implicit and explicit sensory perception.

Keywords: sensory perception; sensory marketing; response latency measurement; implicit association test; measurement method.

1. Introduction

Marketing management is increasingly acknowledging that a large part of consumer decision making is driven by subconscious processes (Matukin, Ohme, & Boshoff, 2016). Accordingly, the interest of marketing research in investigating the consumers' subconscious mind is constantly growing (e.g., Bettiga, Lamberti, & Noci, 2017; Kareklas, Brunel, & Coulter, 2014; Maison, Greenwald, & Bruin, 2004; Martin, 2010; Samson & Voyer, 2012; Yang, Chattopadhyay, Zhang, & Dahl, 2012). This is especially true in the field of sensory marketing (Krishna, 2012) because sensory stimuli not only may be processed consciously (e.g., salient color) but also are most often processed subconsciously as subtle cues in the environment (e.g., background music) (Dijksterhuis, Smith, Van Baaren, & Wigboldus, 2005). To gain profound consumer insights and thus manage sensory marketing effectively, it is crucial to know which associations are provoked on both cognitive levels. To that end, Baumeister, Clark, Kim, and Lau (2017) actively call for integrative models that consider both conscious and subconscious processes.

The psychological literature discusses two types of consumer information processing, which are also referred to as two systems (e.g., Barrett, Tugade, & Engle, 2004; Evans, 2003; Kahneman, 2003; Neys, 2006; Sloman, 2002; Stanovich & West, 2002). System 1 works fast, automatic, effortless, associative, and intuitive. The operations of System 1 are implicit (not available to introspection) and occur on a subconscious level. System 2 works slower, controlled, effortful, serial, and deliberate (Kahneman, 2003). The operations of System 2 are explicit (available to introspection) and processed on a conscious level. While the capacity of the implicit system is nearly unrestricted, the explicit system has very limited capabilities. People can deliberately concentrate on selected information only at a given moment (Smith & DeCoster, 2000). Nevertheless, consumers are constantly surrounded by all kinds of stimuli that they are not actually aware of but that the subconscious mind still gathers and stores.

However, even if the information is not consciously present to the consumers, it can absolutely influence their decision-making processes (Friese, Wänke, & Plessner, 2006). Oftentimes, the explicit system adopts the intuitive suggestions of the implicit system for efficiency reasons, which may lead to similar judgements (Kahneman, 2011). However, depending on the context, the two systems may absolutely cue different responses (McDonald, 1998; Stanovich & West, 2002). For example, consumers may evaluate a product positively on the explicit level because they have consciously perceived it as beautiful, but negatively on the implicit level because they have subconsciously perceived the shape as inconvenient. In addition to different conscious and subconscious memory contents, differences in implicit and explicit measures can arise due to social desirability (Fazio & Olson, 2003). For example, consumers may evaluate a product positively on the explicit level because the peer group sees it as stylish, but negatively on the implicit level in conformity with their true opinion. In either case, when only applying self-report measures, this might lead to misleading results and false inferences or at least to the exclusion of a major part of the truth (Dijksterhuis et al., 2005). Therefore, a company that ignores implicit consumer perception might launch a product that was tested for explicit but not for implicit sensory appeal and fail because consumers were not completely convinced.

However, the literature lacks a measurement approach for implicit sensory perception. Haase and Wiedmann (2018) recently introduced the sensory perception item set (SPI), which represents a holistic scale consisting of 20 adjectives (i.e., four per sense) to measure consumers' sensory perception along the five dimensions of visual, acoustic, haptic, olfactory, and gustatory perception. Haase and Wiedmann made a first attempt at an evaluation of the SPI's implementation in a questionnaire and, thus, explicit sensory perception. However, as the limitation of explicit sensory perception may lead to only partial insights, an equal measurement approach for the implicit sensory perception is urgently needed. The SPI may

provide a good basis because it consists of single-word items (that are perfectly adequate for a response latency measurement) and because it may thus enable an integrative measurement model representing the same basis for explicit and implicit sensory perception measures.

This paper represents an initial step in addressing the outlined gap. The main contribution of this paper is the development and evaluation of a novel response latency measurement technique that implements the SPI and thus enables the capture of implicit sensory perception – the implicit sensory association test (ISAT). The ISAT is developed as the counterpart to self-report measurement using the SPI, which captures explicit sensory perception. The ISAT completes the measurement of a unified concept for both cognitive levels of sensory perception and enables complete consumer insights to be gained. Additionally, since they are built on the same basis, implicit and explicit sensory perception are comparable.

The ISAT includes all five senses, and thus, as a first approach, it enables holistic and detailed information about consumers' implicit sensory perception to be gathered. Further, the ISAT is easily applicable and highly flexible. For cases where not all five senses directly matter (e.g., print ads neglecting the gustatory sense), researchers or practitioners can partly apply the measurement technique just employing the relevant senses. Thus, all possible use cases are covered, and the respective senses can be examined in a consistent manner. Moreover, the ISAT is suitable for diverse products and industries.

For the evaluation of the ISAT, first, we prove the reliability and validity of the ISAT variables with two studies (a laboratory study and a field study) based on several quality criteria. Second, we provide empirical evidence for the significant relationships among the ISAT variables and the essential outcome variables of marketing management (i.e., brand image, customer satisfaction, brand loyalty, and price premium). Third, we demonstrate the relevance of measuring both explicit and implicit sensory perception by conducting a third

study (a laboratory study), which shows that compared to the second study, the two forms of sensory perception can be correlated negatively and positively.

In the following sections, we first give a brief literature review of response latency measurement approaches. Then, as a new response latency measurement technique for implicit sensory perception, the ISAT is introduced. Here, the design and implementation of the ISAT and the computation of implicit sensory perception are explained. To evaluate the ISAT in depth, three studies are presented. The paper closes with a discussion.

2. Review of response latency measurement approaches

The field of cognitive psychology provides several techniques for capturing implicit measures that may represent suitable bases for the present case (see Table 1).

INSERT TABLE 1 HERE

More specifically, the focus is on methods that are based on response latencies, which represent the most popular measure for investigating implicit cognitive processing (Nosek & Banaji, 2001). The prevailing method is the implicit association test (IAT), which examines automatic associations between two targets (e.g., Coke vs. Pepsi) and a bipolar attribute concept (e.g., good vs. bad). Subjects are asked to perform a series of sorting tasks that include all combinations and to respond as quickly as possible. Shorter response latencies are then assumed to indicate stronger associations (Greenwald, McGhee, & Schwartz, 1998). Maison et al. (2004) provided evidence for the validity of the IAT in consumer research studies. Based on the IAT, further response latency measurement methods have emerged. Some also address two targets, allowing only relative associations (e.g., brief IAT, single block IAT), while others concentrate on just one target, revealing absolute associations (e.g., single category IAT). Because more than one attribute is usually of interest, the multifactor trait IAT and the category-item association test have been established. Moreover, the latter enables the

involvement of unipolar attributes that do not require contrast words (Banse & Greenwald, 2007; Nosek, Hawkins, & Frazier, 2011; Schnabel, Asendorpf, & Greenwald, 2008).

Despite the ever-growing diffusion of implicit measurement methods, there is still a deficit of application in sensory marketing. However, as the majority of sensory stimuli are processed subconsciously and such triggers are assumed to be especially valuable in terms of their appeal to the consumer, it is important that marketing management also understands implicit sensory perception in addition to explicit sensory perception (Krishna, 2012).

3. The implicit sensory association test (ISAT)

3.1. Design and implementation

To measure implicit sensory perception, we have developed a response latency measurement technique – the implicit sensory association test (ISAT) – involving the sensory perception item set (SPI) developed by Haase and Wiedmann (2018). The SPI was established by successive scale development based on a literature review, expert interviews, and reliability and validity testing. The scale consists of 20 items (four per sense) to capture consumers' evaluations of sensory stimuli (see Table 2). The items are all positive and specific to one of the five senses (e.g., tasty, instead of sweet or pleasant). The SPI was specially developed to enable not only explicit measurement but also implicit measurement based on response latencies. The integration of the SPI into the ISAT thus enables the capture of implicit visual, acoustic, haptic, olfactory, and gustatory perception.

INSERT TABLE 2 HERE

The structure of the ISAT is based on the measurement of category-item associations, as proposed by Fazio, Williams, and Powell (2000). Similarly, the ISAT captures the associations between an object and the subject's evaluation of that object (Fazio, 1990). However, the evaluation in this case does not relate to the associative strength of a brand with its product

category but, rather, to that of a brand or product with the sensory perception items. Therefore, the ISAT enables absolute information concerning a single object to be obtained and the investigation of unipolar attributes to be conducted. Moreover, instead of showing the category and the item in succession, they are presented together on the display.

Beforehand, a start screen gives proper instructions. In this setting, the subjects are asked to intuitively decide whether the following words fit the object. In the event of agreement, they press “E” for “yes”; in the event of disagreement, “I” for “no”. Furthermore, it is emphasized that they should respond as quickly as possible. Finally, the ISAT begins when the subjects press the space bar. To facilitate completion, reminder labels are shown throughout the assignment task: “Fits?” at the top edge, “yes” at the bottom left corner and “no” at the bottom right corner of the display. At the center, if possible and needed, the object of the investigation is illustrated (e.g., brand logo) and remains in place the whole time. Underneath, the sensory perception items appear one after another, presented in a white font color against a black background (see Fig. 1).

INSERT FIGURE 1 HERE

The items stay on the screen until the assignment is completed via keystroke or a period of 5000 ms has elapsed. Then, the next item is automatically shown. In the event of a timeout, the respective item is not counted. For neutralization and to prevent confusion in the event of repetition, a white cross is faded in for 200 ms between all items. Depending on the extent of the study, the items can be presented in several runs to obtain stable data, but at least twice is recommended to preclude randomness. In each instance, all items are processed with the same frequency and in randomized order. This may be executed in a single trial block; for example, with 50 trials when investigating all five dimensions with two runs per item. Finally, the subjects see an end screen that thanks them for their participation and, if required, a lead to proceed with the questionnaire.

With regard to implementation, we used OpenSesame, a software program for creating experiments in the social sciences that is based on a graphical user interface and Python scripting (Mathôt, Schreij, & Theeuwes, 2012). In this way, the ISAT was constructed and administered, and the data were captured and stored. The following most important variables are logged and saved: subject number (i.e., serial number to merge the data with those from the questionnaire); item name (e.g., aesthetic); response (i.e., "E" or "I"); response time (i.e., duration between appearance of the item and keystroke in ms); and item position (i.e., place in sequence).

3.2. Computation of the implicit sensory perception

Based on the output generated by OpenSesame (i.e., the single response times, the direction of the responses indicating agreement or non-agreement, etc.), an ISAT score can be computed for every subject and every item. The ISAT scores provide an agglomerate measure that gives information on the strength of the subject's automatic association of an object (e.g., product or brand) with the respective sensory perception item (e.g., aesthetic). Thus, 20 ISAT scores (i.e., four per sense) – one for each sensory perception item – are computed. To obtain the final five variables measuring the five dimensions of implicit sensory perception (i.e., visual, acoustic, haptic, olfactory, and gustatory perception), for each dimension, a factor analysis with the respective four ISAT scores (e.g., aesthetic, attractive, beautiful, and pretty for implicit visual perception) is conducted. If all quality criteria are fulfilled, then the five factors may be saved as variables within the factor analyses.

In addition, if an overall measure is required, the implicit sensory perception may be computed as a second-order construct within a further factor analysis involving the five dimensions (Rindskopf & Rose, 1988).

To transform the OpenSesame output into the final ISAT scores, the data of each subject need to be loaded and calculated in progressive stages. Then, the valid response times are identified. To ensure that answers are actually intuitive and not entered by mistake, only response latencies in the interval of 300 to 3000 ms are included for further computation (Greenwald et al., 1998). Moreover, the valid response time is rescaled so that it takes values in the interval of 0 to 1, that is, from the weakest association possible at a response time of 3000 to the strongest association possible at a response time of 300. In addition, the direction of the association must be considered. If the subject thinks the item fits the product or the brand (i.e., the response was "E" for "yes"), then the sign of the rescaled response time will remain positive; if the subject thinks the item does not fit the product or the brand (i.e., the response was "I" for "no"), then the sign is changed to negative. As a consequence, the ISAT score falls in the interval of -1 to 1. Beyond that, the data may be z-transformed to reduce method variance when the eventual objective is to analyze the ISAT scores in combination with other variables; for example, measured by conventional self-report measures (Bluemke & Friese, 2008). The (z-transformed) ISAT scores of all subjects and all items are then brought together in a complete data sheet for further use (e.g., for SPSS). Finally, the five variables measuring the five dimensions of implicit sensory perception and, if required, the second-order factor may be computed as described above.

4. Evaluation of the implicit sensory association test (ISAT)

We evaluate the ISAT by means of three studies. In addition to the implicit measures (SPI implemented in the ISAT), all three studies included the corresponding explicit measures (SPI implemented in a questionnaire). Haase and Wiedmann (2018) have already tested the explicit measures based on Study 1 and Study 2. This paper is the first to examine whether the ISAT can provide similarly valid and reliable measures for implicit sensory perception. Further,

Study 3 evaluates the ISAT with a specific focus on the importance of measurement in addition to the self-report measures.

4.1. Study 1: Laboratory study

4.1.1. Methods

For a first evaluation of the ISAT, we conducted a laboratory study. The study applies the ISAT to capture intuitive evaluations of different objects (each especially appealing to a specific sense) with regard to their visual, acoustic, haptic, olfactory, or gustatory appeal. To select the test objects, we conducted a pretest with 10 participants (two per sense; 50% female; M_{age} = 30.1, age ranging from 20 to 59 years). Three sensory experts preselected 25 objects (five per sense) as being highly expressive for the respective sensory dimension (e.g., colorful pictures for visual perception) and able to represent a wide range (e.g., food and beverages covering all five basic flavors for gustatory perception). Each participant was randomly assigned to one sense and asked to evaluate all five objects in terms of intensity of appeal to the specific sense and overall liking. Based on the results, three objects for visual (i.e., a picture of a sunset, an optical illusion, and a fairytale scene), acoustic (i.e., film music, opera singing, and paper rustling), haptic (i.e., a heat pack, a steel sculpture, and a fleece ball), olfactory (ground coffee, rose soap, and squeezed oranges), and gustatory perception (e.g., milk chocolate, savory cheese, and potato chips) were selected.

The main study involved 100 participants (20 per sense; 50% female; M_{age} = 23.7, age ranging from 18 to 60 years). After stating introductory questions, one of the three objects was presented for 20 seconds. Possible bias resulting from interactions of the senses (Krishna, 2006; Spence, 2011) was controlled for during the stimulus contact (e.g., using eye masks to test haptic, olfactory, or gustatory perception). Then, the participants were asked to perform the ISAT. Further, all five sensory dimensions were captured by a global item (e.g., 1 = very

negative visual experience, 11 = very positive visual experience) for eventual external validation (Greenwald, Nosek, & Banaji, 2003; Wiedmann, Hennigs, Schmidt, & Wüstefeld, 2011). Subsequently, the other two objects were presented and evaluated based on the ISAT and the global measures. The order of the object blocks, just like the order of sensory perception items within the blocks, was randomized. Finally, sociodemographic characteristics were obtained.

4.1.2. Results

The ISAT is evaluated based on five fundamental quality criteria using SPSS 24. To check for reliability, we compute Cronbach's alpha; to check for validity, we conduct factor analyses and correlation analyses with the respective global measure. Table 3 shows the results for all five implicit sensory perception dimensions.

INSERT TABLE 3 HERE

The findings reveal consistently satisfactory values. First, Cronbach's alpha (α) shows a minimum value of 0.78, which is far above the critical value of 0.6 (Churchill, 1979; Peterson, 1994). This provides evidence for the internal consistency of the ISAT. Second, the Kaiser-Meyer-Olkin measure of sampling adequacy (MSA) has a minimum value of 0.62, surpassing the lower limit of 0.6 (Kim & Mueller, 1978). This gives a first indication of the validity of the ISAT in terms of the relatedness of the respective four items (Stewart, 1981). Third, the average variance extracted (AVE) is at least 0.62 and is thus clearly above the minimum requirement of 0.5 (Fornell & Larcker, 1981). Fourth, the factor loadings range from 0.61 to 0.94 and, therefore, fall into the required interval of 0.5 to 0.95 (Bagozzi & Yi, 1988). Fifth, all items are significantly correlated with the respective global measure (min. $p \leq 0.05$). Regarding the height of the coefficients, according to Hofmann, Gawronski, Gschwendner, Le, and Schmitt (2005), the correlations between implicit measures (here: the ISAT scores) and explicit

measures (here: the global items) may generally be lower for diverse reasons (e.g., method-related characteristics or problems referring to retrieval of information from memory). Here, the results indicate moderate to even strong relationships, which further confirms the validity of the ISAT. Thus, Study 1 provides the first empirical evidence for the qualification of the ISAT as a reliable and valid measurement tool for capturing implicit sensory perception.

4.2. Study 2: Field study

4.2.1. Methods

For further evaluation of the ISAT, we conducted a field study. The study involved 92 participants (55.4% female; M_{age} = 25.7, age ranging from 18 to 67 years) and occurred in a coffee house that appealed to all five senses; for example, through vintage interior design (visual), background music (acoustic), soft-padded cushions (haptic), the aroma of coffee (olfactory), and homemade pastries (gustatory). Each participant was confronted with and questioned about all five senses this time. The participants were invited to take a seat in the gallery and answer some introductory questions. Then, they were given a minute to look down, absorb the stimuli of the coffee house, and eat a pastry. After the stimulus contact, the participants were asked to sit in a neutral corner in front of a laptop and perform the ISAT, thus revealing their implicit sensory perception of the coffee house. To prevent bias from disturbing ambient noise, earplugs were used during the response latency task. Subsequently, the participants filled out the questionnaire and thus rated the coffee house in terms of explicit sensory perception, brand image, customer satisfaction, brand loyalty, and price premium. For explicit sensory perception, the strength of the association of the coffee house and the sensory perception items was rated on five-point Likert-Scales (1 = strongly disagree, 5 = strongly agree). To measure the four marketing-related outcome variables, the items of Wiedmann et al. (2011) were used and also rated on five-point Likert-Scales (1 = strongly disagree, 5 =

strongly agree). In addition, for each sensory dimension, a global item was again collected for eventual external validation (see Study 1). Finally, sociodemographic characteristics were obtained.

4.2.2. Results

The evaluation of the ISAT follows the procedure described above, including the same five quality criteria. Table 4 presents the results.

INSERT TABLE 4 HERE

The findings once more indicate full confirmation of the ISAT. Cronbach's alpha, the MSA, and the AVE all meet the requirements with a minimum of 0.67 (> 0.6), 0.66 (> 0.6), and 0.51 (> 0.5), respectively. Further, the factor loadings range was between 0.63 and 0.93 (ϵ [0.5, 095]). The correlation coefficients, indicating the relationships with the associated global measures, are significant throughout (min. $p \leq 0.05$) and primarily indicate moderate relationships. Consequently, Study 2 confirms the results of Study 1 and further confirms the ISAT as a reliable and valid solution for capturing implicit sensory perception.

In addition, we provide further evaluation of the ISAT in terms of its relevance in a marketing context. Because the study went a step further and captured four marketing-related outcome variables (i.e., brand image, customer satisfaction, brand loyalty, and price premium), we test whether the ISAT variables significantly correlate with these essential outcome variables. For this purpose, in a first step, the five measures capturing the dimensions of implicit sensory perception (i.e., visual, acoustic, haptic, olfactory, and gustatory perception) were saved as variables in the course of the factor analyses. In a second step, implicit sensory perception was computed as a second-order construct (hereinafter referred to as implicit SPI) in the course of a further factor analysis (Rindskopf & Rose, 1988). Table 5 shows the results of the correlation analyses involving the ISAT variables (i.e., the five dimensions and the

second-order factor) and the four marketing-related outcome variables. The findings reveal significant (min. $p \leq 0.05$) positive correlations in all 24 cases. The strengths of the relationships range from 0.22 to 0.46 for the single senses and from 0.40 to 0.53 for the second-order factor. In consideration of Hofmann et al. (2005), who state that correlations between implicit and explicit measures may generally be lower for diverse reasons (see above), it can be stated that the results are meaningful and that the ISAT appears adequate for analyzing relationships in the context of product design, brand management, or similar marketing management issues.

INSERT TABLE 5 HERE

4.3. Study 3: Laboratory study

4.3.1. Methods

To verify the need to measure both explicit and implicit sensory perception, we conducted a further laboratory study. The object of investigation is a print advertisement for perfume showing a lightly dressed couple in a sexually suggestive situation that may be polarizing and critical in view of social desirability. To address as many senses as possible, the print ad was brushed with the perfume itself, accompanied by a QR code leading to the associated jingle, and laminated on selected parts by a smooth and transparent foil. Following the presentation of the stimulus, data collection was performed using the ISAT for implicit sensory perception and a questionnaire for explicit sensory perception. The study involved 77 participants (50.6% female; $M_{age} = 35.3$, age ranging from 19 to 82 years).

4.3.2. Results

To test the relevance of applying both the self-report and the response latency measurement, correlation analyses were carried out for the explicit SPI and implicit SPI (second-order

factors). Table 6 displays, for comparison, the correlation coefficients for Study 2 and Study 3. The results for Study 2 reveal a highly significant and strongly positive correlation ($r = 0.729$; $p \leq 0.001$). As a result, one might think that measuring the ISAT is redundant and should be omitted. However, to the contrary, the manifestations and the relationship between explicit and implicit sensory perception can differ substantially based on the context. In contrast to Study 2, here, a highly significant and strongly negative correlation is found ($r = -0.725$; $p \leq 0.001$). Thus, the results support the assumption of possible divergence between the two cognitive systems and the importance of ensuring that sensory marketing performs well on both perception levels. Otherwise, the effectiveness might be decreased or even fully invalidated.

INSERT TABLE 6 HERE

5. Discussion

5.1. Theoretical implications

This paper provides three theoretical contributions. First, we have introduced a new response latency measurement approach to capture consumers' implicit sensory perception – the implicit sensory association test (ISAT). To the best of our knowledge, this is the first approach that enables the measurement the five dimensions of sensory perception (visual, acoustic, haptic, olfactory, and gustatory) on an implicit level. Further, the ISAT has been developed based on the sensory perception item set (SPI), which was recently established as a measurement approach for the five dimensions of explicit sensory perception (Haase & Wiedmann, 2018). As a result, the ISAT variables represent the counterpart to the self-report measures. This yields the first holistic approach for the measurement of sensory perception in which the five dimensions are comparable across both cognitive levels. Thus, we provide an answer to the current demand of consumer research, which calls for integrative models that consider both the conscious and subconscious consumer mind (e.g., Baumeister et al., 2017).

Consumer research can use this holistic measurement approach to investigate the effects of sensory cues in greater depth and to obtain more complete consumer insights. Thus, this paper offers a basis for further interesting research questions that are expected to become more focal, such as the interactions between conscious and subconscious influences on the consumer (Simonson, 2005).

Second, in the course of the evaluation of the ISAT, we have provided empirical evidence that the implicit and explicit system can evoke quite different perceptions. This adds to the psychological literature conceptually dealing with the possible divergence between the two systems (e.g., Stanovich & West, 2002). Further, the insights provide valuable knowledge on the importance of measuring implicit sensory perception in addition to explicit sensory perception and not relying solely on self-report measures.

Third, we have provided empirical evidence of the significant relationships of implicit sensory perception with essential marketing-related outcome variables (i.e., brand image, customer satisfaction, brand loyalty, and price premium). This adds to the marketing literature dealing with the effects of sensory perception or sensory cues on brand or product performance (e.g., Krishna, 2012). Further, the results underline the relevance of the investigation of the (implicit) appeal of sensory cues to the consumer.

5.2. Managerial implications

Marketing managers can use the ISAT to gain profound information about consumers' implicit sensory perception. The measurement technique provides three major advantages for practical applications. First, the ISAT covers all five senses separately and in a consistent manner. Thus, in contrast to a simple overall measure of appeal, it enables the collection of detailed information about the effect on each individual sense. Further, the appeal to the five senses are comparable. Consequently, marketing managers can detect how their product (or

brand, advertisement, etc.) appeals to all five senses and, if there is potential for improvement, which type of stimuli one should best work on (e.g., in product packaging that may be more appealing regarding its visual appearance but less so regarding its haptic features).

Second, the ISAT, as a counterpart to self-report measurement, allows marketing managers to compare sensory perception (dimensions) across both cognitive levels. As shown in this paper, implicit and explicit sensory perception may differ substantially. The limitation of self-report measures may thus lead to only partial insights. The ISAT, as a complement, provides marketing managers with the ability to obtain comprehensive consumer insights and thus ensure that sensory appeal performs well on both perception levels. Consequently, companies can reduce the risk of flops and make sure to win consumers over.

Third, the introduced technique for measuring implicit sensory perception was developed in such a way that it is easy to use, especially in marketing practice. Compared to other indirect measurement techniques, such as functional magnetic resonance imaging (fMRI) or electroencephalography (EEG), which virtually preclude practical application, the response latency measurement stands out because it is particularly easy to handle, cost-efficient, robust, and very well established.

5.3. Limitations and future research

The limitations of this paper offer interesting starting points for future research. First, the three studies were limited to certain contexts (i.e., diverse objects, gastronomy, and print advertisement). Thus, future research may use and validate the ISAT in further application areas; for example, in different industries (e.g., fashion) or media (e.g., commercials).

Second, we tested the ISAT on a rather homogeneous sample. The samples mainly consisted of students showing similar levels of age, education, professional aspirations, income, and

additional sociodemographic characteristics (Dawar & Parker, 1994). Consequently, future research could extend the investigation to a more diversified and larger sample.

Third, this paper already provided empirical evidence for the correlations of implicit sensory perception with essential outcome variables of marketing management (i.e., brand image, customer satisfaction, brand loyalty, and price premium). Further investigations could give additional insights into the relationships of the ISAT variables (1) with other relevant marketing-related success parameters (e.g., customer perceived value and purchase intention) and (2) in terms of causal effects by using advanced data analysis methods (e.g., structural equation modeling).

Fourth, this paper introduced a measurement technique to capture automatic (implicit), cognitive processes. Haase and Wiedmann (2018) provided a solution for controlled (explicit), cognitive processes. Marketing researchers might want to extend the sensory perception measurement concept by considering further types of information processing. Camerer, Loewenstein, and Prelec (2005) differentiate not only between automatic and controlled but also between cognitive and affective processes, which they combine into four types of neural functioning. Thus, in addition to the cognitive level, marketing researchers could capture automatic, affective processes, for example, by facial expression recognition and controlled, affective processes, for example, by “go/no-go” questions. This may allow an even deeper understanding of consumers.

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Tables and figures

Table 1

Literature review on response latency measurements.

Reference	Method	Measure(s)
Greenwald, McGhee, and Schwartz (1998)	implicit association test (IAT)	associations between 2 targets, 1 attribute (relative, bipolar)
Sriram and Greenwald (2009)	brief IAT	
Teige-Mocigemba, Klauer, and Rothermund (2008)	single block IAT	
De Houwer (2003)	extrinsic affective Simon task	
Nosek and Banaji (2001)	go/no-go association task	associations between 1 target, 1 attribute (absolute, bipolar)
Karpinski and Steinman (2006)	single category IAT	
Greenwald (2005)	multifactor trait IAT	associations between 1 target, multiple attributes (absolute, bipolar)
Fazio (1990)	category-item association test	associations between 1 target, multiple attributes (absolute, unipolar)

Table 2

Sensory perception item set (SPI).

Visual	Acoustic	Haptic	Olfactory	Gustatory
aesthetic	*euphonic*	*comfortable*	*fragrant*	*appetizing*
(ästhetisch)	(klangschön)	(komfortabel)	(wohlriechend)	(schmackhaft)
attractive	*good-sounding*	*handy*	*nice-smelling*	*flavorful*
(attraktiv)	(wohlklingend)	(handlich)	(gutriechend)	(geschmackvoll)
beautiful	*melodic*	*soothing*	*perfumed*	*palatable*
(schön)	(melodisch)	(guttuend)	(wohlduftend)	(wohlschmeckend)
pretty	*sonorous*	*well-shaped*	*scented*	*tasty*
(ansehnlich)	(klangvoll)	(wohlgeformt)	(duftend)	(köstlich)

Note: The original SPI was established in German (terms given in brackets). The English items were developed based on parallel translation, as recommended by Malhotra, Agarwal, and Peterson (1996), with four bilingual speakers who spoke English as their native language.

Table 3

Evaluation of the ISAT (Study 1).

		α	MSA	AVE	Factor loadings	r
Visual	aesthetic	0.779	0.724	0.618	0.627	0.514***
	attractive				0.836	0.306*
	beautiful				0.867	0.544***
	pretty				0.792	0.437***
Acoustic	euphonic	0.932	0.768	0.833	0.911	0.663***
	good-sounding				0.931	0.681***
	melodic				0.915	0.720***
	sonorous				0.892	0.764***
Haptic	comfortable	0.895	0.792	0.761	0.900	0.534***
	handy				0.848	0.563***
	soothing				0.884	0.633***
	well-shaped				0.857	0.654***
Olfactory	fragrant	0.860	0.621	0.705	0.921	0.692***
	nice-smelling				0.847	0.708***
	perfumed				0.938	0.575***
	scented				0.613	0.368**
Gustatory	appetizing	0.888	0.818	0.771	0.921	0.775***
	flavorful				0.865	0.744***
	palatable				0.904	0.725***
	tasty				0.819	0.739***

Note: α = Cronbach's alpha; MSA = Kaiser-Meyer-Olkin measure of sampling adequacy; AVE = average variance extracted; r = Pearson correlation with the global measure; * indicates significance at the $p \leq 0.05$ (** $p \leq 0.01$; *** $p \leq 0.001$) level of confidence (two-tailed).

Table 4

Evaluation of the ISAT (Study 2).

		α	MSA	AVE	Factor loadings	r
Visual	aesthetic	0.792	0.759	0.626	0.702	0.351***
	attractive				0.772	0.570***
	beautiful				0.817	0.535***
	pretty				0.865	0.520***
Acoustic	euphonic	0.831	0.782	0.665	0.762	0.411***
	good-sounding				0.811	0.507***
	melodic				0.829	0.464***
	sonorous				0.858	0.469***
Haptic	comfortable	0.670	0.664	0.506	0.677	0.413***
	handy				0.727	0.371***
	soothing				0.631	0.363***
	well-shaped				0.800	0.263*
Olfactory	fragrant	0.922	0.846	0.812	0.884	0.649***
	nice-smelling				0.892	0.644***
	perfumed				0.926	0.654***
	scented				0.902	0.739***
Gustatory	appetizing	0.739	0.769	0.587	0.773	0.320***
	flavorful				0.783	0.290**
	palatable				0.819	0.370***
	tasty				0.683	0.477***

Note: α = Cronbach's alpha; MSA = Kaiser-Meyer-Olkin measure of sampling adequacy; AVE = average variance extracted; r = Pearson correlation with the global measure; * indicates significance at the $p \leq 0.05$ (** $p \leq 0.01$; *** $p \leq 0.001$) level of confidence (two-tailed).

Table 5

Relationships with outcome variables (Study 2).

	Brand image	Satisfaction	Brand loyalty	Price premium
Visual	0.383***	0.270**	0.215*	0.305**
Acoustic	0.371***	0.384***	0.309**	0.223*
Haptic	0.391***	0.342***	0.240*	0.274**
Olfactory	0.366***	0.306**	0.296**	0.381***
Gustatory	0.360***	0.458***	0.392***	0.314**
Implicit SPI	0.527***	0.506***	0.397***	0.412***

Note: Pearson correlation; SPI = sensory perception item set (second-order factor); * indicates significance at the $p \leq 0.05$ (** $p \leq 0.01$; *** $p \leq 0.001$) level of confidence (two-tailed).

Table 6

Relationship between explicit and implicit SPI (Studies 2 and 3).

	Explicit SPI	
	Study 2	Study 3
Implicit SPI	0.729***	-0.725***

Note: Pearson correlation; SPI = sensory perception item set (second-order factor); *** indicates significance at the $p \leq 0.001$ level of confidence (two-tailed).

Fig. 1. ISAT with brand logo (left) and without brand logo (right).

P3:

Effects of consumer sensory perception on brand performance

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Journal of Consumer Marketing

Forthcoming

Effects of consumer sensory perception on brand performance

Abstract

Purpose – Sensory perception is an important factor to understand and effectively appeal to consumers. As consumers process information consciously and subconsciously, both perception levels (explicit and implicit) are essential to investigate. This paper aims to analyze the effects of explicit and implicit sensory perception on brand experience and brand-related performance indicators and then investigate the correlations between the senses and experience dimensions.

Design/methodology/approach – The authors conducted a field experiment in a coffee house. For data collection, the authors used a questionnaire for explicit measures and a response latency measurement for implicit measures. For data analysis, structural equation modeling and a correlation analysis were conducted.

Findings – The results reveal positive relationships between explicit and implicit sensory perception, brand experience, and brand performance in the context of gastronomy. Furthermore, implicit perception acts through explicit perception, and brand experience plays a major role as a mediator between sensory perception and consumer responses. Moreover, visual and haptic perception reveal the highest weights in the structural model and the strongest correlations with the experience dimensions.

Originality/value – This paper contributes to consumer research by providing empirical evidence for the importance of both the explicit and implicit sensory perception to effectively

appeal to consumers. The results give valuable insights on the effectiveness of sensory marketing in generating memorable brand experiences and positive brand performance. Furthermore, the findings provide new knowledge on which senses (explicit and implicit) are related to different types of experiences.

Keywords Sensory perception, Consumer perception, Consumer behavior, Brand performance, Brand experience, Gastronomy

Paper type Research paper

Introduction

Given the continuous homogenization of products and services, it is critical for companies to differentiate themselves from competitors. Especially in the service industry, marketing researchers and practitioners have a significant interest in effectively managing service encounters to maximize the consumers' satisfaction and loyalty (Morrison and Crane, 2007). While brand management has traditionally focused on physical and functional aspects, consumers now wish for brands that can provide them with unique experiences (Brakus *et al.*, 2014; Mascarenhas *et al.*, 2006). In this context, sensory marketing is increasingly gaining importance as a means to better appeal to the consumer. The service industry and especially gastronomy have a high potential to apply a holistic communication concept that takes all five senses (sight, hearing, touch, smell, and taste) into account (Brakus *et al.*, 2009; Hui and Bateson, 1991). Through a coherent sensory marketing approach, gastronomy has the opportunity to create an overall experience that leads to positive consumer perception and favorable consumer behaviors (Turley and Milliman, 2000; Wiedmann *et al.*, 2013; Zeithaml, 1988). However, to manage sensory marketing effectively, it is essential to consider that sensory stimuli may be processed consciously and subconsciously (Friese *et al.*, 2006). According to well-established literature on cognitive psychology (e.g., Kahneman, 2003; Neys, 2006; Sloman, 2002; Stanovich and West, 2002), the consumer processes information by two different systems. The implicit system usually processes subconscious stimuli and works automatically and effortlessly, whereas the explicit system generally captures conscious stimuli and operates controlled and deliberately. Both cognitive systems form the consumer's decision-making process. Thus, the consideration of only one system is not enough to fully understand the consumer. Therefore, the creation of a comprehensive multisensory marketing concept requires the combination of both the implicit and explicit systems.

Although there is an increasing interest in assessing consumers' implicit and explicit sensory perception, there is still a lack of empirical research. Prior research has already acknowledged the importance of both perception levels (e.g., Kahneman, 2003; Sloman, 2002); however, it has treated the relationships between sensory marketing and brand experience by still focusing on a conceptual level (e.g., Hultén, 2011; Joy and Sherry, 2003; Walter *et al.*, 2010). Hence, there is a knowledge gap with regard to the causal relationships between implicit and explicit sensory perception, brand experience, and brand-related performance indicators (e.g., brand image, brand satisfaction, brand loyalty, price premium, and buying intention). This paper presents a structural equation modeling analysis (for implicit and explicit sensory perception, brand experience, and brand-related performance indicators) and a correlation analysis (for the five sensory perception dimensions and the four brand experience dimensions) for the given context of gastronomy. In this way, the authors provide three notable, novel contributions to the existing literature. First, the impact of implicit sensory perception on explicit sensory perception is empirically confirmed. Second, the effects of implicit and explicit sensory perception on brand experience are determined. Third, information on how the five senses (i.e., visual, acoustic, haptic, olfactory, and gustatory perception) relate to the four brand experience dimensions (i.e., sensory, affective, behavioral, and intellectual) are given. The results may provide a better understanding for brand managers (particularly in the context of gastronomy) about the effectiveness of sensory marketing communications in creating a memorable brand experience that further leads to positive brand perception and consumer behavior. Additionally, it emphasizes the importance of combining both implicit and explicit sensory stimuli to better appeal to consumers. The findings of the correlation analysis provide useful insights regarding which senses are related to different types of experiences, which marketing managers may use for the creation of such brand experiences.

Regarding the structure of the paper, first, the conceptual model and related hypotheses are presented based on existing research. Second, the methodology and results of the empirical study that includes the partial least squares structural equation modeling and a correlation analysis are described. Finally, the paper provides a discussion of the results, managerial implications and conclusions leading to further research steps.

Conceptual model and the development of hypotheses

The basic framework is displayed in Figure 1. In the following, the constructs and relationships of explicit and implicit sensory perception, brand experience and brand-related performance indicators are explained. The basic driver of the conceptual model is sensory perception. Sensory perception is defined as the consumer's evaluation of an object (e.g., product or brand) that determines the degree of appeal of the object to the human senses (i.e., visual, acoustic, haptic, olfactory, and gustatory). Accordingly, a high evaluation represents a positive sensory perception, whereas a low evaluation indicates a negative sensory perception. Based on the common two-system theory of cognitive psychology (e.g., Kahneman, 2003; Neys, 2006; Sloman, 2002; Stanovich and West, 2002), the consumers' evaluation results from cognitive information processing that can be either subconscious (implicit) or conscious (explicit). In the first case, judgment is usually rendered fast, automatic and effortless, and in the latter case, it is slow, deliberate and effortful (Kahneman, 2003; Sloman, 2002). In addition, the explicit system has a very limited capacity, while the capabilities of the implicit system are nearly unrestricted. Thus, at a given moment, people can consciously direct their attention at selected information only (Smith and DeCoster, 2000). Nevertheless, the consumer is surrounded by all kinds of stimuli that he or she is not actually aware of but that the subconscious mind still gathers and stores. However, even if the information is not consciously present to the consumer, it can absolutely influence his or her

decision-making processes (Friese *et al.*, 2006). The two different types of memory content should not be regarded separately. The psychology literature widely addresses the relationship between the two systems (e.g., Barrett *et al.*, 2004; Evans, 2003; Kahneman, 2011). For efficiency reasons, the explicit system often adopts the intuitive suggestions of the implicit system (Kahneman, 2011) to compensate for missing information or to justify the spontaneous suggestion. Consequently, the literature stresses a positive relationship that is directed from the implicit system to the explicit system. Thus, with regard to valence, positive memory content on an implicit level can lead to similar positive perceptions on an explicit level. Conversely, negative implicit memory content may lead to negative explicit perceptions. Hence, we hypothesize the following.

H1: Implicit sensory perception has a positive effect on explicit sensory perception.

Sensory stimuli, whether perceived subconsciously or consciously, play a major role in establishing an outstanding brand experience (Hirschman, 1984; Hultén, 2011). According to Brakus *et al.* (2009, p. 53), a brand experience represents "subjective, internal consumer responses (sensations, feelings, and cognitions) and behavioral responses evoked by brand-related stimuli that are part of a brand's design and identity, packaging, communications, and environments".

Sensory marketing (i.e., marketing that aims to appeal to a consumers' senses to affect their perception, judgment, and behavior; Krishna, 2012) offers diverse possibilities for creating experiences unique to the consumer. Furthermore, several studies provide evidence for the influence of sensory stimuli on the consumer, such as color and flavor (e.g., Compeau *et al.*, 1998), touch (e.g., Peck and Childers, 2006), background music (e.g., Milliman, 1986), and store scent (e.g., Spangenberg *et al.*, 2006). According to that, in the context of gastronomy, companies can design their stores and develop their products in a way that strongly appeals to customers' senses. For example, they can place especially comfortable

furnishings, use a soothing color design and play arousing background music to evoke positive emotions and establish an exceptional atmosphere. In addition, they can emit appetizing scents and create new combinations of ingredients to intensify the customers' taste experience. Furthermore, these individual stimuli will merge into an overall experience (Hultén, 2011; Lindstrom, 2005). To create a strong holistic experience, companies have to thus apply a coherent concept of sensory marketing, meaning that the sensory stimuli reinforce each other and consequently transmit a consistent brand promise (Guzman and Iglesias, 2012). According to the theory of superadditive effects (Lwin *et al.*, 2010), the quality of the experience is positively related to the number of senses congruently addressed. Therefore, the more and the better the senses are appealed to (i.e., the higher the sensory perception), the better the perceived brand experience. Overall, the following is proposed:

H2: Implicit sensory perception has a positive effect on brand experience.

H3: Explicit sensory perception has a positive effect on brand experience.

In accordance with Pine and Gilmore (1999), brand experiences are highly subjective, vary in intensity and valence, and encompass the customers at different levels. Therefore, the authors follow Brakus *et al.* (2009) and differentiate brand experience along four dimensions: sensory, affective, behavioral, and intellectual. The affective dimension refers to customers' moods or feelings, such as pleasure and excitement, while the cognitive component comprises mental processes (e.g., stimulating consumers' creativity or engaging them in deep thinking). The behavioral dimension reflects individual actions or lifestyles. The sensory component appeals to the five human senses, which can further arouse emotional responses. According to existing research in the field of experiential marketing, the experiences offered by gastronomy may create an emotional connection between the customer and the brand (Arora, 2012; Morrison and Crane, 2007; Xie *et al.*, 2017). By providing high levels of emotional intensity, customers feel a higher level of satisfaction and are more likely to return

to the service brand (Brakus *et al.*, 2009; Holbrook, 1999; Nysveen *et al.*, 2013; Triantafillidou and Siomkos, 2014). Therefore, it is assumed that the experiences stored in consumers' long-term memory may affect consumer perception (i.e., brand image and brand satisfaction) and consumer behavior (i.e., brand loyalty, willingness to pay a higher price and actual buying intention). Thus,

H4: Brand experience has a positive effect on (a) brand image, (b) brand satisfaction, (c) brand loyalty, (d) price premium, and (e) buying intention.

Moreover, in the marketing literature, it has been shown that brand image and brand satisfaction are key performance indicators in brand management. By influencing consumers' expectations, perceived qualities and attitude toward the brand, brand image has been proven in existing marketing research to have a positive impact on brand satisfaction, brand loyalty, price premium, and buying attention (e.g., Bloemer and De Ruyter, 1998; Keller, 1993; Patterson *et al.*, 1996). Furthermore, it is also assumed that higher satisfaction leads to higher loyalty, willingness to pay a price premium, and likelihood of buying a brand's products or services (Rauyruen and Miller, 2007; Selnes, 1993; Tse and Wilton, 1988). Empirical studies have also revealed that consumers who show more trustworthiness and faithfulness toward a brand are more likely to pay a price premium and have a higher intention to buy products or services from the brand in the future (Chaudhuri and Holbrook, 2001). Consequently, the authors suggest the following:

H5: Brand image has a positive effect on (a) brand satisfaction, (b) brand loyalty, (c) price premium, and (d) buying intention.

H6: Brand satisfaction has a positive effect on (a) brand loyalty, (b) price premium, and (c) buying intention.

H7: Brand loyalty has a positive effect on (a) price premium and (b) buying intention.

H8: Price premium has a positive effect on buying intention.

Insert Figure 1 about here.

Methodology

Measurement

The proposed model contains two formative and six reflective constructs (see Figure 1). For measuring the formative constructs (i.e., implicit and explicit sensory perception), the sensory perception items (SPI) developed by Haase and Wiedmann (2018) are applied (see Table 1).

Insert Table 1 about here.

The twenty items were used for the measurement of both the implicit and explicit sensory perception to assess the two factors in a consistent manner and make them comparable. However, for a distinct measurement of the two perception levels, the authors applied two different methods that are specifically suitable for the respective case. For explicit (deliberate and controlled) sensory perception, the items were integrated in a questionnaire. The subjects were asked if they associated the coffee house with the following attributes (items), which they could reply to on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). For implicit (spontaneous and automatic) sensory perception, the items were implemented in a response latency measurement that was soundly developed and validated by Haase and Wiedmann (2018). The methodology relies on well-established implicit association tests, such as the implicit association test by Greenwald *et al.* (1998) and the category-item association test by Fazio (1990). The response latency measurement was completed on a computer. The subjects were asked to intuitively decide whether the following attributes (items) fit the coffee house or not. Furthermore, it was emphasized that they should respond as quickly as possible without actually thinking about it. In case of agreement, they should press “E” for “yes”, and in case of disagreement, they should press “I” for “no”. The respective reminder labels were shown throughout the assignment task: “Fits?” at the top

edge, “yes” at the bottom left corner and “no” at the bottom right corner of the screen. At the center, the brand logo of the coffee house was illustrated. Underneath, the sensory perception items appeared one after another and were presented in a white font color against a black background. Figure 2 shows the screen in an exemplary way.

Insert Figure 2 about here.

In line with the approach of Greenwald *et al.* (1998), for every item, a final score was computed based on the response latency and the valence of sensory perception (i.e., “E” for agreement and “I” for disagreement). To ensure that answers were actually intuitive and not entered by mistake, only response latencies in the interval of 300 to 3000 ms were considered. The valid response times were rescaled so that they took values in the interval of 0 to 1, which is from the weakest association possible at a response time of 3000 to the strongest association possible at a response time of 300. Then, the signs of the rescaled response times were adapted according to the valence (positive for “E” and negative for “I”). Consequently, the final scores ranged from -1 to 1. Furthermore, the final scores for both the implicit and explicit sensory perception were z-transformed to reduce method variance (Bluemke and Friese, 2008) and to make the two factors comparable.

Table 2 shows the items of the reflective measurement models. With regard to brand experience, the original scale of Brakus *et al.* (2009) consisting of four dimensions (i.e., affective, behavioral, intellectual, and sensory) is adapted. Measuring consumer perception (i.e., brand image and brand satisfaction) and consumer behavior (i.e., brand loyalty, price premium, and buying intention) relies on the item set developed by Wiedmann *et al.* (2011). All items are specified to the gastronomy context and are rated on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). The variables were also z-transformed for further analyses.

Insert Table 2 about here.

Data collection and sample

For the evaluation of the proposed model, a field experiment in a well-established coffee house serving gastronomic specialties (e.g., homemade chocolates) was conducted in January 2016. The recruitment of respondents was organized by marketing students in exchange for course credit. For the purpose of the study, a representative sample primarily consisting of students was the goal to obtain a balanced set of data with regard to levels of age, education and other demographic characteristics (Agrawal *et al*., 2011; Dawar and Parker, 1994). Therefore, the marketing students had to contact potential respondents by making use of their social network and invite them to participate in the field experiment. One special instruction for the students was the equal distribution of the sexes.

The main purpose was to investigate the sensory perception of the coffee house, which meant how well the individual senses of the customers were addressed. With regard to the setting, a gallery that provides a view down on the seating area and the counter display of the café was closed for the study to avoid any disruption during data collection. To examine the sensory perception of the coffee house, participants were first asked to observe the coffee house, which included taking in the whole atmosphere, listening to the ambient sound and feeling the furniture. In detail, sensory stimuli were present in the form of a cozy and tradition-rich interior design including particular wood paneling, Dutch tiles, chandeliers and fireplaces (visual). Furthermore, soft and classic background music was played (acoustic). High-quality wood and soft-padded cushions were used for chairs and tables (haptic) and a discreet coffee smell filled the café (olfactory). Second, subjects were invited to pick a sweet-tasting chocolate truffle from a separate table and to taste it (gustatory). After absorbing the different sensory stimuli, the participants took a seat in a neutral and silent corner and were asked to complete the questionnaire. The first part included questions about the respondents' familiarity with the brand. Then, the implicit sensory perception was captured by the

response latency measurement. After that, the participants proceeded with the questionnaire, which assessed the explicit sensory perception of the coffee house, the evaluation of the brand experience and brand-related performance indicators. Finally, the last section presented questions regarding demographics.

In total, 138 subjects participated in the study. Table 3 presents the corresponding characteristics of the sample. The participants' ages ranged from 18 to 67 years, with an average age of 25.7 years. With regard to gender, the distribution was almost equal (48.6% women and 51.4% men). Furthermore, most of the participants were students (80.4%), had a senior high school diploma (61.6%), and a monthly income below 1,000 € (44.2%).

Insert Table 3 about here.

Data analysis

For the descriptive analysis of the demographic sample profile (i.e., means and frequencies), for some aspects of the evaluation of the measurement models (i.e., Cronbach's alpha, Pearson correlation coefficient, and variance inflation factor), and for the correlation analysis, the analysis software SPSS 24.0 was used. To test the hypotheses, partial least squares structural equation modeling was applied since the conceptual model comprises both formative and reflective indicators. Following a two-step approach, the analysis contains an evaluation of the measurement models (outer models) first and an evaluation of the structural model (inner model) second (Henseler *et al.*, 2009). For this purpose, the authors used the analysis software SmartPLS 2.0 (Ringle *et al.*, 2005), including the partial least squares (PLS) algorithm (path weighting scheme) and a blindfolding and bootstrapping procedure (individual sign changes).

Findings

Structural equation modeling

Evaluation of the measurement models. Following the two-step approach of Henseler *et al.* (2009), first, the measurement models and then the structural model were assessed for quality. With regard to the two formative measurement models (i.e., implicit and explicit sensory perception), Table 4 presents the relevant criteria. Except for gustatory perception, all sensory perception dimensions show outer weights that are higher than 0.1 and are significant, as proposed by Hair *et al.* (2012). Moreover, the maximum variance inflation factor (VIF) is 1.661, which falls far below the critical value of 10. Hence, the data are not biased due to multicollinearity (Diamantopoulos *et al.*, 2008).

Insert Table 4 about here.

With reference to the six reflective measurement models (i.e., brand experience, brand image, brand satisfaction, brand loyalty, price premium, and buying intention), Table 5 presents the results concerning reliability and validity. For all variables, the quality criteria are fulfilled. With a minimum of 0.744, all factor loadings are higher than 0.7, which affirms indicator reliability (Hair *et al.*, 2011). The average variance extracted (AVE) has a minimum amount of 65.9% throughout, thus surpassing the requirement of 50%. Hence, convergent validity is confirmed. Additionally, in each case, the AVE is higher than the highest squared correlation with another latent variable, which satisfies the Fornell-Larcker criterion for discriminant validity (Fornell and Larcker, 1981). Finally, Cronbach's alpha always takes a value above 0.6 with a minimum of 0.678, and composite reliability is above 0.7 with a minimum of 0.861. Therefore, internal consistency reliability is also fulfilled (Bagozzi and Yi, 2012; Churchill, 1979; Peterson, 1994).

Insert Table 5 about here.

Finally, the authors performed a Harman's one-factor test for the explicit measures to ensure that there is no common method bias. The analysis revealed that the questionnaire-based items explain only 30.94% of the single factor's variance, which clearly falls below the limit of 50%. Thus, the results negate that the data are biased due to the source of the measures (Podsakoff and Organ, 1986).

Evaluation of the structural model. To assess the quality of the structural model, two prediction-oriented and nonparametric measures are considered. Table 6 presents the results. The coefficient of determination (R^2) ranges from 0.358 to 0.660, which indicates a satisfactory goodness of fit (Chin, 1998). Furthermore, the cross-validated redundancy measure (Q^2) has a minimum of 0.214 and is positive throughout, thus confirming the model's predictive relevance (Geisser, 1974; Stone, 1974).

Insert Table 6 about here.

In the following, the research hypotheses representing the structural relationships between the latent variables are examined. Table 7 displays the path coefficients and t values that give the strength and significance of the relationships, respectively. In the case of the first hypothesis on the impact of implicit sensory perception on explicit sensory perception, the data analysis reveals a highly significant and very strong positive effect ($b = 0.804$, $p \leq 0.001$). Hence, hypothesis H1 has full empirical support. The next two hypotheses address sensory perception as a driver for brand experience. The results detect that brand experience is directly driven only by the explicit system, but in a highly significant and very strong manner ($b = 0.539$, $p \leq 0.001$). The implicit system shows no direct effect ($b = 0.073$, $p > 0.1$). However, implicit sensorial memory content does not remain ineffective. By contrast, as a result of the two abovementioned highly significant and strong relationships, it affects brand experience via the explicit system; here, a perfect mediation effect is found (Baron and

Kenny, 1986). Hypothesis H2 is thus rejected in its proposed form, and hypothesis H3 is confirmed.

The following five hypotheses test whether this effect is passed on to further brand-related performance indicators. The data analysis affirms a significant and positive effect of brand experience on brand image ($b = 0.623$, $p \leq 0.001$), brand loyalty ($b = 0.273$, $p \leq 0.001$), price premium ($b = 0.250$, $p \leq 0.01$), and buying intention ($b = 0.104$, $p \leq 0.1$). Brand satisfaction is not directly influenced ($b = 0.090$, $p > 0.1$). Hence, hypotheses H4a, H4c, H4d, and H4e find full empirical support, and hypothesis H4b is negated. In addition, the findings reveal further effects between brand-related performance indicators. Brand image has a significant and positive effect on brand satisfaction ($b = 0.698$, $p \leq 0.001$) and brand loyalty ($b = 0.267$, $p \leq 0.01$). By contrast, there is no significant direct effect on the downstream measures of consumer behavior, that is, on price premium ($b = 0.146$, $p > 0.1$) and buying intention ($b = 0.128$, $p > 0.1$). Therefore, hypotheses H5a and H5b are verified, but hypotheses H5c and H5d are rejected. The same is true in the case of brand satisfaction, which also shows a significant and positive effect on brand loyalty ($b = 0.301$, $p \leq 0.001$) but no significant direct effect on price premium ($b = -0.034$, $p > 0.1$) or buying intention ($b = 0.043$, $p > 0.1$). Thus, hypothesis H6a finds empirical support, while hypotheses H6b and H6c are rejected. Brand loyalty does have a highly significant and positive impact on price premium ($b = 0.432$, $p \leq 0.001$) and buying intention ($b = 0.510$, $p \leq 0.001$), which supports hypotheses H7a and H7b. Finally, price premium positively affects buying intention ($b = 0.146$, $p \leq 0.05$), thus confirming hypothesis H8.

The findings provide full empirical support for 12 of the 18 hypotheses. The result is a complex impact model (see Figure 3). In detail, the data analysis states a causal chain of various direct and indirect effects with sensory perception as the basic success driver for brand-related key performance indicators through the establishment of a positive brand

experience. With regard to the relevance of the single senses, except for gustatory perception, all the sensory perception dimensions play a significant role. For implicit sensory perception, haptic perception is the most powerful driver ($b = 0.488$, $p \leq 0.001$), followed by visual ($b = 0.412$, $p \leq 0.001$), acoustic ($b = 0.278$, $p \leq 0.05$), and olfactory perception ($b = 0.181$, $p \leq 0.1$). Regarding explicit sensory perception, visual perception is the most important driver ($b = 0.412$, $p \leq 0.001$), followed by haptic ($b = 0.349$, $p \leq 0.01$), acoustic ($b = 0.299$, $p \leq 0.01$), and olfactory perception ($b = 0.246$, $p \leq 0.05$).

Insert Table 7 about here.

Insert Figure 3 about here.

Correlation analysis

To gain deeper insights into the relationship between sensory perception and brand experience, an additional correlation analysis has been conducted. In detail, the correlations between all five sensory perception dimensions (i.e., visual, acoustic, haptic, olfactory, and gustatory) on both an explicit and implicit level and the four brand experience dimensions (i.e., sensory, affective, behavioral, and intellectual) have been investigated (see Table 8). The results show that all 40 correlations are significant at least at $p \leq 0.1$, where most are highly significant at $p \leq 0.001$. With regard to the sensory brand experience dimension, all correlations are highly significant at $p \leq 0.001$. The only exception is implicit acoustic perception, which is still significant but seems to play a minor role in the given case ($r = 0.204$, $p \leq 0.05$). In contrast, the visual sense appears to play the major role. Across all ten variables, it shows the highest correlation coefficients (explicit: $r = 0.475$; implicit: $r = 0.425$). Referring to the affective dimension, haptics turn out to be especially important. Haptic perception reveals the two strongest correlations across all ten variables (explicit: $r = 0.366$, $p \leq 0.001$; implicit: $r = 0.342$, $p \leq 0.001$). Furthermore, the behavioral dimension is

especially related to explicit sensory stimulation. Here, the two strongest correlations are given with explicit visual perception ($r = 0.306$, $p \leq 0.001$) and explicit gustatory perception ($r = 0.294$, $p \leq 0.001$). Finally, the intellectual dimension is most strongly related with explicit haptic perception ($r = 0.437$, $p \leq 0.001$) and explicit visual perception ($r = 0.364$, $p \leq 0.001$), which are also highly relevant on the implicit level ($r = 0.334$, $p \leq 0.001$ and $r = 0.293$, $p \leq 0.001$, respectively).

Insert Table 8 about here.

Discussion

This paper provides new insights on the effects of sensory marketing and the particular relevance of both modes of information processing (i.e., the implicit and explicit sensory perception) in the context of gastronomy by two analyses. First, a structural equation modeling analysis tested the relationships between implicit and explicit sensory perception, brand experience, and brand-related performance indicators. Second, a correlation analysis investigated in more detail the relationship between the dimensions of sensory perception on both an explicit and implicit level and of brand experience.

The structural equation modeling largely confirms the introduced model. It has been shown that implicit and explicit sensory perception explained brand experience to a considerable degree and that sensory perception and brand experience are important drivers for brand-related performance indicators in the given context of gastronomy. In detail, implicit sensory perception shows a highly significant and strong effect on explicit sensory perception. The findings are in line with existing research highlighting the positive relationship between the two systems. As supposed, for sensory perception, the implicit system has high explanatory power in constituting the explicit system, which confirms the significant role when assessing consumer' opinions. Moreover, explicit sensory perception

shows a positive and substantial effect on brand experience. In contrast, implicit sensory perception has an indirect and somewhat smaller effect through explicit sensory perception. Overall, the results indicate that sensory marketing is a strong predictor for brand experience. In particular, for both the implicit and explicit sensory perception, the visual and haptic perception are the most important drivers. Acoustic and olfactory perception also play a significant but less important role. With regard to gustatory perception, for both the implicit and explicit sensory perception, the findings show insignificant weights. Literature on sensory marketing states that taste often depends on the other four senses (e.g., Hultén, 2011; Krishna, 2012; Krishna *et al.*, 2016). Due to given correlations, especially with visual and haptic perception that represent the strongest drivers of sensory perception, the distinct explanatory power of gustatory perception is problematic to separate (Diamantopoulos and Winklhofer, 2001). Thus, the weight of gustatory perception becomes insignificant and flows into the weights of the other four dimensions. Moreover, brand experience shows a positive impact on brand-related performance indicators. As consumer perception (including brand image and brand satisfaction) further influences consumer behavior (including brand loyalty, price premium, and buying intention), partial mediating effects exist. More specifically, the indirect impact of brand experience through brand image, satisfaction, and loyalty on price premium and buying intention is higher than the direct one. Therefore, when consumers have a positive experience with the brand, the overall assessment of the brand becomes more favorable, thus ultimately leading to more positive behavior toward the brand. The results confirm various research approaches with regard to brand equity (e.g., Chaudhuri and Holbrook, 2001). Due to the mediator effect of brand loyalty, the direct paths of brand image and brand satisfaction show no significance with the terminative variables of consumer behavior (i.e., price premium and buying intention). The influence is only significant through the indirect path via brand loyalty.

The correlation analysis shows that all 40 relationships between the five senses (on an explicit and implicit level) and the four brand experience dimensions are significant, with most of them at $p \leq 0.001$. With regard to the strength, the coefficients predominantly indicate moderate correlations, as the separate dimensions of both sensory perception and brand experience are combined. Notwithstanding, the results indeed reveal which type of experience is most strongly related to which type of sensory stimulation. For each type of experience, different senses were more or less relevant. First, in accordance with basic literature on sensory marketing (e.g., Hultén, 2011; Lindstrom, 2005), all five senses are empirically confirmed to be highly relevant in forming an overall sensory experience. Only implicit acoustics (although still significant) played a minor role, as the background music was clearly not appealing and outstanding enough to make a crucial difference in the given case. The visual sense (both on an implicit and explicit level) was found to play the major role. This finding goes in line with the sensory marketing literature that states that the visual sense is the dominant sense (e.g., Krishna, 2012; Schifferstein, 2006). For affective experiences, especially haptic stimuli (both on an implicit and explicit level) are highly important. Affective experiences arise from customers' moods or feelings (Brakus *et al.*, 2009). Thus, the comfort factor, coming from items such as convenient furniture made from high-quality wood and soft padded cushions, clearly contributes a large part to the fact that customers feel good and develop positive emotions. With regard to behavioral experiences, visual and gustatory perception (both on an explicit level) are particularly decisive. Consequently, for consumers to get active and to have bodily experiences, the conscious perception of the outstanding visual appearance of the coffee house and the good taste of the products are apparently the most decisive. Finally, for intellectual experiences, haptic and visual appeal play a major role on both an explicit and implicit level. Clearly, what makes the consumers think and stimulate their curiosity is an exceptional atmosphere based on

outstanding visual and haptic stimuli. In the case of the coffee house, this was given especially by the extraordinary interior and furniture (e.g., Dutch tiles, chandeliers, fireplaces, high-quality wooden chairs and soft padded cushions), which clearly differ from standard locations.

Managerial implications

This paper provides marketing managers with valuable insights on the importance of sensory marketing to create unique brand experiences. Because both implicit and explicit sensory perception were found to be highly relevant, marketing managers need to ensure that they perform well on both perception levels. If this performance is neglected and the implicit and/or explicit sensory perception is negatively assessed, it will further negatively affect the brand experience and brand-related performance indicators. Accordingly, marketing managers need to set appealing sensory cues that fit the consumers' preferences and that are consistent across the five senses and across both perception levels. Doing so will constitute a positive sensory perception and hence brand success. To ensure that the planned multisensory marketing concept actually appeals to the target group on both perception levels, marketing managers are advised to conduct market research by engaging the introduced measurement approach. Doing so may essentially enhance the chances of success of the considered sensory stimuli.

With regard to the individual senses that may be addressed, the main focus of marketing practice is still on visual stimuli. However, this study provides empirical evidence for the relevance of an integrated approach by addressing several senses. In the given case of gastronomy, great potential especially lies in the visual and haptic senses. To create visual appeal, gastronomes may pay special attention to exceptional interior design. For example, when managers plan on establishing an atmosphere for people who appreciate a cozy

ambience, the use of warm colors, fireplaces and dimmed light may be beneficial. For haptic appeal, for example, warm temperature, high-quality materials and comfortable furniture may be applied. Depending on the intensity to which the sensory cues are present, the sensory stimulation can be established on an explicit or implicit level. For example, the visual presentation of the food can be on an étagère which may positively surprise the customer (explicit) or nicely arranged on a plate which may be less striking (implicit). Furthermore, music can be played loudly in the foreground by a live band (explicit) or discreetly in the background (implicit). Moreover, haptic appeal can be achieved by providing special lounge areas where customers may take off their shoes and make themselves comfortable (explicit) or through convenient furniture with soft-padded cushions where customers can sit (implicit). With regard to olfaction, scented candles can be lighted in front of the customer (explicit) or a decent room-fragrance can be spread (implicit). Finally, the good taste of a certain product can be actively promoted by the service staff (explicit) or perceived incidentally while eating (implicit).

In this way, gastronomy can attract customers by creating extraordinary experiences. For the creation of specific types of experiences (sensory, affective, behavioral, or intellectual), marketing managers may set different foci regarding sensory stimulation. For an overall sensory experience, all senses on both perception levels are highly relevant and shall thus flow into a holistic multisensory concept, with the visual sense being central. To evoke positive consumer emotions, especially haptic stimuli (of both the explicit and implicit form) are relevant. For bodily experiences, gastronomes need to ensure that customers consciously perceive that the products taste good and that the location is visually appealing. Finally, to create mental experiences that stimulate the customers' curiosity, visual and haptic stimuli (of both the explicit and implicit form) are particularly appropriate.

Furthermore, the creation of positive brand experiences leads to a positive relationship between the customer and the brand. Thus, marketing managers can establish customer satisfaction and a positive image of the brand, which eventually will cause consumers to be more loyal, to be more willing to pay a higher price and to buy their products and services.

Limitations and future research

This study features some limitations that offer potential starting points for future research. The study tested the model in a first step on a limited and relatively homogeneous sample. For this purpose, a sample primarily consisting of students was chosen. Thus, further studies could verify the results for larger and more heterogeneous samples. Moreover, the data are related to the specific context of gastronomy. However, the findings might not unlikely be true for other various application areas of sensory marketing. Hence, future research may analyze the stated relationships for different industries such as fast-moving and slow-moving consumer goods, or even for B2B sectors where branding is increasingly shifting into focus. Furthermore, the data analysis has focused on causal relationships through structural equation modeling. To get an even better understanding of the effects of sensory marketing activities, examining the moderating effects of socio-demographic aspects (such as gender or age) via analyses of variance would be insightful. Finally, by an additional correlation analysis, the study provides the first insights into the relationships between the dimensions of implicit and explicit sensory perception and the dimensions of brand experience. Future studies may focus on this specific issue and investigate in even more detail the relationships between the single dimensions to deepen the knowledge on the application of sensory stimuli to create particular brand experiences. To conclude, sensory perception, especially in both explicit and implicit forms, remains an under-researched construct in the marketing literature that offers several promising opportunities for further research.

Conclusion

This paper provides empirical evidence for the power of multisensory stimulation in the context of gastronomy. This study gives new insights on the causal relationships of explicit and implicit sensory perception on brand experience and further brand-related key performance indicators. The results support 12 of the 18 research hypotheses outlined in the conceptual model, thus indicating a causal chain of positive direct and indirect effects between sensory perception and brand-related performance indicators. Implicit perception always acts through explicit perception. Furthermore, brand experience plays a major role as a mediator between consumers' sensory perceptions and their responses. In addition, this paper provides valuable knowledge on the correlations between the five senses and the four brand experience dimensions. The results may help gastronomes to create effective sensory stimuli and thus to succeed in a competitive market. Additionally, it may also benefit brand managers since the empirically confirmed research model may be adapted to other contexts.

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Figures and Tables

Figure 1: Conceptual model

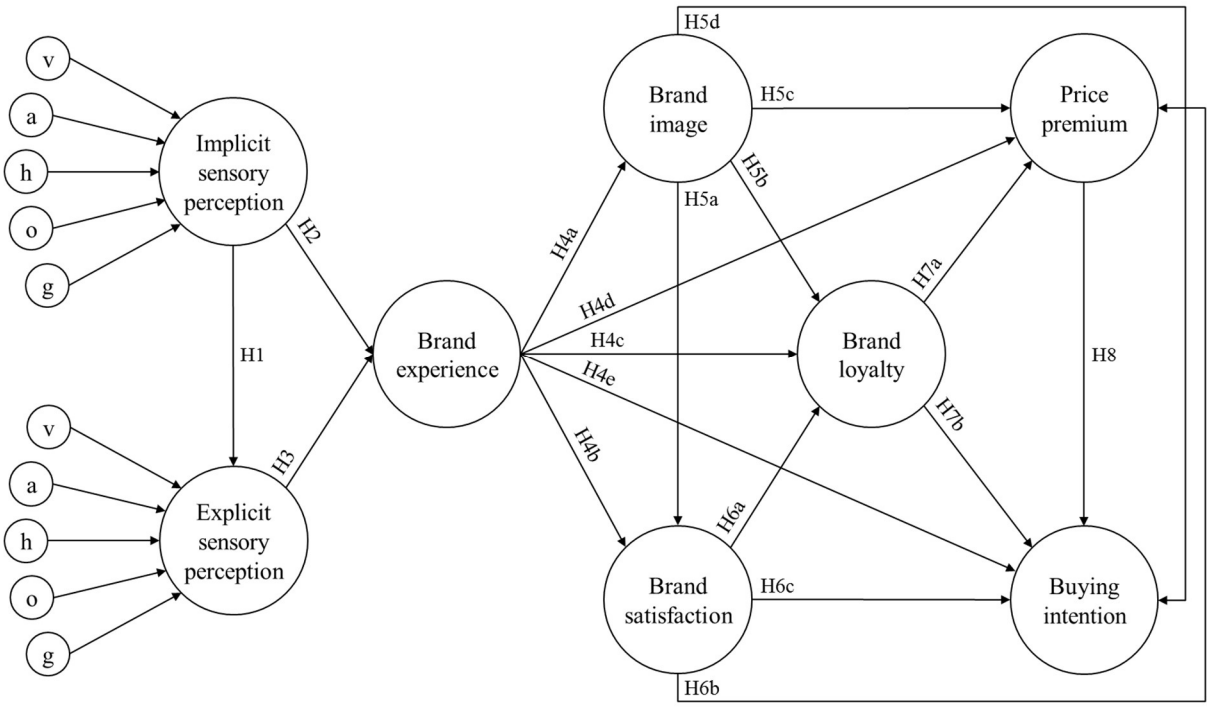


Figure 2: Response latency measurement

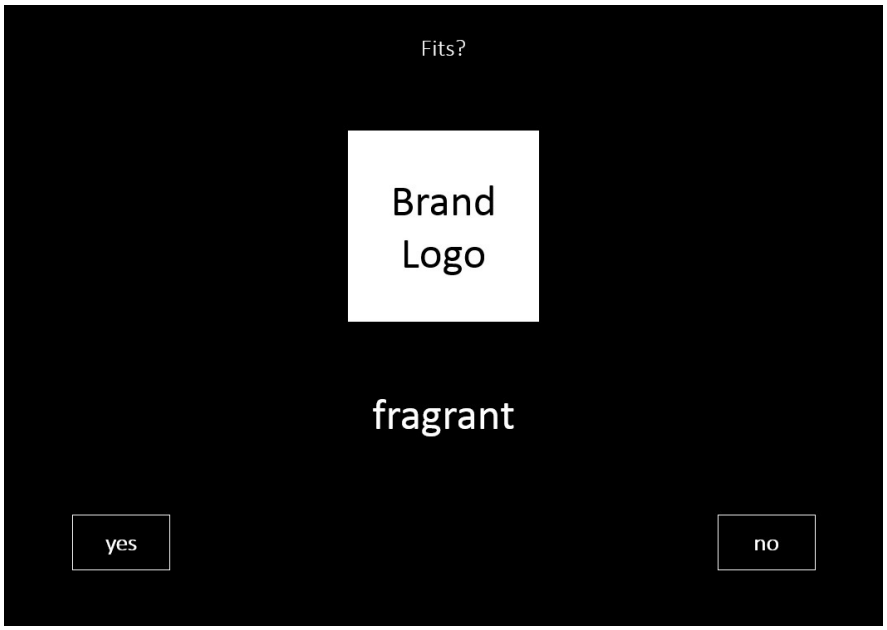
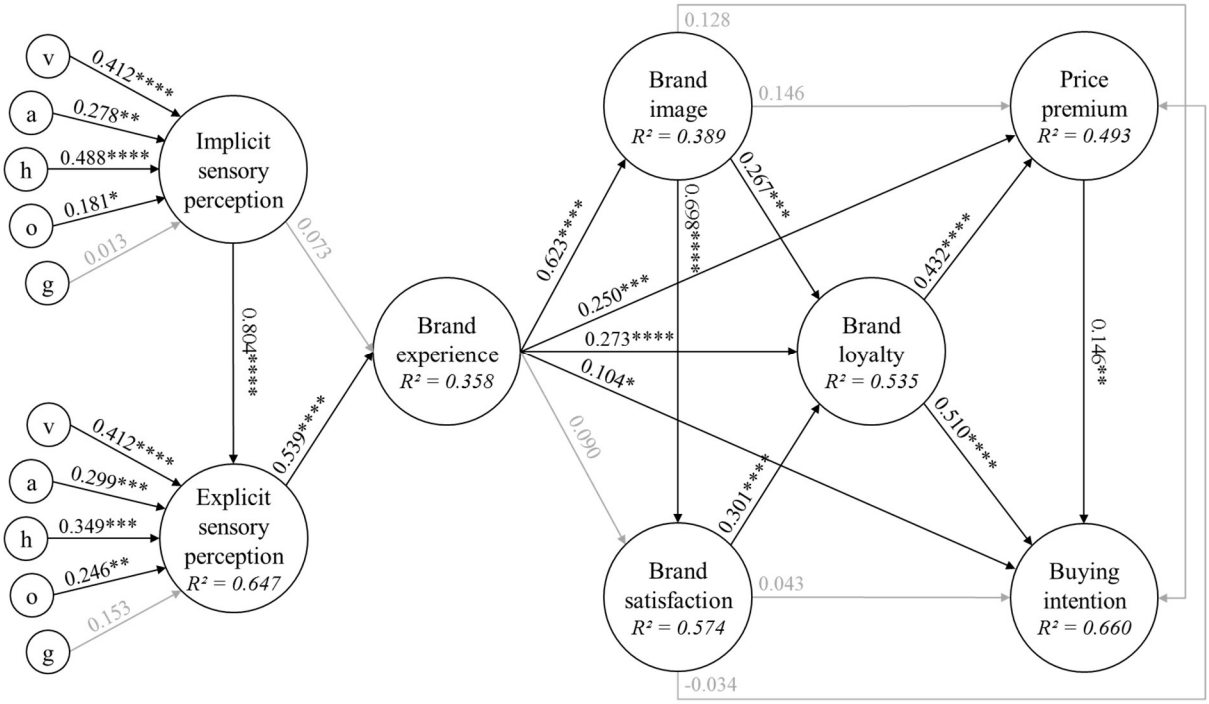


Figure 3: Empirical model



Note: * indicates significance at the $p \leq 0.1$ (** $p \leq 0.05$; *** $p \leq 0.01$; **** $p \leq 0.001$) level of confidence (two-tailed).

Table 1: Items of the formative measurement models

Sensory Perception				
Visual	Acoustic	Haptic	Olfactory	Gustatory
attractive	euphonic	comfortable	fragrant	appetizing
beautiful	good-sounding	handy	nice-smelling	flavorful
pretty	melodic	soothing	perfumed	palatable
aesthetic	sonorous	well-shaped	scented	tasty

Note: The items are used for the measurement of both explicit sensory perception (questionnaire) and implicit sensory perception (response latency measurement).

Table 2: Items of the reflective measurement models

Brand experience
The coffee house makes a strong impression on my senses.
I find the coffee house interesting in a sensory way.
The coffee house appeals to my senses.
The coffee house induces feelings and sentiments.
I have strong emotions for the coffee house.
The coffee house is emotional.
I engage in physical actions and behaviours when I stay at the coffee house.
The coffee house results in bodily experiences.
The coffee house is action oriented.
I engage in a lot of thinking when I stay at the coffee house.
The coffee house makes me think.
The coffee house stimulates my curiosity.
Brand image
I like the coffee house very much.
The coffee house is really likable.
Brand satisfaction
I am very satisfied with the coffee house.
The coffee house absolutely meets my expectations.
Brand loyalty
I would recommend the coffee house to my friends.
I would regret if the coffee house was not existent.
Price premium
I am willing to pay a higher price for the coffee house than for other coffee houses.
The coffee house is worth a higher price compared to other coffee houses.
Buying intention
I plan to visit the coffee house in the future.
I intend to buy products of the coffee house in the future.

Table 3: Demographic profile of the sample

Variable	Characteristics	n	%
Age	18 – 24 years	86	62.3
	25 – 30 years	44	31.9
	> 30 years	8	5.8
Gender	female	67	48.6
	male	71	51.4
Marital status	single	130	94.2
	married	8	5.8
Education	pupil	1	0.7
	junior high school diploma	5	3.6
	senior high school diploma	85	61.6
	university degree	47	34.1
Occupation	scholar	1	0.7
	trainee	3	2.2
	student	111	80.4
	full-time employee	14	10.1
	part-time employee	4	2.9
	housewife/househusband	2	1.5
	unemployed	3	2.2
Income	very low income (< 1000 €)	61	44.2
	low income (1000 – 2000 €)	24	17.4
	middle income (2000 – 3000 €)	18	13.0
	high income (3000 – 4000 €)	12	8.7
	very high income (> 4000 €)	11	8.0
	no answer	12	8.7
Total sample size		**138**	**100.0**

Table 4: Evaluation of the formative measurement models

	Weights	t value	VIF
Implicit sensory perception			
Visual	0.412	3.654	1.355
Acoustic	0.278	2.521	1.231
Haptic	0.488	3.988	1.597
Olfactory	0.181	1.653	1.410
Gustatory	0.013	0.167	1.635
Explicit sensory perception			
Visual	0.412	3.946	1.444
Acoustic	0.299	3.044	1.207
Haptic	0.349	3.222	1.661
Olfactory	0.246	2.395	1.237
Gustatory	0.153	1.571	1.407

Note: VIF = variance inflation factor.

Table 5: Evaluation of the reflective measurement models

	Loadings	AVE	α	ρ_c	FLC (AVE > r^2)
Brand experience	0.744 – 0.851	0.659	0.829	0.885	0.659 > 0.389
Brand image	0.833 – 0.906	0.757	0.684	0.862	0.757 > 0.569
Brand satisfaction	0.895 – 0.917	0.821	0.783	0.902	0.821 > 0.569
Brand loyalty	0.849 – 0.889	0.756	0.678	0.861	0.756 > 0.609
Price premium	0.941 – 0.953	0.897	0.886	0.946	0.897 > 0.430
Buying intention	0.976 – 0.978	0.954	0.952	0.976	0.954 > 0.609

Note: AVE = average variance extracted; α = Cronbach's alpha; ρc = composite reliability; FLC = Fornell-Larcker-criterion; r^2 = highest latent variable correlation squared.

Table 6: Evaluation of the structural model

	R^2	Q^2
Explicit sensory perception	0.647	-
Brand experience	0.358	0.214
Brand image	0.389	0.290
Brand satisfaction	0.574	0.467
Brand loyalty	0.535	0.399
Price premium	0.493	0.435
Buying intention	0.660	0.630

Table 7: Evaluation of the structural relations

			Original sample	Sample mean	SD	SE	t value
H1:	Implicit SP	→ Explicit SP	0.804	0.809	0.040	0.040	19.886
H2:	Implicit SP	→ BE	0.073	0.118	0.082	0.082	0.890
H3:	Explicit SP	→ BE	0.539	0.550	0.114	0.114	4.727
H4a:	BE	→ BI	0.623	0.626	0.052	0.052	12.040
H4b:	BE	→ BS	0.090	0.099	0.063	0.063	1.419
H4c:	BE	→ BL	0.273	0.273	0.077	0.077	3.539
H4d:	BE	→ PP	0.250	0.247	0.078	0.078	3.207
H4e:	BE	→ BU	0.104	0.109	0.063	0.063	1.648
H5a:	BI	→ BS	0.698	0.699	0.066	0.066	10.664
H5b:	BI	→ BL	0.267	0.271	0.093	0.093	2.859
H5c:	BI	→ PP	0.146	0.162	0.102	0.102	1.437
H5d:	BI	→ BU	0.128	0.134	0.080	0.080	1.597
H6a:	BS	→ BL	0.301	0.298	0.087	0.087	3.458
H6b:	BS	→ PP	-0.034	-0.083	0.063	0.063	0.547
H6c:	BS	→ BU	0.043	0.066	0.048	0.048	0.892
H7a:	BL	→ PP	0.432	0.430	0.096	0.096	4.498
H7b:	BL	→ BU	0.510	0.510	0.088	0.088	5.780
H8:	PP	→ BU	0.146	0.147	0.072	0.072	2.026

Note: SD = standard deviation; SE = standard error; SP = sensory perception; BE = brand experience; BI = brand image; BS = brand satisfaction; BL = brand loyalty; PP = price premium; BU = buying intention.

Table 8: Results of the correlation analysis

	Brand experience			
	Sensory	Affective	Behavioral	Intellectual
Implicit sensory perception				
Visual	0.425****	0.239***	0.232***	0.293****
Acoustic	0.204**	0.272****	0.163*	0.288****
Haptic	0.424****	0.342****	0.287****	0.334****
Olfactory	0.388****	0.189**	0.168**	0.176**
Gustatory	0.377****	0.180**	0.205**	0.254***
Explicit sensory perception				
Visual	0.475****	0.326****	0.306****	0.364****
Acoustic	0.283****	0.287****	0.243***	0.348****
Haptic	0.424****	0.366****	0.269****	0.437****
Olfactory	0.343****	0.253***	0.202**	0.192**
Gustatory	0.406****	0.231***	0.294****	0.269****

Note: * indicates significance at the $p \leq 0.1$ (** $p \leq 0.05$; *** $p \leq 0.01$; **** $p \leq 0.001$) level of confidence (two-tailed).

P4:

Sensory stimuli in print advertisement – Analyzing the effects on selected performance indicators

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Journal of International Business Research and Marketing

3(2), 7-15

ResearchLEAP

Journal of International Business Research and Marketing
Volume 3, Issue 2, 2018
journal homepage: www.researchleap.com

Sensory Stimuli in Print Advertisement – Analyzing the Effects on Selected Performance Indicators

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DOI: *10.18775/jibrm.1849-8558.2015.32.3001*
URL: *http://dx.doi.org/10.18775/jibrm.1849-8558.2015.32.3001*

Keywords:
Sensory perception, Product design, Brand experience, Brand perception, Consumer behavior, Print advertisement

ABSTRACT

The multisensory marketing approach is often associated with the creation of memorable consumer experiences. In contrast, the broad field of advertisement is increasingly struggling to appeal effectively to the consumer. Thus, the implementation of multisensory aspects in traditional advertisement activities might be promising. In the given context of the print advertisement, the empirical results of this research provide evidence that the application of multisensory stimuli is an important success factor in creating experiences and influencing the perception of product design. As there is great potential in the haptic and olfactory senses, marketing managers can appeal to consumers by using, for example, singular scents or special materials. However, to address consumers effectively, marketing managers must be aware of both the explicit and implicit effects when implementing different sensory stimuli to ensure that there is no conflict between the perception levels.

1. Introduction

Today, it is becoming increasingly difficult for marketing practitioners to appeal effectively to the consumer. The rapidly growing number of products with the same characteristics and the unsatisfying effects of conventional marketing techniques have led to a demand for more innovative approaches (Lee & Lee, 2004; McNally, Akdeniz & Calantone, 2011). Looking for new ways to differentiate products and brands from competitors, sensory marketing has recently gained growing popularity with both marketing researchers and managers (Krishna & Schwarz, 2014). In addition, a multisensory marketing approach is increasingly shifting into focus to create memorable experiences for the consumer (Lindstrom, 2005). Accordingly, several studies have already investigated the utility of sensory stimuli in terms of a specific consumer approach, particularly in the context of advertisement (Krishna, Cian, & Sokolova, 2016). For instance, evidence is provided for the impact of the salience of touch (e.g., Peck & Childers, 2006), store scent (e.g., Spangenberg, Sprott, Grohmann, & Tracy, 2006), and background music (e.g., Milliman, 1986) on consumer behavior. As a result, some companies have already transferred these insights to traditional print advertisements (Hultén, 2009). It is widely recognized that print advertisement is still a useful and relevant communication medium in today's world, more than ever before, because other advertisement formats, such as TV spots and online ads, are often questioned with regard to their impact on the consumer (Liu & Shrum, 2013; Yoon & Kim, 2001). Therefore, the implementation of, for example, haptic elements, scented stripes, and music-related QR codes to print ads seems to correlate with the aforementioned findings and underlines the broad innovation potential of print advertisement in terms of a multisensory marketing approach. Although recent studies have helped to provide a better understanding of how specific sensory cues affect consumer perception, there is still much to learn about the causal relationships between sensory perception and brand-related outcomes (e.g., Spence, 2012; Streicher & Estes, 2016). Hence, as sensory cues may be perceived on an explicit or implicit level, it is important to focus on both types of consciousness to assess specific relationships with the product- and brand-related key factors (Krishna, 2012). Moreover, there is still a great need to investigate the aspects underlying the relationship between sensory perception and consumer behavior (Underwood & Klein, 2002). As marketing literature has detected product design and brand experience as relevant factors determining consumer perception and behavior (e.g., Brakus, Schmitt, & Zhang, 2014; Moon, Park, & Kim, 2015), this paper focuses on both constructs to examine their potential mediating role. As deduced from these remarks, the objective of the present study is to close the outlined gaps in the context of potential effects of sensory cues in print advertisement.

The paper is organized as follows: The next chapter provides the theoretical background, including the conceptual framework, outlines the relevant constructs, and deduces the research hypotheses. In the subsequent section, the methodology of the empirical study is described. Next, partial least squares structural equation modeling yields the findings. Finally, the paper provides a discussion and conclusions with an outlook toward future research opportunities.

2. Theoretical Background and Hypothesis Development

The conceptual framework is displayed in Figure 1. In the following section, the constructs and relationships of explicit and implicit sensory perception, product design, brand experience, brand perception and consumer behavior are explained in detail.

Sensory perception represents the initial driver of the conceptual model. In this paper, sensory perception is considered the consumer's evaluation of an object (e.g., product or brand) in terms of its appeal to the senses (i.e., visual, acoustic, haptic, olfactory, and gustatory). According to the well-established two-system approach of cognitive psychology (e.g., Kahneman, 2003; Neys, 2006; Sloman, 2002; Stanovich & West, 2002), consumers can form these evaluations in their subconscious (implicit) or conscious (explicit) mind. The implicit system (System 1) generally works quickly, automatically, associatively, and effortlessly. In contrast, the explicit system (System 2) operates slowly, deliberately, sequentially, and with more effort (Kahneman, 2003; Sloman, 2002). Furthermore, consumer choice is always based on both conscious and nonconscious processes; the influence of the nonconscious is particularly central. People perceive numerous stimuli in their environment unconsciously (Fitzsimons, Hutchinson, & Williams, 2002), whether it be music in a commercial, the scent in a store or the way a product feels. Consumers are perpetually confronted with product stimuli, of which only a fraction is actually noticed on an explicit level. People can concentrate on selected stimuli only, and their attentional resources are restricted (Smith & DeCoster, 2000). Although most product information is thus not accessible to the consumers' conscious mind, it can absolutely influence decision processes (Friese, Wänke, & Plessner, 2006). In fact, due to the spontaneous functioning of System 1 and the comparatively very limited capacity of System 2, the latter often adopts the intuitive suggestions of the former (Kahneman, 2011). Positive implicit memory content can, therefore, lead to an equally positive explicit perception (and vice versa) in terms of a compensation of missing conscious information or a justification of the spontaneous suggestion. Thus,

H1: Implicit sensory perception has a positive effect on explicit sensory perception.

In addition to environmental factors (e.g., atmospherics) or individual differences (e.g., gender), a product's intrinsic factors (e.g., color or taste) represent core elements of a perceived product design and impact consumer perception (Krishna, Cian, & Aydınoğlu, 2017; Piqueras-Fiszman & Spence, 2015; Zampini, Wantling, Phillips, & Spence, 2008). In fact, there are three dimensions of product design: aesthetics, functionality, and symbolism (Homburg, Schwemmle, & Kuehnl, 2015). Aesthetics indicate the level of the perceived beauty of an object (Desmet & Hekkert, 2007), functionality describes the assumed utility of the product based on design properties (Bloch, 2011), and symbolism explains the degree of identification and meaning a consumer associates with a certain design (Kumar & Noble, 2016). Empirical work in this area suggests relationships between sensory perception and all dimensions of product design (e.g., Aslam, 2006; Hoegg & Alba, 2011; Peck & Childers, 2003; Veryzer & Hutchinson, 1998). Accordingly, the perception of product design can potentially be influenced by both explicit and implicit sensory perception (Veryzer, 1999). Thus, it is influenced by all sensory cues sent out from the product itself (Schifferstein & Desmet, 2008). Therefore, it is assumed that

H2a: Implicit sensory perception has a positive effect on product design.
H3a: Explicit sensory perception has a positive effect on product design.

Whether processed on an implicit or explicit level, the consumer's sensory perception of a product or brand may contribute to a memorable experience (Hirschman, 1984; Hultén, 2011). According to Brakus, Schmitt, and Zarantonello (2009, 53), the term brand experience can be defined as "subjective, internal consumer responses (sensations, feelings, and cognition) and behavioral responses evoked by brand-related stimuli that are part of a brand's design and identity, packaging, communications, and environments". Companies have various opportunities to build outstanding experiences by appealing to the five senses, for example, through striking pictures that make consumers think, pleasant scents that evoke positive emotions, or exciting music that creates an arousing atmosphere. Moreover, the separate stimuli that a company uses to stimulate the consumer merge into an overall impression (Hultén, 2011; Lindstrom, 2005). For this reason, and to establish a strong holistic experience, sensory marketing must use sensory stimuli coherently and in a mutually reinforcing way to transmit a consistent brand promise (Guzman & Iglesias, 2012). This phenomenon is known as the superadditive effects of sensory stimuli (Lwin, Morrin, & Krishna, 2010). However, brands must also prevent sensory overload. Hence, the amount, content and intensity of sensory stimuli play a major role in creating an ideal brand experience (Krishna, 2012). Thus, we propose

H2b: Implicit sensory perception has a positive effect on the brand experience.
H3b: Explicit sensory perception has a positive effect on the brand experience.

Marketing research has already found evidence for the causal relationship between product design and key indicators of marketing success (Bloch, 1995; Homburg et al., 2015; Montana, Guzman, & Moll, 2007). In short, the creation of a superior product design can significantly enhance customer experience (Brakus et al., 2014). Thus, research from Morgan-Thomas and Veloutsou (2013) has shown that an appropriate design can foster a consumer's entire brand experience. Consequently, several researchers found a strong relationship between the design of a company's products and overall brand perception (e.g., Brunner, Ullrich, Jungen, & Esch, 2016; Mishra, 2016; Wang, 2013). Thus, product design plays a major role in general consumer behavior (Landwehr, Wentzel, & Herrmann, 2012). Accordingly, studies provide evidence for the impact that product design has on different aspects of consumer behavior, such as product and brand choice (e.g., Lim, Kim, & Cheong, 2016) as well as purchase intention (e.g., Beneke, Mathews, Munthree, & Pillay, 2015). Therefore, it is hypothesized

H4a: Product design has a positive effect on the brand experience.
H4b: Product design has a positive effect on brand perception.
H4c: Product design has a positive effect on consumer behavior.

To embed brands deeply in a consumer's mind, the concept of brand experiences has become an important component in marketing communication. Superior experiences are thus created through offering brand-related stimuli as part of, for example, a brand's design, packaging or advertisement, at any time during the encounter (Cliffe & Motion, 2005; Klaus & Maklan, 2007). Research in the field of experience marketing has already shown that brand experiences are highly subjective, vary in strength, intensity, and valence, and engage the customers at different levels (Brakus et al., 2009; Gentile, Spiller, & Noci, 2007; Iglesias, Singh, & Batista-Foguet, 2011, Pine & Gilmore, 1999; Schmitt, 1999). Therefore, we divide the construct into four dimensions: affective, behavioral, cognitive, and sensory (Brakus et al., 2009). The affective component refers to the emotional responses (e.g., fun or pleasure) that are generated through marketing communication. Behavioral experiences are action-oriented and result in physical actions and bodily experiences. The cognitive component aims for mental processes, such as the enhancement of consumer' creativity or the

engagement in deep thinking. Finally, sensory experiences appeal to the five senses, which can further cause excitement and pleasure (Aaker, 1997, Gentile et al., 2007; Schmitt, 1999). Based on the literature, it is argued that a superior brand experience results in differentiation from other brands and builds a positive customer-brand relationship (Chang & Chieng, 2006; Nysveen, Pedersen, & Skard, 2013). Thus, it is assumed that the experience, which is assumed to be stored in a consumer's memory for long-term, promotes strong emotional responses, further leading to a positive brand perception, for example, in terms of brand image and satisfaction. Besides, the experience may also affect future-directed responses. Customers are more likely to be faithful to the brand, have a higher willingness to recommend the brand to others, and intend to buy the brand's products or services (Guzman & Iglesias, 2012; Ha & Perks, 2005; Iglesias et al., 2011). Therefore,

H5a: Brand experience has a positive effect on brand perception.

H5b: Brand experience has a positive effect on consumer behavior.

The existing marketing literature has also shown that brand perception, which is understood as the consumer's general perception of and feeling about a brand, is considered to be a key driver of brand equity and thus has the potential to influence consumer behavior (e.g., Belén del Rio, Vazquez, & Iglesias, 2001; Esch, Langner, Schmitt, & Geus, 2006; Faircloth, Capella, & Alford, 2001; Keller, 1993). Therefore, in the given context of the print advertisement, it is suggested that positive brand perception leads to such behavioral outcomes as consumer willingness to buy the product, to pay a premium price, and to offer positive recommendations. Thus,

H6: Brand perception has a positive effect on consumer behavior.

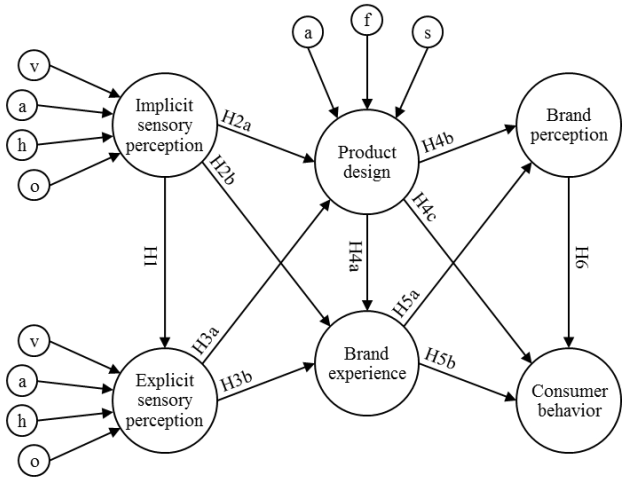

Figure 1: Conceptual model

3. Methodology

3.1 Measures

The introduced conceptual model consists of three formative (i.e., implicit sensory perception, explicit sensory perception, and product design) and three reflective (i.e., brand experience, brand perception, and consumer behavior) measurement models (see Figure 1). In particular, to capture implicit and explicit sensory perception, we adapted the sensory perception items (SPI) developed by Haase and Wiedmann (2017). To measure the three dimensions of product design (i.e., aesthetic, functionality, and symbolism), the original scale of Homburg et al. (2015) was adopted. For measuring the four dimensions of brand experience (i.e., sensory, affective, behavioral, and intellectual), the item set developed by Brakus et al. was applied (2009). The measurement of brand perception (i.e., image, satisfaction, and trust) and consumer behavior (i.e., loyalty, price premium, and willingness to buy) employs items developed by Wiedmann, Hennigs, Schmidt, and Wuestefeld (2011). Finally, all items were specified to an advertisement context and rated on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree).

3.2 Data Collection and Sample

To test the introduced conceptual model, a laboratory experiment was conducted in July 2016. The main objective was to investigate the sensory perception of a specially prepared print ad promoting both a female and a male fragrance. To achieve a haptic effect, a self-adhesive foil highlighting the perfume bottles and brand logo was incorporated. In addition, a QR code playing the advertising jingle when activated was added for acoustics, and the corresponding perfume was sprayed on the print ad to appeal to the olfactory sense. The initial part of the study included direct stimulus contact, where participants had to absorb the sensory stimuli from the print ad. Next, the subjects were asked to evaluate the perfume, the men rating only the male fragrance and the women only the female fragrance. First, the participants completed a forced-choice implicit association test. Subsequently, a questionnaire was filled out: the first section asked introductory questions on, for example, the participants' familiarity with perfumes and the brand; the second and main section included queries about the test variables (i.e., implicit and explicit sensory perception, product design, brand experience, brand perception, and consumer behavior); and the third section contained social demographics.

In total, 77 subjects participated in the study. Table 1 presents the corresponding characteristics of the sample. The participants' age ranged from 19 to 82, having an average age of 35.25 years. Most of the respondents were female (50.6%), single (64.9%), had a university degree (46.7%), were students (42.9%) and had a monthly income of either between 2000€ and 3000€ (20.8%) or higher than 4000€ (20.8%), respectively.

3.3 Data Analysis

The analysis software SPSS 24.0 was applied for the descriptive analysis of the demographic sample characteristics (i.e., means and frequencies) and for some aspects of the evaluation of the measurement models (i.e., Pearson correlation coefficient, Cronbach's alpha, and variance inflation factor). For hypotheses testing, partial least squares structural equation modeling (PLS-SEM) was used, as the conceptual model contains reflective and formative indicators. The data analysis follows a two-step approach involving the evaluation of first the measurement models and second the structural model (Henseler, Ringle, & Sinkovics, 2009). For that purpose, the SmartPLS 2.0 analysis software was applied (Ringle, Wende, & Will, 2005) including the PLS algorithm (path weighting scheme) and bootstrapping and blindfolding and procedure (individual sign changes).

Table 1: Sample Characteristics

Variable	Characteristics	n	%
Age	18 – 24 years	23	29.9
	25 – 49 years	35	45.5
	> 50 years	19	24.7
Gender	female	39	50.6
	male	38	49.4
Marital status	single	50	64.9
	married	25	32.5
	divorced	2	2.6
Education	junior high school diploma	15	19.5
	senior high school diploma	26	33.8
	university degree	36	46.7
Occupation	scholar	1	1.3
	trainee	1	1.3
	student	33	42.9
	full-time employee	32	41.6
	part-time employee	4	5.2
	housewife/househusband	1	1.3
	retired	5	6.5
Income	< 1000 €	13	16.9
	1000 – 2000 €	14	18.2
	2000 – 3000 €	16	20.8
	3000 – 4000 €	13	16.9
	> 4000 €	16	20.8
	no answer	5	6.5
Total sample size		**77**	**100.0**

4. Findings

4.1 Evaluation of the Measurement Models

Prior to hypothesis testing, the measurement models are first checked to ensure reliability and validity (Henseler et al., 2009). With regard to the formative constructs (i.e., implicit sensory perception, explicit sensory perception, and product design), Table 2 presents the respective quality criteria. As required by Hair, Sarstedt, Ringle, and Mena (2012), all items show outer weights higher than 0.1. Except for the implicit visual and acoustic perception, all items have t values above 1.645 and are thus, at least on a 10% level, significantly important for the respective measurement model. Further, the maximum variance inflation factor (VIF) is 1.834, far below the limit of 10, so there are no multicollinearity problems (Diamantopoulos, Riefler, & Roth, 2008).

Referring to the reflective measurement models (i.e., brand experience, brand perception, and consumer behavior), Table 3 shows the values checking for quality. The criteria are satisfied throughout. The factor loadings, with a minimum value of 0.785, all exceed the limit of 0.7. Accordingly, indicator reliability is given (Hair, Ringle, & Sarstedt, 2011). The average variance extracted (AVE) clearly exceeds the 50% requirement, as it shows a minimum amount of 74.2%. This confirms convergent validity. Moreover, the AVE is always higher than the highest squared correlation with another latent variable. Thus, the Fornell-Larcker-criterion for discriminant validity is satisfied (Fornell & Larcker, 1981). Finally, the composite reliability shows its minimum at 0.901 and Cronbach's alpha at 0.833, both of which are far above the limits of 0.7 and 0.6, respectively. Consequently, internal consistency reliability is also fulfilled (Bagozzi & Yi, 2012; Churchill, 1979; Peterson, 1994).

Table 2: Evaluation of the formative measurement models

	Weights	t value	VIF
Implicit sensory perception			
Visual	0.191	1.154	1.555
Acoustic	0.135	1.096	1.378
Haptic	0.591	3.579	1.834
Olfactory	0.311	1.923	1.722
Explicit sensory perception			
Visual	0.508	3.895	1.335
Acoustic	0.278	2.389	1.188
Haptic	0.335	2.881	1.490
Olfactory	0.263	2.161	1.339
Product design			
Aesthetics	0.406	3.480	1.520
Functionality	0.301	2.644	1.397
Symbolism	0.547	5.900	1.295

Note: VIF = variance inflation factor.

Table 3: Evaluation of the reflective measurement models

	Loadings	AVE	α	ρ_c	FLC (AVE > r^2)
Brand experience	0.844–0.884	0.742	0.884	0.920	0.742> 0.480
Brand perception	0.862–0.910	0.790	0.867	0.918	0.790> 0.625
Consumer behavior	0.785–0.909	0.752	0.833	0.901	0.752> 0.625

Note: α = Cronbach's alpha; AVE = average variance extracted; FLC = Fornell Larcker criterion; ρc = composite reliability; r^2 = highest latent variable correlation squared.

To preclude common method bias, Harman's one-factor test for the explicit measures was used. The explained variance for the single factor is at 35.14%. As this value clearly remains under the upper limit of 50%, the data are not biased by the source of the measurements (Podsakoff & Organ, 1986).

4.2 Evaluation of the Structural Model

In addition to the measurement models, the quality of the structural model must be tested. Table 4 shows the respective values of two prediction-oriented and nonparametric measures, the coefficient of determination (R^2) and the cross-validated redundancy measure (Q^2). R^2 ranges from 0.372 to 0.667. Thus, the results indicate a satisfactory goodness of fit (Chin, 1998). Furthermore, Q^2 reveals a minimum value of 0.309. Hence, all values are positive, which confirms the model's predictive relevance (Geisser 1974; Stone 1974).

Table 4: Evaluation of the structural model

	R^2	Q^2
Explicit sensory perception	0.551	-
Product design	0.372	-
Brand experience	0.440	0.309
Brand perception	0.557	0.400
Consumer behavior	0.667	0.453

Finally, the research hypotheses can be verified. Table 5 shows the t values and path coefficients representing the significance and strength of the structural relations between the latent variables.

Table 5: Bootstrapping results for the causal relationships

			Original sample	Sample mean	SD	t value
H1:	ISP	→ ESP	-0.743	-0.753	0.068	10.867
H2a:	ISP	→ PD	-0.087	-0.131	0.091	0.955
H2b:	ISP	→ BE	0.295	0.293	0.122	2.414
H3a:	ESP	→ PD	0.543	0.566	0.111	4.874
H3b:	ESP	→ BE	0.423	0.437	0.123	3.433
H4a:	PD	→ BE	0.497	0.490	0.068	7.353
H4b:	PD	→ BP	0.359	0.355	0.079	4.560
H4c:	PD	→ CB	0.032	0.066	0.050	0.644
H5a:	BE	→ BP	0.471	0.475	0.073	6.441
H5b:	BE	→ CB	0.272	0.278	0.088	3.095
H6:	BP	→ CB	0.582	0.570	0.088	6.635

Note: SD = standard deviation; ISP = implicit sensory perception; ESP = explicit sensory perception; PD = product design; BE = brand experience; BP = brand perception; CB = consumer behavior.

With reference to the first hypothesis, which covers the influence of the implicit on the explicit system, the results actually reveal a highly significant effect, although it is negative (b = -0.743, $p \leq 0.001$). However insightful, hypothesis H1 in its above-postulated form must be rejected. The next four hypotheses address the driving role of sensory perception for product design and brand experience. The findings show that perceived product design is driven only by the explicit component of sensory perception (b = 0.543, $p \leq 0.001$), not by the implicit one (b = -0.087, $p > 0.1$). Moreover, the experience with a brand is significantly affected by both explicit sensory perception (b = 0.423, $p \leq 0.001$) and implicit sensory perception (b = 0.295, $p \leq 0.05$). Hence, hypothesis H2a is rejected, while hypotheses H2b, H3a, and H3b find full empirical support. Further, the following three hypotheses address the effect of product design on brand-related outcome variables. More specifically, the study provides evidence for a highly significant impact on brand experience (b = 0.497, $p \leq 0.001$) and brand perception (b = 0.359, $p \leq 0.001$). By contrast, consumer behavior is not directly enhanced by product design (b = 0.032, $p > 0.1$). Consequently, hypothesis H4c is rejected, but hypotheses H4a and H4b are confirmed. Moreover, the effect of brand experience on brand-related outcome variables is tested. The results indicate that a positive experience with a brand contributes to a better overall perception of that brand (b = 0.471, $p \leq 0.001$) and a more favorable behavior of the consumer toward that brand (b = 0.272, $p \leq 0.01$). Thus, both hypotheses H5a and H5b are verified. Finally, the last hypothesis contains the effect of brand perception on consumer behavior. Correlating with former research, the findings show a highly significant and strong causal relationship (b = 0.582, $p \leq 0.001$). Overall, the results reveal that eight of the eleven hypotheses find full empirical support, so a causal chain of direct and indirect effects from sensory perception to consumer behavior is detected (see Figure 2).

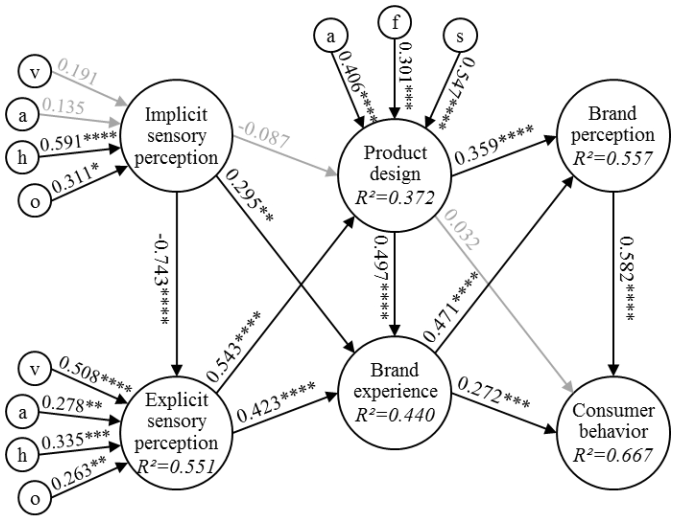

Figure 2: Empirical model

Note: **** $p \leq 0.001$; *** $p \leq 0.01$; ** $p \leq 0.05$;* $p \leq 0.1$.

5. Discussion

The data analysis confirms a major part of the theoretically based model. The results reveal that sensory perception is an important driver of product- and brand-related outcome variables in the chosen context of the print advertisement. Specifically, the incorporation and coherent use of several sensory stimuli lead to positive consumer behavior. The findings show a positive, indirect effect of explicit sensory perception on both brand perception and consumer behavior. In this context, product design and brand experience work as mediators. On an explicit level, all sensory drivers show significant results. The visual perception is the most important driver (b = 0.508, $p \leq 0.001$). Haptic perception plays a substantial but less significant role (b = 0.335, $p \leq 0.01$), followed by acoustic and olfactory perception, which have almost equal effects (b = 0.278, $p \leq 0.05$; b = 0.263, $p \leq 0.05$). The findings correlate with existing marketing literature, highlighting visual perception as the strongest driver in most contexts (Schifferstein, 2006). However, our results also point to the importance of the other senses. With regard to the implicit level, only two of the four drivers are significant. Haptic perception is the most powerful driver (b = 0.591, $p \leq 0.001$). Olfactory perception plays a lesser but still significant and essential role (b = 0.311, $p \leq 0.1$). The reason for the strong effect of haptic perception on an explicit and implicit level might be found in the nature of print ads: as they are usually integrated into advertising materials made of paper (e.g., in journals), contact with the ad is often accompanied by physically touching it. This is why haptic perception might have such a strong, positive influence. For olfactory perception, the value for the implicit perception is higher than for the explicit perception. Therefore, it can be assumed that the olfactory sense is perceived more strongly on an implicit level and that the dominant implicit perception causes an inferior explicit effect. In fact, haptic and olfactory perception might also be influenced by imagery induced by, for example, the visual cues of the advertisement (Deng & Kahn, 2009; Krishna, Morrin, & Sayin, 2013). However, the direct effect of implicit on explicit sensory perception is negative. A potential reason for this result could be that the participants were implicitly averse to the print ad, which was rather indecent in terms of showing a half-naked man touching an attractive woman. However, the respondents did not express this reluctance explicitly. Because the print ad promotes a renowned luxury brand, this contradiction might be explained by the participants' generally positive attitude toward that brand, regardless of the print ad. Thus, if marketing managers implement different sensory stimuli, they must be

aware of both the explicit and implicit effects and, to make the advertisement more effective, should ensure that there is no conflict between the perception levels.

The study reveals the significance of various senses on an explicit and implicit level, providing evidence for the importance of a multisensory marketing approach in which the appeal of all senses is paramount. Moreover, the results confirm a positive and strong effect of explicit sensory perception on perceived product design, whereas implicit sensory perception shows only an indirect effect through explicit sensory perception. All dimensions of product design reveal significant results. Symbolism seems to be the strongest driver ($b = 0.547$, $p \leq 0.001$), followed by aesthetics ($b = 0.406$, $p \leq 0.001$) and functionality ($b = 0.301$, $p \leq 0.01$). These findings correlate with recent insights emphasizing the importance of the symbolic dimension when examining aspects of product design. In the specific case of the print advertisement, the sensory stimuli perceived from the print ad mainly promote the appearance of the product and communicate symbolic value but only partly explain the functional aspects. Thus, marketing managers should always be aware of the specific positioning context in which they are operating and further conclude from this which product design dimensions might be of increased importance for an overall evaluation. Additionally, to address a specific dimension, the product itself must be created in a multisensory way to provide additional information on a conscious or subconscious level. Moreover, for brand experience, the results indicate a positive direct effect from implicit and explicit sensory perception and perceived product design as well as an indirect effect from implicit sensory perception, where explicit sensory perception and product design work as mediators. In the given context of print ads, the composition of different sensory stimuli and the promotion of the product itself can be used to implement a holistic experiential marketing concept that evokes positive feelings or engages consumers in deep thinking and attracts behavioral options.

The question arises of how sensory stimuli can be designed to be fully effective in addressing the different experience components. In addition, the sensory perception has an indirect impact on perceived product design. This is why the use of sensory stimuli can be linked to the promoted product to achieve a strong effect, for example, through special haptic, olfactory or acoustic elements highlighting the specific product within the ad. Moreover, product design and brand experience show a strong and positive impact on brand-related outcomes. Because brand perception also positively influences consumer behavior, there are partial mediator effects in both cases. First, the perceived product design has no direct impact on consumer behavior but has an indirect impact on brand experience and brand perception. Second, brand experience influences consumer behavior both directly and indirectly through brand perception. Thus, when consumers perceive product design and brand experience well, their behavior becomes more favorable, and they experience a positive overall assessment of the brand. Accordingly, to build a positive relationship between the customer and the brand with the help of a multisensory marketing concept, special attention should be paid to the mediation of strong product design and brand experience. These can be seen as important drivers, as they explain 55% of the variance of brand perception and 66% of the variance of consumer behavior.

To conclude, in the given context of print ads, the data analysis shows that implicit and explicit sensory perception is relevant success drivers for the implementation of a brand experience and for strengthening the perceived product design, which in turn leads to a satisfied and loyal customer. To gain a positive overall assessment of a brand in terms of brand image, trust, and satisfaction and to make customers buy the brand's products, an appealing product design and an integrated experiential marketing approach are crucial. Accordingly, the implementation of different sensory stimuli seems to be a promising brand management tool for creating effective print ads. Hence, our results broaden conventional thinking that has focused on the visual sense as the only one to appeal to.

6. Conclusions and Outlook

The aim of this paper was to analyze the potential of sensory cues in the context of the print advertisement. The results confirm the assumption that addressing different sensory modalities in a congruent way can have a positive influence on brand-related outcome variables. In particular, the study provides new insights into the effects of both explicit and implicit sensory perception on product design, brand experience, brand perception, and consumer behavior. Furthermore, it has been shown that product design and brand experience act as mediating factors between the consumer's sensual stimulation and response.

Moreover, our results provide an opportunity for further research, especially in the field of sensory marketing. First, it would be interesting to determine which sensory modalities have the strongest impact. Therefore, a group comparison study with different amounts of sensory stimuli per group would be necessary. In addition, the use of various sensory stimuli with different characteristics would add even more insights to this topic. Second, the impact of demographic, cultural, and situational aspects as moderator variables could be assessed to gain more insights into the underlying relationships. Third, the conceptual model can be used as a foundation in the context of (print) advertisement and in many other areas (e.g., product policy). Although there is still a great need for more research to understand the underlying relationships, these findings will also help brand managers, especially in the field of print advertisement, to manage sensory stimuli effectively and succeed in a competitive market. To this end, the results also emphasize that when implementing a successful multisensory marketing strategy, "how" things are done is more important than "whether" something is done.

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P5:

Sensory imagery in advertising: How the senses affect perceived product design and consumer attitude

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Journal of Marketing Communications

Forthcoming

JOURNAL OF MARKETING COMMUNICATIONS
https://doi.org/10.1080/13527266.2018.1518257

Routledge
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Sensory imagery in advertising: How the senses affect perceived product design and consumer attitude

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ABSTRACT

Research in sensory marketing provides evidence for the significant potential of sensory imagery to create sensory consumer experiences. Particularly in the context of food and beverage advertising, the targeted appeal of the senses through sensory imagery appears to be promising. However, research gaps remain concerning the concrete effect sizes of sensory appeals and possible mediators such as perceived product design. This paper aims to close these gaps by focusing on two different research issues. First, it investigates the effects of sensory imagery on marketing-related key performance indicators (i.e., sensory perception, perceived product design, and attitude) using analysis of variance. Further, the paper examines underlying causal relationships between these potential market success factors by applying partial least squares structural equation modeling (PLS-SEM). The findings support the usefulness of sensory imagery in advertisements, as it appears to be a valuable approach to address specific senses and to positively affect consumer perception. Moreover, the results reveal a causal chain of several direct and indirect effects between relevant performance indicators. Implications for marketing managers can be derived from this research on how to design powerful advertisements and effectively appeal to all five human senses by relying on sensory imagery.

ARTICLE HISTORY
Received 31 January 2018
Accepted 26 August 2018

KEYWORDS
Advertising; imagery; sensory marketing; product design; attitude; product management

Introduction

Research on the effectiveness of advertising has a long history in marketing literature (e.g., Frazer, Sheehan, and Patti 2002; Gallagher, Foster, and Parsons 2001; MacKenzie, Lutz, and Belch 1986; Wells 2014). Specific attention has been given to the design of advertisements. Advertisement design leads to specific associations with the product and is thus of significant importance for product perception and actual purchase behavior (Lane 2000; Olney, Holbrook, and Batra 1991; Resnik and Stern 1977). However, uncertainty remains in marketing management regarding whether company advertising activities are chosen and used most effectively (Aaker and Carman 1982; Tellis 2003). Therefore, marketing practitioners are increasingly seeking innovative advertising strategies because traditional marketing approaches may frequently lead to unsatisfying and undesirable consumer responses (Lee and Lee 2004; McNally,

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Akdeniz, and Calantone 2011). In this regard, the selective utilization of sensory cues to attract consumers and provide memorable experiences has gained notable interest from a theoretical and practical point of view (Krishna and Schwarz 2014; Lindstrom 2005). Particularly in the field of food and beverages, advertisements that effectively appeal to consumers' senses appear to be promising, as all five human senses (vision, hearing, touch, olfaction, and taste) are potentially of high importance for product evaluation (Schifferstein 2006). In principal, an advertisement can appeal to consumers' senses in two ways, directly or indirectly through sensory imagery (Krishna, Cian, and Sokolova 2016). Correspondingly, advertisements which transfer real sensory cues and therefore directly target consumers' senses have been developed in recent times. This approach includes, for instance, the implementation of a scented strip in a perfumery advertisement to appeal to the olfactory sense or the use of haptic elements to provide a specific experience of touch (Wiedmann et al. 2017). Moreover, the phenomenon of sensory imagery has been highlighted in marketing literature as an effective opportunity to create sensory consumer experiences. Sensory imagery is induced, for instance, by an image when the viewer perceives to have a specific sensory experience without actually perceiving related sensory cues (Elder et al. 2017). Although there are different manifestations of sensory imagery, the majority of research has focused on visual imagery (Dahl, Chattopadhyay, and Gorn 1999; Escalas 2004; Hung and Wyer 2011). However, there is also evidence regarding the existence of other types of sensory imagery related to the nonvisual senses (Krishna, Morrin, and Sayin 2014; Larson, Redden, and Elder 2014; Peck, Barger, and Webb 2013; Unnava, Agarwal, and Haugtvedt 1996). Furthermore, in the context of advertisement, some studies have already empirically shown the significant potential of sensory imagery (e.g., Elder and Krishna 2012). Although research provides evidence for the generally positive effects of sensory imagery on attitude toward the product, uncertainty remains regarding the concrete effect sizes and possible mediator variables (such as perceived holistic product design). Therefore, this paper addresses two different research issues. On the one hand, it examines the effect of sensory imagery on marketing-related key performance indicators in terms of sensory perception, perceived product design, and attitude (H1). On the other hand, it investigates the subsequent causal relationships between the marketing-related key performance indicators (H2–H4). For the first part, we apply one-way analyses of variance (ANOVAs); for the second part, we use partial least squares structural equation modeling (PLS-SEM). The object of investigation is an advertisement showing lemonade in two versions: a simple picture evoking a low level of imagery and an enhanced picture eliciting a high level of imagery. This paper is structured as follows. In the next section, we provide further theoretical background leading to the derivation of our hypotheses. Then, we present the methodology of our study, followed by the results. Finally, we discuss our findings and suggest implications for marketing management and future research.

Theoretical background

The majority of sensory imagery research in marketing focuses on single sensory experiences (Elder et al. 2017), such as creating a vivid imagining of a cookie's smell in the consumer's mind by presenting an advertisement picture of a cookie (Krishna,

Morrin, and Sayin 2014). There is also empirical evidence for multisensory imagery (MacInnis and Price 1987). However, findings predominantly suggest modality-specific patterns of imagery, as self-report studies show that there is no reason to believe in the existence of a holistic factor of general sensory imagery (Andrade et al. 2014). Based on these insights, it appears to be a reasonable approach for marketers to specifically target the senses separately through sensory imagery induced by advertisement design. This thesis is further supported by the assumption of the multisensory enhancement effect, which is expected to appear when different sensory modalities are appealed to in a congruent way (Hultén 2011). This should lead to a better consumer experience and therefore positively influence consumer perception (Joy and Sherry, Jr. 2003). Furthermore, the targeted sensory approach may affect consumer perception in various ways. On the one hand, the approach can increase the respective modal-specific consumer liking (Lwin, Morrin, and Krishna 2010). On the other hand, the enhancement of sensory stimulation might also lead to a better overall perception and liking (Krishna, Elder, and Caldara 2010). In the context of products, the overall perception of a product is primarily explained by the perception of product design. Therefore, we conceptualize product design from a gestalt theoretical viewpoint as a set of constitutive elements of a product that are perceived by the consumer and processed as a multidimensional construct (Homburg, Schwemmle, and Kuehnl 2015). In the literature, the perception of product design is generally divided into three subdimensions, that is, esthetics, functionality, and symbolism. Esthetics is linked to the hedonic pleasure of a product (Desmet and Hekkert 2007), whereas functionality indicates the perceived utilitarian value the product conveys through its design (Bloch 2011). Symbolism refers to the level of identification and meaning the product design transfers to the consumer (Kumar and Noble 2016). In line with the aforementioned descriptions, studies have already provided evidence for a strong relationship between sensory appeal and all dimensions of product design (e.g., Hoegg and Alba 2011; Peck and Childers 2003; Veryzer and Hutchinson 1998). Additionally, the perception of product design plays an important role in general consumer behavior and thus can significantly influence key factors of marketing success such as consumer attitude (Bloch 1995; Landwehr, Wentzel, and Herrmann 2012; Montana, Guzman, and Moll 2007). In the specific case of advertisements, research has further confirmed the positive effect of consumers' attitudes toward the ad on consumers' general attitudes toward the promoted product (MacKenzie, Lutz, and Belch 1986; Shimp 1981). Thus, in a first step, we hypothesize:

H1: The more senses are appealed to by an advertisement through sensory imagery, the better the (a) sensory perception (i.e., visual, acoustic, haptic, olfactory, and gustatory), (b) perceived product design (i.e., esthetics, functionality, and symbolism), and (c) attitude (i.e., toward the ad and toward the product) becomes.

In addition, we expect the following causal relationships between the identified factors:

H2: Sensory perception (i.e., visual, acoustic, haptic, olfactory, and gustatory) has a positive effect on perceived product design (i.e., esthetics, functionality, and symbolism).

H3: Perceived product design (i.e., esthetics, functionality, and symbolism) has a positive effect on attitude (i.e., toward the ad and toward the product).

H4: Attitude toward the ad has a positive effect on attitude toward the product.

Methodology

To test the research hypotheses, we conducted a quantitative study involving an experiment and an online survey. As the object of investigation, we used an advertisement promoting lemonade. For the experiment, we created two versions of the advertisement, a simple and an enhanced one (see Figure 1). The simple version showed the product only (the lemonade bottle) and an ordinary advertising slogan. The enhanced version showed the same product and slogan but was supplemented by several elements appealing to the five senses to enhance the imagery processing in the consumer's mind (e.g., condensation drops running down the bottle to communicate freshness, speech bubbles with the words 'mmmh' to evoke an impression about the good taste and 'zisch' to illustrate the sound when opening the sparkling beverage). The online survey began with a brief introduction and preliminary questions (e.g., frequency of lemonade consumption, general liking of lemonade). Then, each subject was presented with the stimulus, that is, either the simple or the enhanced advertisement. The assignment of the test persons to the respective groups was made randomly. After the stimulus contact, the questionnaire sequentially inquired about the degree of imagery processing, the consumers' sensory perception of the product, the perceived product design and the attitude toward the ad and toward the product. Finally, the subjects were asked to provide information on their sociodemographic characteristics.

The sample included 407 participants (44.7% male, 55.3% female) with a mean age of 30.56 years (from 16 to 77 years). Most respondents drink lemonade at least once a week (50.6%), followed by respondents who drink lemonade at least once a month (33.2%). Further, the sample shows a mean liking of lemonade of 5.60 (SD = 2.34) on a 9-point hedonic scale, where the modal value is 7 (19.9%). Furthermore, most participants are single (77.9%), have a university degree (56.0%), are students (42.3%), and have a monthly net income below 2000 € (56.7%), respectively. Moreover, the two groups

Figure 1. Simple (left) and enhanced (right) advertisement.

(simple ad: n = 198, enhanced ad: n = 209) show very similar values with respect to their affinity for lemonade (e.g., mean liking of 5.58 and 5.61), all sociodemographic attributes such as gender distribution (44.9% male, 55.1% female; 44.5% male, 55.5% female), and age (mean age of 30.52 and 30.59 years). Consequently, the data are perfectly suitable for comparison testing.

For the measurement of the test variables, we used diverse scales. The consumers' sensory perception of the product was measured by the sensory perception item set established by Haase and Wiedmann (2017). For each sense, we adopted four adjectives to determine how well the lemonade appealed to the consumer on a visual, acoustic, haptic, olfactory, and gustatory level. With regard to perceived product design, we applied the measurement scale of Homburg, Schwemmle, and Kuehnl (2015) with three items for each dimension (i.e., esthetics, functionality, and symbolism). All of the mentioned items were rated on 5-point Likert scales (1 = strongly disagree, 5 = strongly agree). Moreover, to capture the attitude toward the ad and the attitude toward the product, we relied on the measurement of Grohmann (2009) using 9-point semantic differential scales with the anchors 'negative/positive', 'dislike/like', and 'unfavorable/favorable'. In addition, for the subsequent manipulation check, we applied the measurement of communication-evoked mental imagery according to Babin and Burns (1998). To maintain a moderate length for the questionnaire, we integrated one statement per dimension, namely, the item that was identified as the strongest indicator variable having the highest factor loading for the respective dimension. Thus, we used 'vivid' for vividness, 'I imagined a number of things' for quantity, and 'I imagined what it would be like to use the product advertised' for elaboration. The items were again rated on 5-point Likert scales (1 = strongly disagree, 5 = strongly agree).

To test the manipulation of the advertisement used in our experiment, we conducted a one-way ANOVA with the group variable (simple ad vs. enhanced ad) as the independent variable and the three dimensions of imagery (vividness, quantity, and elaboration) as the dependent variables. The results indicate that the enhanced advertisement (e) scored significantly better on all three dimensions compared to the simple advertisement (s), that is, on vividness (M_s = 2.535 vs. M_e = 3.191; $F_{1,\ 405}$ = 33.977, $p < 0.001$, η^2 = 0.077), quantity (M_s = 2.242 vs. M_e = 2.694; $F_{1,\ 405}$ = 16.109, $p < 0.001$, η^2 = 0.038), and elaboration (M_s = 3.227 vs. M_e = 3.498; $F_{1,\ 405}$ = 4.623, p = 0.032, η^2 = 0.011). Hence, as intended, the enhanced advertisement evoked a stronger level of imagery.

Results

To test hypothesis H1, we conducted one-way ANOVAs. As recommended, we considered a one-sided confidence interval for a difference between means (i.e., alpha of 0.10 instead of 0.05) due to the one-sided directionality of the hypothesis (Cho and Abe 2013). The two groups (simple ad vs. enhanced ad) were compared with regard to 10 dependent variables: (a) visual, acoustic, haptic, olfactory, and gustatory perception (sensory perception); (b) esthetics, functionality, and symbolism (perceived product design); and (c) attitude toward the ad and attitude toward the product (attitude). Referring to sensory perception, there were significant differences for the olfactory ($F_{1,\ 405}$ = 3.564, p = 0.060, η^2 = 0.009) and gustatory perception ($F_{1,\ 405}$ = 3.960, p = 0.047, η^2 = 0.010). The enhanced advertisement led to a better assessment of the lemonade's

aroma in terms of scent (M_s = 3.133 vs. M_e = 3.298) and taste (M_s = 3.376 vs. M_e = 3.548). Interestingly, the visual manipulation of the ad did not affect the visual perception ($F_{1, 405}$ = 1.893, p = 0.170, η^2 = 0.005). In addition, the acoustic and haptic perception were not significantly influenced ($F_{1, 405}$ = 0.394, p = 0.530, η^2 = 0.001; $F_{1, 405}$ = 1.380, p = 0.241, η^2 = 0.003). Moreover, with respect to perceived product design, only esthetics shows significant differences between the two groups ($F_{1, 405}$ = 5.986, p = 0.015, η^2 = 0.015). Again, the group that was stimulated with the enhanced advertisement evaluated the product better (M_s = 2.534 vs. M_e = 2.775). Functionality and symbolism were not significantly affected ($F_{1, 405}$ = 1.585, p = 0.209, η^2 = 0.004; $F_{1, 405}$ = 0.005, p = 0.944, η^2 = 0.000). Further significant differences were detected in the case of attitude, in the form of both the attitude toward the ad ($F_{1, 405}$ = 3.625, p = 0.058, η^2 = 0.009) and the attitude toward the product ($F_{1, 405}$ = 3.001, p = 0.084, η^2 = 0.007). Again, the subjects with the enhanced advertisement showed higher values compared to the subjects with the simple advertisement, that is, a better evaluation of the ad (M_s = 5.099 vs. M_e = 5.451) and the product (M_s = 5.396 vs. M_e = 5.695). Consequently, hypotheses H1a and H1b found partial support and H1c received full empirical support.

With regard to hypotheses H2–H4, we applied PLS-SEM. First, the measurement models were checked for reliability and validity. Following the recommendations of Hair et al. (2012) and Henseler, Ringle, and Sinkovics (2009), the data revealed satisfactory values for the relevant quality criteria. Across all measurement models, the factor loadings ranged from 0.703 to 0.972 and thus surpassed the critical value of 0.7. Moreover, the average variance extracted (AVE) showed its minimum at 61.2%, clearly above the critical share of 50%. Further, the Fornell–Larcker criterion was fulfilled, as the AVE was higher throughout than the construct's highest squared correlation with any other construct (Fornell and Larcker 1981). In addition, each indicator's loadings were higher than all of its cross loadings. Finally, the composite reliability had a minimum value of 0.863 and Cronbach's alpha of 0.787, both far above the lower limit of 0.7. Second, the structural model was evaluated. The coefficient of determination (R^2) ranged from 0.276 (functionality) to 0.708 (attitude toward the product), indicating a satisfactory goodness of fit (Chin 1998). The cross-validated redundancy measure (Q^2) ranged from 0.188 (functionality) to 0.649 (attitude toward the product), verifying the model's predictive relevance (Geisser 1974; Stone 1974).

In a further step, the causal relationships between the test variables were evaluated. Figure 2 illustrates the findings. Between the five dimensions of sensory perception and the three dimensions of product design, there were several significant positive effects. Esthetics was mainly driven by visual perception (b = 0.647, $p \leq 0.001$) and slightly influenced by haptic perception (b = 0.104, $p \leq 0.05$). Functionality was affected by gustatory (b = 0.312, $p \leq 0.001$), haptic (b = 0.142, $p \leq 0.05$), and olfactory perception (b = 0.123, $p \leq 0.05$). Symbolism was formed by all senses except for the olfactory sense, that is, by visual (b = 0.365, $p \leq 0.001$), haptic (b = 0.230, $p \leq 0.001$), gustatory (b = 0.132, $p \leq 0.01$), and acoustic perception (b = 0.089, $p \leq 0.05$). Furthermore, the results confirmed all of the proposed effects from perceived product design on attitude, where the direct impact on the attitude toward the ad is always stronger than the one on the attitude toward the product, that is, in the case of esthetics (b = 0.437, $p \leq 0.001$; b = 0.075, $p \leq 0.1$), functionality (b = 0.112, $p \leq 0.05$; b = 0.098, $p \leq 0.01$) as well as symbolism (b = 0.236, $p \leq 0.001$; b = 0.174, $p \leq 0.001$). Finally, the attitude toward the

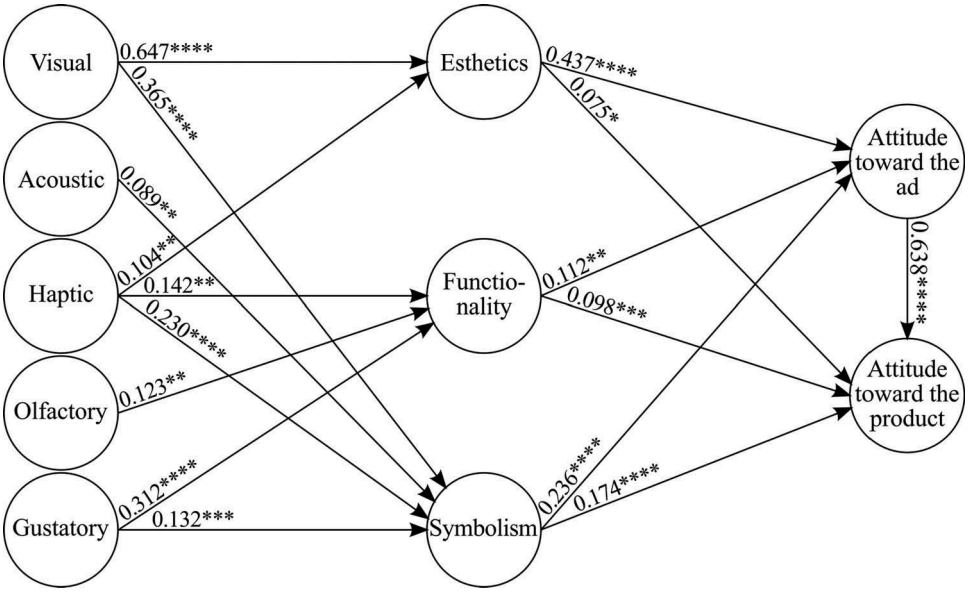

Figure 2. Results of the PLS-SEM.

ad showed a strong and highly significant positive effect on the attitude toward the product ($b = 0.638$, $p \leq 0.001$), mediating the effects of perceived product design. All in all, the majority of the proposed causal relationships were confirmed. As a result, it can be stated that hypotheses H2–H4 found empirical support.

Discussion

The findings suggest that the modification of a purely visual advertising medium in the form of supplemented elements that enhance sensory imagery is a valuable approach to addressing other senses and positively affecting consumer perception in terms of perceived product design and attitude. First, the one-way ANOVAs (considering two groups, one with a simple and another with an enhanced advertisement) provided evidence for the presence of sensory imagery as the transfer of the visual cues to olfactory and gustatory perception. Interestingly, the impact on visual perception was insignificant. However, this result makes sense when remembering that the modification of the advertisement, even though purely visual, was only focused on appealing to the other four senses. In fact, this affirms the potential of visual cues to influence nonvisual perception, but without interfering with visual perception. Further, the acoustic and haptic perception could not be improved by the enhanced advertisement. This result may be explained by different factors. First, compared to the other three senses, sound and touch play a subordinate role in the specific product category of beverages (Schifferstein 2006). Accordingly, the moderate visual changes may have been insufficient to induce a conscious improvement of these two factors. Another possible reason may be found in the style of the elements. The condensation drops running down the bottle and the word 'zisch' illustrating the sound of the sparkling beverage obviously

were not enough to establish an effective positive haptic and acoustic impression of the lemonade. With regard to product design, perceived esthetics, which relates to hedonic pleasure resulting from the interaction of all senses (Desmet and Hekkert 2007; Homburg, Schwemmle, and Kuehnl 2015), was significantly affected. Conversely, functionality and symbolism showed no significant differences. Functionality refers to the satisfaction of utilitarian needs and is thus based on factual information or related to specific situations for which the product can provide a specific benefit. Both are not given by the modifications in this experiment. Symbolism represents the consumer's identification with the product. The lemonade, as intended, had an ordinary appearance representing an average product in the sector of beverages. As a result, the product per se was not able to evoke a feeling of identification. This may be more a question of either outstanding products with very specific features providing the opportunity to express the consumer's identity or brands that represent a certain image. Again, both aspects were deliberately not included in the advertisement. Furthermore, the two essential outcome variables, consumer attitude toward the ad and the product, were improved. This may be explained by the fact that both the advertisement and the product become more interesting through the small but effective changes. The several improvements altogether translate into a positive overall perception of the product.

Second, the PLS-SEM has provided new insights into the effects of sensory perception, which is elicited by the purely visual advertisement, on perceived product design and attitude. With respect to the causal relationships between the five dimensions of sensory perception and the three dimensions of product design, it can now be determined which senses best appeal to which product design dimension. In the context of beverages, as expected, functionality is primarily driven by gustatory perception, because taste represents the most important sensory modality in the usage of beverages (Schifferstein 2006). Esthetics, although resulting from all five senses, as stated above, is primarily formed by visual perception as it represents the dominant sense in this regard (Blijlevens, Creusen, and Schoormans 2009). Symbolism appears to be a conglomerate that is affected by a mixture of the senses, which seems plausible when considering that consumers may have diverse reasons to identify themselves with a product, due to a specific look of the product, an outstanding form or a particular taste. Moreover, the results have shown that product design directly influences the attitude toward the ad, and less intensively, the attitude toward the product. Further, because the attitude toward the ad strongly affects the attitude toward the product, aligning with established research, partial mediator effects are detected. Accordingly, before the attitude toward the product can be improved, the attitude toward the ad is formed. Hence, the consumer first evaluates the advertising medium as such and then, based on this, conceives an opinion in terms of an overall evaluation of the product. All in all, the study reveals a causal chain of several direct and indirect effects from sensory perception, across product design and the attitude toward the ad, finally to the attitude toward the product.

This paper provides valuable knowledge for marketing managers regarding how to design powerful advertisements and effectively appeal to all five human senses by using the visual sense. First, marketing managers may draw on the given results to successfully appeal to consumers' senses, for example, to know which senses may be addressed to achieve the improvement of specific dimensions of perceived product design. For the

most effective consumer approach, for example with regard to holistic product design that comprises all three dimensions, the strength and number of the elements used in the ad must be considered. Compared to the presented study, further ad elements also may be applied. For instance, a scene at which the product provides a specific benefit may be shown to improve the functional dimension (e.g., a sweating girl who worked out on a sunny day is refreshed by drinking the lemonade) or a brand logo representing the image that the target group can identify with to improve the symbolic dimension. Moreover, the finding that an advertisement design that stimulates sensory imagery in consumers' minds can significantly improve attitude is highly beneficial for marketing managers. Minor changes in the ad may suffice to substantially enhance consumers' attitude toward both the ad and the product. The former is particularly important in recent times, where consumer resistance to advertising represents a significant challenge (Pilelienė and Grigaliūnaitė 2016). Using interesting sensory-enhancing elements, companies may increase the chance that consumers are positive about the ad, which can lead to a positive attitude toward the product. Numerous studies have provided evidence regarding the impact of attitude on consumer behavior (e.g., Homer and Kahle 1988). Consequently, the improvement of attitude is a core objective of marketing managers and an important step for market success, which may be achieved using the provided insights of this paper.

The study features several limitations that offer interesting possibilities for future research. First, we focused on the product level and deliberately eliminated any reference to a brand to exclude existing associations and brand-related preferences. However, as stated above, the brand and the related image are certainly not unimportant in the given context, especially with regard to constructs such as symbolism. As a result, further studies may also include brand-related information (e.g., brand logo or brand-specific design elements). In addition, our findings relate specifically to lemonade. Nevertheless, the results may be applicable to other food products and consumer goods as well. Hence, the study may be replicated for different products and industries. Further, we have used specific elements in our ad (e.g., condensation drops, speech bubbles). Future research may also test other ad elements (e.g., specific scenes, brand-related information). Referring to the illustration of acoustic and haptic features, the analysis has detected difficulties. Thus, further elements may be implemented and examined (e.g., a hand grabbing the bottle or more interesting bottle shapes for haptic perception). From an analytical point of view, future studies may consider analyzing possible moderating effects such as individual differences and context factors. Finally, the study was limited to the explicit (conscious) level of cognitive processing. However, the implicit (subconscious) level of perception may also be of significant interest, especially with regard to the senses that play a secondary role and that consumers may not explicitly think about. Consequently, future research could also measure the test variables on an implicit level (e.g., using reaction time measurement) and examine whether the visual advertisement manipulation leads to an improvement in consumer perception in the subconscious mind. This approach would provide further valuable insights, as the implicit system often provides the initial impetus for behavior (Kahneman 2011) and can thus essentially influence consumers' decision processes (Friese, Wänke, and Plessner 2006).

Disclosure statement

No potential conflict of interest was reported by the authors.

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P6:

It's not all about function: Investigating the effects of visual appeal on the evaluation of industrial products using the example of product color

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Forthcoming

It's not all about function: investigating the effects of visual appeal on the evaluation of industrial products using the example of product color

Abstract

Purpose – Industrial markets are generally associated with objective decision-making in which rational and functional product benefits are central. Recently, however, subjective aspects of decision-making, such as visual appeal, are attracting research attention. The aim of this paper is to examine, first, the effect of product color as a non-functional design element on attitude toward the product and, second, the underlying causal relationships of this effect, in the context of industrial products.

Design/methodology/approach – The authors conducted an online quasi-experiment in the dental market with a sample of 300 dentists. The product stimulus was a picture of a treatment chair that varied in color. An analysis of variance tested the effect of product color on attitude. Structural equation modeling investigated the underlying effects of product evaluation.

Findings – The results indicate that product color affects attitude toward the product. Further, the authors find an insightful causal chain of direct and indirect effects on attitude. The most effective path runs via visual appeal and aesthetics, while haptics and functionality are of minor importance.

Originality/value – This paper is one of the first to provide empirical evidence for the effect of non-functional design elements such as product color on the evaluation of an industrial product. The results provide valuable insights into the effects on attitude in this context and stress the great importance of visual appeal and aesthetics in the product evaluation process.

Keywords: product management, product evaluation, visual appeal, sensory perception, product design, aesthetics, functionality, symbolism, attitude, color, industrial products

Paper type: Research paper

Introduction

Industrial markets are generally associated with rational customer behavior and objective decision-making [1], where hard facts, such as expected return of investments, cost reduction, and functional product features, are of primary importance (Bonoma and Johnston, 1978; Moon and Tikoo, 2002). However, whether decision-makers are acting for themselves or for a firm, they are nevertheless individual people, and as such, even the most rational are affected by their own subjective perceptions (Kotler and Pfoertsch, 2006; Leek and Christodoulides, 2011). Therefore, to succeed in competition, companies in industrial markets should not only consider rational concerns but also address emotional aspects and individual preferences (Lynch and De Chernatony, 2004). Recent research in the context of consumer goods has highlighted the importance of sensory design elements in effectively appealing to the consumer and increasing the overall product evaluation (Krishna, 2012). The impact of product color is especially well-documented in consumer research literature. Even though product color generally provides no functional value, it often represents a main driver of the consumer's product-related emotions and hedonic value (Labrecque *et al.*, 2013). Accordingly, the use of sensory cues, such as product color, to evoke positive emotions and increase value and sales may also be a promising approach for companies in the industrial market (Noad and Rogers, 2008; Soars, 2009).

There is, however, little empirical foundation for the importance of such soft facts with regard to customers' decision-making in an industrial context (Visentin *et al.*, 2015; Wolter *et al.*, 1989). For instance, there is little insight into the effects that a product's sensory appeal and design benefits have on a customer's evaluation of an industrial product, even though these factors are essential for the evaluation of consumer goods (Homburg *et al.*, 2015; Krishna, 2012). As industrial products are generally not intended to provide any specific aesthetic or symbolic value to the customer (Bingham and Raffield, 1990), there is a great

need for research that investigates how these factors might still influence customers' decision-making (Yamamoto and Lambert, 1994). For instance, Chitturi *et al.* (2008) call for further investigations on the effects of hedonic design elements in the context of industrial products. Additionally, Hansen *et al.* (2008) and Mencarelli and Riviere (2015) stress the importance of including non-rational dimensions to the assessment of the customer's perceived value in business-to-business markets. Thus, this paper addresses these calls and contributes to the stream of industrial product perception research by specifically focusing on the impact of non-functional product elements in the context of industrial markets.

The objectives of this paper are (1) to examine the effect of product color as an exemplary visual and hence non-functional design element on attitude toward the product and (2) to explore the underlying effects by taking into account the causal relationships between visual and haptic appeal, aesthetics, functionality, symbolism, and attitude toward the product in the context of industrial markets. For this purpose, the authors conducted a quantitative study in the dental market as a specific industrial application area with a treatment chair as the industrial product under investigation. The dental market represents a good example of the still-growing medical sector with professional decision-makers in small and medium-sized organizations (Calnan *et al.*, 2000; Kent, 1984). As such, it might also serve as a good example for highly educated decision makers in small- and medium-sized organizations in other industries.

The paper is organized as follows. The next chapter presents the literature review, outlines the included constructs and provides the research hypotheses. The subsequent section describes the methodology of the empirical study. Then, an analysis of variance (ANOVA) and partial least squares structural equation modeling (PLS-SEM) yield the findings. Finally, the paper provides a discussion and implications followed by the study's limitations and recommendations for further research.

Literature review and hypothesis development

Effect of product color

Managers and researchers alike have long realized the relevance of color as one of the most important visual design elements in marketing. With regard to the term, it is necessary to note that "color" is composed mainly of three different dimensions: hue, saturation and value (Hagtvedt and Brasel, 2016; Hynes, 2009; Labrecque *et al.*, 2013). As most consumer studies focus on hue (Bagchi and Cheema, 2012; Mehta and Zhu, 2009), this paper follows this proven approach as a first step in investigating the effects of product color in the context of industrial products. Researchers have also studied the impact of color in different marketing areas of consumer goods, such as branding (Bottomley and Doyle, 2006; Labrecque and Milne, 2012), advertisement (Lohse and Rosen, 2001; Meyers-Levy and Peracchio, 1995), atmospherics (Lee *et al.*, 2018; Spence, 2018), and product and packaging design (Mead and Richerson, 2018; Rebollar *et al.*, 2012; Zampini *et al.*, 2008). In the context of consumer goods, color plays a significant role in the product evaluation process. Several studies have shown the effects of color on the overall perception of a product, for example, in terms of attitude toward the product (e.g., Guido *et al.*, 2017; Silayoi and Speece, 2007). These overall judgments are often explained by fluency theory, which states that a color that fits a certain product or brand leads to reduced mental perceptual effort and therefore to a higher probability of liking such products or brands (De Bock *et al.*, 2013). Moreover, the choice of product color often significantly affects the visual appeal of a product and can further create specific associations in the consumer's mind. A more attractive appearance or liked associations can contribute to a more positive attitude toward a product for the consumer. (Deng *et al.*, 2010). According to these described premises, color is often linked to emotion and affect rather than cognition and rationality (Gilbert *et al.*, 2016). Hence, the effect of color on attitude toward a product strongly relates to a person's subjective perception and

preference (Spence and Wan, 2015). Thus, to provide a better understanding of the relevant underlying factors in the product evaluation process of consumer goods, some researchers have investigated the impact of color on different aspects of perception, such as sensory appeal (e.g., Piqueras-Fiszman *et al.*, 2012; Szocs and Biswas, 2013) and perceived product design (e.g., Madzharov *et al.*, 2016; Rebollar *et al.*, 2012). However, given that most research on color focuses on consumer goods, the question arises: are similar effects of such non-functional design elements on product evaluation also present in the context of industrial goods (Chitturi *et al.*, 2008)? From a traditional point of view, functional product benefits are crucial for industrial product evaluation (Bonoma and Johnston, 1978). Accordingly, a non-functional product benefit, such as the product color, would be of minor importance. Nevertheless, recent research on value perceptions of business customers highlights the importance of aspects such as product appearance and emotions, which gives reason to assume that color as a non-functional product benefit still has an essential impact on the product evaluation process. Mencarelli and Riviere (2015) note in this context that although there are differences between B2C and B2B customer behavior, several aspects overlap. Studies by Flint *et al.* (2002) and Prior (2013), for example, emphasize the importance of emotional aspects for customer value perception in the business-to-business context. Boksberger and Melsen (2011) argue similarly that affect-related aspects such as pleasure and arousal are important factors for the perceived value of business customers. Moreover, Yamamoto and Lambert (1994) provided the first evidence that product appearance has an impact on the evaluation of industrial products. In addition, the existence of a symbolic value was also proposed for products in industrial markets (Lindgreen and Wynstra, 2005). Accordingly, the use of different colors in business-to-business advertising has been empirically investigated and the results point to a similar potential as in consumer goods advertising (Clarke and Honeycutt, 2000).

As a result, the authors assume the following:

H1. Product color has an effect on attitude toward the product in the context of an industrial product.

Underlying effects of product evaluation

As product color is perceived via the visual sense, color as a visual stimulus closely relates to visual perception and visual appeal. In this regard, a favored product color may lead to higher visual appeal. Moreover, the visual sense can also influence other sensory modalities, for example, by sensory imagery or through the occurrence of cross-modal correspondences (Elder *et al.*, 2017). In particular, the perception of a product's haptic properties is closely related to visual perception (Raghubir and Krishna, 1999). In the case of this paper's study and research focus, visual and haptic cues are most relevant, as the target product of the quasi-experiment was a picture of a dental treatment chair. Based on insights from gestalt theory and design research, consumers tend to organize and interpret objects as a result of the sensory perception process (Veryzer, 1999). These higher order constructs, such as the perceived aesthetics of a product, closely relate to the overall evaluation of a product in terms of attitude toward the product (Orth and Malkewitz, 2008). The following sections will explain these outlined causal relationships in detail.

Effect of visual appeal on haptic appeal. Recent research on the topic of sensory appeal gives evidence for the consumers' ability to transfer a sensory experience from one sensory modality to another. There are a rising number of studies that focus on the relationships between different sensory modalities, that is, exploring the research field of cross-modal correspondences (Spence, 2011). Given that the first contact with a product or brand is mostly visual by nature, prior studies have focused on the transfer of visual stimuli to other sensory modalities. Research from this field has then confirmed the consumers' ability to mentally imagine various sensory properties of a product by just seeing it (Aydinoğlu and Krishna,

2011; Cardello, 1996; Underwood *et al.*, 2001). A strong connection between visual and haptic appeal is empirically well-confirmed and is thus increasingly important in evaluating most tangible products (e.g., Alexander and Shansky, 1976; Deng and Kahn, 2009; Krishna, 2006; Raghubir and Krishna, 1999; Xu and Labroo, 2014). In this context, visual cues tend to influence haptic experiences (Krishna, 2012; Piqueras-Fiszman and Spence, 2015). Thus, the authors assume:

H2. Visual appeal has a positive effect on haptic appeal.

Effects of visual and haptic appeal on product design. Moreover, as multisensory perception leads to a holistic perception of a stimulus, perceived product design represents a further underlying factor in the evaluation process (Schifferstein and Desmet, 2008). Product design comprises constitutive elements of a product that consumers perceive and organize as a multidimensional construct comprising aesthetics, functionality, and symbolism (Homburg *et al.*, 2015). All three dimensions contribute to the overall evaluation. Aesthetics refers to the level of perceived beauty (Desmet and Hekkert, 2007), functionality indicates the utilitarian value (Bloch, 2011), and symbolism represents the perceived meanings of a product's design (Creusen and Schoormans, 2005). There is strong evidence of relationships between sensory design elements (e.g., product color) and all three dimensions of product design. During the perception process, consumers aggregate sensory design elements into more complex components (design benefits), which transmit specific characteristics to the consumer (Orth and Malkewitz, 2008). Empirical work in this area suggests relationships between visual perception and all three dimensions of product design, that is, perceived aesthetics (Patrick, 2016; Sharma, 2018; Veryzer and Hutchinson, 1998), functionality (Hoegg *et al.*, 2010; Hoegg and Alba, 2011), and symbolic meaning of a product (Aslam, 2006; De Bock *et al.*, 2013). Moreover, there is also evidence of a relationship between a product's haptic properties and its perceived aesthetics (Argo *et al.*, 2008; Becker *et al.*, 2011), functionality

(Peck and Childers, 2003), and symbolic meaning (Krishna and Morrin, 2008). Therefore, the authors suggest:

H3. Visual appeal has a positive effect on product design in terms of (a) aesthetics, (b) functionality, and (c) symbolism.

H4. Haptic appeal has a positive effect on product design in terms of (a) aesthetics, (b) functionality, and (c) symbolism.

Effect of product design on attitude. Practitioners and researchers have recognized that product design is an important factor when evaluating a product and therefore impacts its success in the marketplace (Bloch, 1995; Page and Herr, 2002). Generally, all products comprise characteristics of all three product design dimensions (i.e., aesthetics, functionality, and symbolism). Accordingly, all three dimensions should have an impact on the overall evaluation in terms of the attitude toward the product (Homburg *et al.*, 2015). The authors follow the definition of Schmitt (2012), describing attitude as "psychological tendencies to evaluate objects along a degree of favor or liking". Researchers have already addressed the effects of product design on attitude and found evidence for strong relationships between each design dimension and consumer attitudes (e.g., Becker *et al.*, 2011; Brunner *et al.*, 2016; Homburg *et al.*, 2015; Luchs and Swan, 2011). Consequently, the authors propose:

H5. Product design in terms of (a) aesthetics, (b) functionality, and (c) symbolism has a positive effect on attitude toward the product.

Figure 1 shows the structural model including all the underlying effects mentioned in H2-H5.

Insert Figure 1 about here.

Methodology

Pre-test

First, the authors conducted a pre-test to increase the quality of the data collection for the main study (Hunt *et al.*, 1982). The main objective was to obtain preliminary information on color preferences in the specific group of dentists. In this regard, a specific and primary aim was to identify the most relevant product colors in the given context – that is, colors that are perceived positively by the target group and that might thus be relevant for product choice. Therefore, the authors conducted an online quasi-experiment with 300 dentists (see Table 1). The sample ranged in age from 27 to 68 years with the average age at 49.4 years, consisted of 41% female and 59% male dentists, and included dental offices with an average of 3.3 treatment chairs.

Insert Table 1 about here.

In addition to sociodemographic attributes and working conditions, the questionnaire presented a color palette from which the subjects could choose their favorite color with regard to the design of dental products. The results show that blue is the most popular color (42.3%), followed by gray (18.7%), and green (15.0%). The results coincide with existing works on general consumer preferences that state that blue is most commonly the favorite hue, often followed by green (Crozier, 1999; Madden *et al.*, 2000). In addition to the dentists' personal preferences, the contextual effects and meanings of colors are important to consider. Cool colors such as blue are calming, whereas warm colors are arousing and, in the case of red, often associated with danger or blood (Grossman and Wisenblit, 1999; Walters *et al.*, 1982). Thus, blue and green appear to be especially relevant for the given case. As a neutral color, the authors additionally consider gray for the main study. In conclusion, the choice of the three product colors in the main study is grounded by relevant literature on color perception and is supported by a context-specific pre-test.

Measures

The main study included six variables (i.e., visual appeal, haptic appeal, aesthetics, functionality, symbolism, and attitude). Thus far, marketing literature has been lacking an integrated measurement concept for the consumer's sensory appeal enabling a uniform measurement of the five senses. Haase and Wiedmann (2018) recently developed the sensory perception item set (SPI) to close this gap. The SPI, established by successive scale development relying on literature review and expert interviews, contains the most expressive adjectives to describe how well a product appeals to the consumer's five senses. Factor analyses and the computation of Cronbach's alpha tested the SPI in several different contexts, which all confirmed the validity and reliability. Thus, to measure sensory appeal, the authors used the items from the SPI to capture visual appeal (e.g., attractive) and haptic appeal (e.g., comfortable). For the measurement of the three dimensions of product design, the scale of Homburg *et al.* (2015) was applied. To capture attitude toward the product as a general evaluation of the product, the authors used a single item ("I think the product is good") based on Low and Lamb (2000) as recommended by Derbaix (1995) and performed by several researchers such as Burke and Edell (1986), Burton and Lichtenstein (1988), and Park and Young (1986). Further, per Bergkvist and Rossiter (2007), in the case of attitude, single-item measures are equally as valid as multiple-item measures and reduce respondent refusal and data collection costs. Finally, all of the items were rated on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). Table 2 shows the measurement items for all six variables.

Insert Table 2 about here.

Data collection and sample

The authors conducted an online quasi-experiment with three conditions – a gray-, blue-, and green-colored stimulus. The product stimulus was a dental treatment chair in one of the three

colors. When conducting an experiment, two objectives are of central concern: (1) internal validity, which ensures that any change in the dependent variable is due to the manipulation of the independent variable, and (2) external validity, which determines that the observed causal relationship can be generalized to the real world (Aaker *et al.*, 2001; Babin and Zikmund, 2016; Burns and Bush, 2014; Malhotra *et al.*, 2013). For internal validity, the authors made sure that product color was the only aspect that varied from subject to subject. For all subjects, the same picture of the treatment chair was used, just varying in the color of the upholstery. Thus, all other aspects (e.g., shape, size, materials) were controlled. In addition, the authors chose a homogeneous sample (only German dentists with similar working conditions). Further, empirical research in an industrial context is specific to the people who operate in a particular business area. Consequently, for external validity, the sample for this study is composed exclusively of dentists, as they are the decision-makers and thus the relevant customer group in the dental market. Moreover, through cooperation with one of the largest manufacturers of dental products, the authors were able to use a realistic product picture, which could also be used in the real world on a homepage or in an online shop. The treatment chair represented a standard product in terms of shape, size, materials etc. The product and the picture were detached from brand-identifying elements to avoid biased results due to brand associations.

The questionnaire was structured in the following way. First, the participants answered some introductory questions concerning their working conditions (e.g., size of practice location, number of treatment chairs). After that, an image of the treatment chair was shown according to random selection, either with gray-, blue- or green-colored upholstery. The authors decided on that particular product stimulus due to its central importance in all dental offices. Subsequently, the participants evaluated the presented product with regard to visual and haptic appeal, the three product design dimensions (i.e., perceived aesthetics, functionality, and symbolism), and attitude toward the product. Finally, sociodemographic

characteristics were captured. In total, the sample consisted of 300 dentists (see Table 3). The dentists' age ranged from 32 to 70 years, with the average age at 44.9 years. Further, gender distribution was almost even (52.7% female, 47.3% male). In addition, the majority worked in a single practice (80.7%), were located in a small town (28.7%), and did not employ dental technicians (88.7%). Finally, the dental offices had an average of 3.4 treatment chairs.

Insert Table 3 about here.

Data analysis

The authors test the first hypothesis H1 – assuming a significant difference between the three groups in their attitude toward the product – by a one-way ANOVA using SPSS 24. Here, the authors investigate the F- and p-values that indicate the significance of the tested differences as well as the means and standard deviations that reveal the magnitude of the differences.

Hypotheses H2 to H5 – postulating the underlying effects between sensory appeal, product design, and attitude – are tested by structural equation modelling (SEM). The structural model, as shown in Figure 1, has not been sufficiently tested in the marketing literature; with specific regard to the context of industrial products, it represents a new phenomenon. In addition, the SPI measurement concept is quite novel. Consequently, the authors decided to take the partial least squares (PLS) approach (Chin and Newsted, 1999) applying SmartPLS 2.0. Following the two-step approach recommended by Henseler *et al.* (2009), the authors first evaluated the measurement models, followed by the structural model. The first step checks for validity and reliability based on relevant quality criteria. As all measurement models are reflective, the authors follow the recommendations of Hair *et al.* (2012) and examine factor loadings, the average variance extracted, the Fornell-Larcker criterion, cross loadings, and the composite reliability. The second step determines the model's goodness of fit and predictive relevance. For hypothesis testing, the authors ran a bootstrapping procedure

(individual sign changes, 300 cases and 5000 subsamples) providing the t-values and a partial least squares algorithm (path-weighting scheme) calculating the path coefficients.

Findings

Effect of product color (H1)

The results of the one-way ANOVA support hypothesis H1. Product color has a significant impact on attitude toward the product ($F_{2,297} = 2.735$, $p = 0.067$). With regard to the magnitude of the measures for the single groups (i.e., the subjects who evaluated the gray, blue or green chair), the means show that blue performs best ($M = 4.07$, $SD = 0.77$), followed by gray ($M = 3.97$, $SD = 0.78$), and green ($M = 3.81$, $SD = 0.83$). Scheffé post-hoc tests were conducted to determine which groups significantly differ (Burns and Bush, 2014; Cheng *et al.*, 2007; Vaidyanathan and Aggarwal, 2000). The results show a significant difference between the means of blue and green ($p = 0.070$). Thus, dentists might prefer a color that contributes to a relaxing atmosphere. Blue is located at the lower end of the color spectrum, while green is positioned more toward the middle. Thus, blue compared to green has a shorter wavelength, which leads to a more calming color effect (Walters *et al.*, 1982). As there are actually significant differences in attitude toward the product that are dependent on color design, the usage of color in an industrial context appears to have great potential. In addition, a further group comparison with regard to visual appeal shows that there are also differences between the color groups ($F_{2,297} = 2.680$, $p = 0.070$). Based on this effect on visual appeal, the following section will investigate which factors and underlying relationships are decisive for the positive effect on attitude toward the product in the given context. In particular, the effects of visual appeal in general (i.e., without considering a specific design element) in an industrial context are examined to gain further relevant insights.

Underlying effects of product evaluation (H2-H5)

In H1, we made the assumption that the visual stimulus product color has an influence on the overall evaluation of the product in terms of the attitude toward the product. Therefore, we used group comparison tests (ANOVA) to examine if a change in color influences the attitude toward the product. Indeed, we found differences in this regard. On this basis, H2-H5 propose the causal relationships between sensory appeal, perceived product design and attitude toward the product. In this way, we examine the general underlying effects and causal relationships between the visual appeal and the overall evaluation of a product in an industrial context.

Evaluation of the measurement models. Prior to hypothesis testing, the authors checked the measurement models for validity and reliability by means of several quality criteria (see Table 4). The results show satisfactory values for all factors. The factor loadings lie between 0.766 and 0.937, therefore falling between the Bagozzi and Yi (1988) required range of 0.5 and 0.95 while also exceeding the frequently mentioned critical value of 0.7 (e.g., Hair *et al.*, 2011). The average variance extracted (AVE) showed values between 67.4% and 84.9%, clearly surpassing the minimum requirement of 50%. In addition, the AVE is always higher than the highest squared correlation with another factor. Thus, the Fornell-Larcker-criterion (FLC) is satisfied (Fornell and Larcker, 1981). Moreover, each indicator's loadings are higher than all of its cross loadings. Finally, the composite reliability (ρ_c) has a minimum value of 0.878, which is significantly higher than the minimum requirement of 0.7 (Bagozzi and Yi, 2012).

Insert Table 4 about here.

Evaluation of the structural model. To assess the quality of the structural model, the authors determined two prediction-oriented and non-parametric measures (see Table 5). According to Chin (1998), the authors calculate the coefficient of determination (R^2) and the cross-validated redundancy measure (Q^2). R^2 revealed a minimum of 40.9% and a maximum of

67.6%. Consequently, the amount of the explained variance of the endogenous variables is at least acceptable and up to substantial. Thus, the results confirm the model's goodness of fit (Hair *et al.*, 2011). In addition, Q^2 has a minimum of 0.294 and a maximum of 0.656. Hence, all of the endogenous and reflective factors show a value above zero. In line with this, the findings attest to the model's predictive relevance. Consequently, the proposed hypotheses can be properly tested, as presented in the following section.

Insert Table 5 about here.

Effect of visual appeal on haptic appeal (H2). The results of the PLS-SEM (see Table 6) confirm hypothesis H2. The findings reveal that visual appeal influences haptic appeal on a highly significant level and with strong positive power ($b = 0.669$, $p < 0.001$). This supports the assumption that the visual sense is dominant over the other senses (here: the haptic sense), which complies with the literature (e.g., Krishna, 2012). Hence, the visual appearance of a product, and thus the degree to which it appeals to a customer, obviously affects the way the customer evaluates the product in terms of haptic attributes as well.

Effect of visual appeal on product design (H3). The findings support hypothesis H3. Visual appeal has a highly significant and positive impact on all three product design dimensions – aesthetics ($b = 0.762$, $p < 0.001$), functionality ($b = 0.267$, $p < 0.001$), and symbolism ($b = 0.386$, $p < 0.001$). Thus, visual cues (e.g., product color) may substantially alter a customer's perception of a product, which is in line with diverse research insights (e.g., Blijlevens *et al.*, 2009). For example, if the customer perceives the product color as appealing, he or she may certainly evaluate the product as more aesthetically pleasing and therefore better identify with the product; strikingly, the customer may also assess the product as more functional. Consequently, just as in the case of consumer goods, visual cues seem to be very important in the context of industrial products as well.

Effect of haptic appeal on product design (H4). Further, the results partly support hypothesis H4. Haptic appeal shows a highly significant and positive impact on functionality ($b = 0.429$, $p < 0.001$) and on symbolism ($b = 0.427$, $p < 0.001$), but no significant impact on aesthetics ($b = 0.086$, $p > 0.1$). Although relevant literature describes aesthetics as a perceptional construct that may result from all five senses (e.g., Bloch, 2011), in the given context, visual cues are obviously decisive, which reinforces their importance in attaining a positive perception of the product. Nevertheless, haptics is highly important in communicating the functionality of the product. For example, if the treatment chair seems to be comfortable and have a nice surface, it will most likely appear to be more functional. For the symbolic meaning of the product, both senses are of significant importance.

Effect of product design on attitude (H5). The results support hypothesis H5. All three product design dimensions have a highly significant and positive impact on the attitude toward the product – aesthetics ($b = 0.473$, $p < 0.001$), followed by symbolism ($b = 0.254$, $p < 0.001$), and functionality ($b = 0.198$, $p < 0.001$). Most interestingly, functionality does not have the strongest, but instead the weakest, influence. In contrast, aesthetics turned out to be the most powerful driver of attitude in the context of the industrial good “treatment chairs”. Further, for a positive attitude, it is obviously also very important that the product has a high symbolic value to the customer, meaning that he or she can identify with the product or express himself or herself through the product. Consequently, subjective factors that have to do with individual preferences actually drive the customers’ attitude toward the product most effectively. Calling to mind that the focus in industrial markets is still most often on function and practicability, the results are surprising and very insightful.

Insert Table 6 about here.

Discussion and implications

General discussion

This paper is one of the first to provide empirical evidence for the effect of non-functional design elements on product evaluation in the context of an industrial market. The results of the ANOVA show a significant impact of product color on the evaluation of an industrial product in terms of the attitude toward that product. Additionally, post-hoc tests revealed a significant difference between the colors blue and green. Moreover, deeper investigations into the relevant underlying effects of product evaluation yield new insights into the perception of industrial products.

The PLS-SEM analysis – except for the effect of haptic appeal on aesthetics – confirms all of the proposed causal effects. The result is an insightful causal chain of direct and indirect effects (see Figure 2). In the context of an industrial product, visual cues (e.g., product color) appear to be an important driver of the consumer's attitude toward the product. Visual appeal – that is, the degree to which the product's visual cues please the consumer – enhances attitude via an improvement of perceived product design. The positive effect on attitude toward the product is most effective through aesthetics (total effect: $b = 0.36$, $p < 0.001$). In contrast, functionality plays a minor role (total effect: $b = 0.11$, $p < 0.001$). Thus, the findings affirm the great importance of visual appeal and aesthetics in the context of an industrial product, which may be considerably higher than the impact of more rational concerns like functionality.

Insert Figure 2 about here.

Theoretical implications

The results from this study importantly add to pre-existing literature on the perception of industrial products. First, on a general note, studies in the context of industrial markets tend to

use qualitative research methods, whereas this study provides results based on a quantitative approach. The focus on qualitative studies in this context is mainly due to the difficulty in recruiting sufficient numbers of industry-specific business customers for quantitative studies. Insights from both qualitative and quantitative studies, however, are needed for an efficient exploration of a research topic (Piekkari *et al*., 2010). Second, the findings demonstrate differences in the evaluation of an industrial product by manipulating only the product color. Thus, the results from this study also contribute to research on the effects of product color in general (Labrecque *et al.,* 2013; Spence, 2018). The impact of visual cues such as color on product evaluation is well-explored in the context of consumer goods but has been mostly overlooked by studies in the context of industrial products (Chitturi *et al.*, 2008; Lehmann and O'Shaughnessy, 1974). Third, color influences industrial product evaluation without adding further functional value or creating a rational advantage for the customer. Therefore, the results give further indication of the importance of non-functional design elements in the product evaluation process in industrial markets (Lindgreen and Wynstra, 2005; Yamamoto and Lambert, 1994). In addition, the results support recent research propositions of including non-rational aspects when investigating the customer's product evaluation in a business-to-business context (Mencarelli and Reviere, 2015; Prior, 2013). Fourth, deeper analysis of the underlying factors (i.e., sensory appeal and perception of product design) provides additional evidence supporting the importance of product appearance. Additionally, these findings extend the current literature on sensory product perception (Haase and Wiedmann, 2018; Krishna *et al.,* 2017) and product design research (Candi *et al.,* 2017; Haase *et al.*, 2018) by combining these factors in the specific case of industrial products.

Managerial implications

Moreover, the causal effects of these factors are indeed relevant from a practical point of view. Product developers and managers can use these insights when designing a new product

to effectively appeal to customers and convince them of the product's value. Instead of relying solely on functional and rational product properties, product developers and managers may also focus on the product's sensory appeal in their design thinking. In an industrial market, the sensory appeal can positively influence the holistic perception of a product in terms of the perceived product design. In particular, product designers should consider the intended use of sensory cues such as product color to create a pleasant product design for the customer. This can be achieved through targeted enhancement of the three design dimensions (aesthetics, functionality, and symbolism). With regard to aesthetics, product designers might rely on general principles of aesthetic pleasure based on findings in design research, for example, unity in variety (Hekkert, 2006). To improve the perception of functionality, specific haptic properties such as form, weight and texture can be of great importance for the ease of use of a product (Hoegg and Alba, 2011). For more symbolic value, product designers might, for instance, provide the possibility of customized design options like specific embossing and colors (Deng *et al.*, 2010). By taking into account these ideas, companies operating in industrial markets may decisively improve the perception of the product in the customers' minds and thus increase the likelihood of market success.

Limitations and further research

This paper lays the foundation for future research activities on the perception of industrial products. First, the study is specific to the dental market. It shows that soft facts such as visual and haptic appeal and color as specific non-functional design elements actually affect the perception processes of dentists. Dentists without a doubt fall into the category of business customers who purchase industrial products; however, they feature a fairly high degree of personal involvement in their business. Therefore, they were suitable to test the proposed hypotheses for the industrial context in a first attempt. Nevertheless, it is not unlikely that the

findings may also be true for other industrial sectors. Consequently, for future research, it would be interesting to investigate the effects of non-functional design elements for further industrial products to broaden the understanding of the opportunities such as sensory marketing in the field of industrial markets. In addition, for the given product of treatment chairs, only the visual design in terms of product color, more precisely only the hue of color, was manipulated. However, further research could specifically examine differences or similarities in the effects of a broader range of colors on the customer's attitude. In particular, it would be insightful to explore if and why some colors may generate a more favorable attitude toward the product than other colors or also non-colors like black and white in a given context. Moreover, with regard to sensory appeal outcomes, only the visual and haptic appeal were examined because acoustics, scent and taste were not relevant product characteristics in this case. In different industrial sectors, additional or other senses may be of crucial importance (e.g., acoustics in machinery, scent in retailing, taste in catering, or all five senses in the context of trade fairs). In addition, systematically leveraging different forms of stimuli presentation (e.g., not only in the form of a picture that is presented online) would be expedient. Thus, it would be insightful to analyze the associated effects for the specific product and to identify which sense is the most effective with which to appeal to the customer. Hence, to support management practice, academic marketing research should engage in further investigation to explain existing and non-existing relationships.

Moreover, future research could examine whether sociodemographic parameters, such as cultural (e.g., mentality or values), personal (e.g., centrality of visual product aesthetics, individual color preferences), motivational (e.g., the subjective importance of safety, power and joy) or locational aspects (e.g., rural or urban environments) play a moderating role in the decision processes of business customers. In the case of industrial customers, it is also important to differentiate between task and non-task variables (Webster and Wind, 1972), for instance, motives in terms of doing a good job for patients, and motives that are aligned to

personal benefits (e.g., enjoyment). In addition, a whole range of important moderators emerge from a consistent recourse on the figure-ground schema (e.g., the positioning of a specifically designed treatment chair against the background of the dental practice situation, which is composed of elements such as the premises, the entire interior architecture, the working situation, the dominant type of patient). With respect to the outcome variable, due to space constraints and to keep the analysis on a reasonable level, the study only considers attitude toward the product. Although it is well-established in marketing literature that attitude has significant effects on behavioral outcomes such as purchase behavior or the willingness to pay a higher price (e.g., Chaudhuri and Holbrook, 2001; Esch *et al.*, 2006), the direct and indirect effects of sensory design elements on further outcome variables may be examined in the given context.

Finally, the study was limited to the explicit level, which is to say, the customer's conscious perception of the product. However, as the majority of sensory cues are processed unconsciously, further studies may also consider implicit sensory information processing. Hence, in addition to classical self-assessment scales, innovative techniques (e.g., reaction time measurement, facial expression recognition, and electroencephalography) may be involved.

Notes

1 The terms "rational customer behavior" and "objective decision-making" refer to a purpose-oriented way of thinking and acting, which includes the deliberate decision for actions that are considered reasonable to achieve a particular goal.

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Tables

Table 1: Sample characteristics (pre-test)

Variable	Characteristics	n	%
Age	27 – 30 years	3	1.0
	31 – 40 years	39	13.0
	41 – 50 years	118	39.3
	51 – 60 years	113	37.7
	61 – 68 years	27	9.0
Gender	female	123	41.0
	male	177	59.0
Number of treatment chairs	2	105	35.0
	3	106	35.3
	4 or more	89	29.7
Practice type	single practice	231	77.0
	joint practice	69	23.0
Size of practice location (population in K)	small town (population < 20)	123	41.0
	small medium-sized town (20 ≤ population < 50)	73	24.3
	big medium-sized town (50 ≤ population < 100)	54	18.0
	small city (100 ≤ population < 500)	21	7.0
	big city (population ≥ 500)	29	9.7
Employment of dental technician	yes	90	30.0
	no	210	70.0
Total sample size		**300**	**100.0**

Table 2: Measurement items

Visual appeal
attractive
beautiful
pretty
Haptic appeal
comfortable
soothing
well-shaped
Aesthetics
The product is visually striking.
The product is good looking.
The product looks appealing.
Functionality
The product is likely to perform well.
The product seems to be capable of doing its job.
The product seems to be functional.
Symbolism
The product would help me in establishing a distinctive image.
The product would be helpful to distinguish myself from the mass.
The product would accurately symbolize my achievements.
Attitude
I think the product is good.

Table 3: Sample characteristics (main study)

Variable	Characteristics	n	%
Age	32 – 40 years	88	29.3
	41 – 50 years	147	49.0
	51 – 60 years	59	19.7
	61 – 70 years	6	2.0
Gender	female	158	52.7
	male	142	47.3
Number of treatment chairs	2	80	26.7
	3	119	39.7
	4 or more	101	33.7
Practice type	single practice	242	80.7
	joint practice	58	19.3
Size of practice location (population in K)	small town (population < 20)	86	28.7
	small medium-sized town (20 ≤ population < 50)	72	24.0
	big medium-sized town (50 ≤ population < 100)	51	17.0
	small city (100 ≤ population < 500)	35	11.7
	big city (population ≥ 500)	56	18.7
Employment of dental technician	yes	34	11.3
	no	266	88.7
Total sample size		**300**	**100.0**

Table 4: Evaluation of the measurement models

	Loadings	AVE	FLC (AVE > r^2)	Cross loadings < Loadings	ρ_c
Visual appeal	0.800 – 0.887	0.710	0.710 > 0.671	fulfilled	0.907
Haptic appeal	0.766 – 0.870	0.674	0.674 > 0.470	fulfilled	0.892
Aesthetics	0.866 – 0.890	0.774	0.774 > 0.671	fulfilled	0.912
Functionality	0.834 – 0.843	0.706	0.706 > 0.389	fulfilled	0.878
Symbolism	0.904 – 0.937	0.849	0.849 > 0.503	fulfilled	0.944
Attitude	1	1	1 > 0.598	fulfilled	1

Note: AVE = average variance extracted; ρc = composite reliability; FLC = Fornell-Larcker-criterion; r^2 = highest latent variable correlation squared.

Table 5: Evaluation of the structural model

	R^2	Q^2
Haptic appeal	0.447	0.297
Aesthetics	0.676	0.520
Functionality	0.409	0.294
Symbolism	0.553	0.464
Attitude	0.667	0.656

Table 6: Evaluation of the structural relations

		Original Sample	Sample Mean	SD	SE	t-value
H2:	Visual appeal → Haptic appeal	0.669	0.669	0.049	0.049	13.785
H3a:	Visual appeal → Aesthetics	0.762	0.760	0.055	0.055	13.771
H3b:	Visual appeal → Functionality	0.267	0.268	0.076	0.076	3.505
H3c:	Visual appeal → Symbolism	0.386	0.388	0.072	0.072	5.377
H4a:	Haptic appeal → Aesthetics	0.086	0.094	0.053	0.053	1.615
H4b:	Haptic appeal → Functionality	0.429	0.429	0.073	0.073	5.895
H4c:	Haptic appeal → Symbolism	0.427	0.428	0.065	0.065	6.539
H5a:	Aesthetics → Attitude	0.473	0.473	0.054	0.054	8.757
H5b:	Functionality → Attitude	0.198	0.196	0.053	0.053	3.735
H5c:	Symbolism → Attitude	0.254	0.254	0.056	0.056	4.555

Note: SD = standard deviation; SE = standard error.

Figures

Figure 1: Structural model

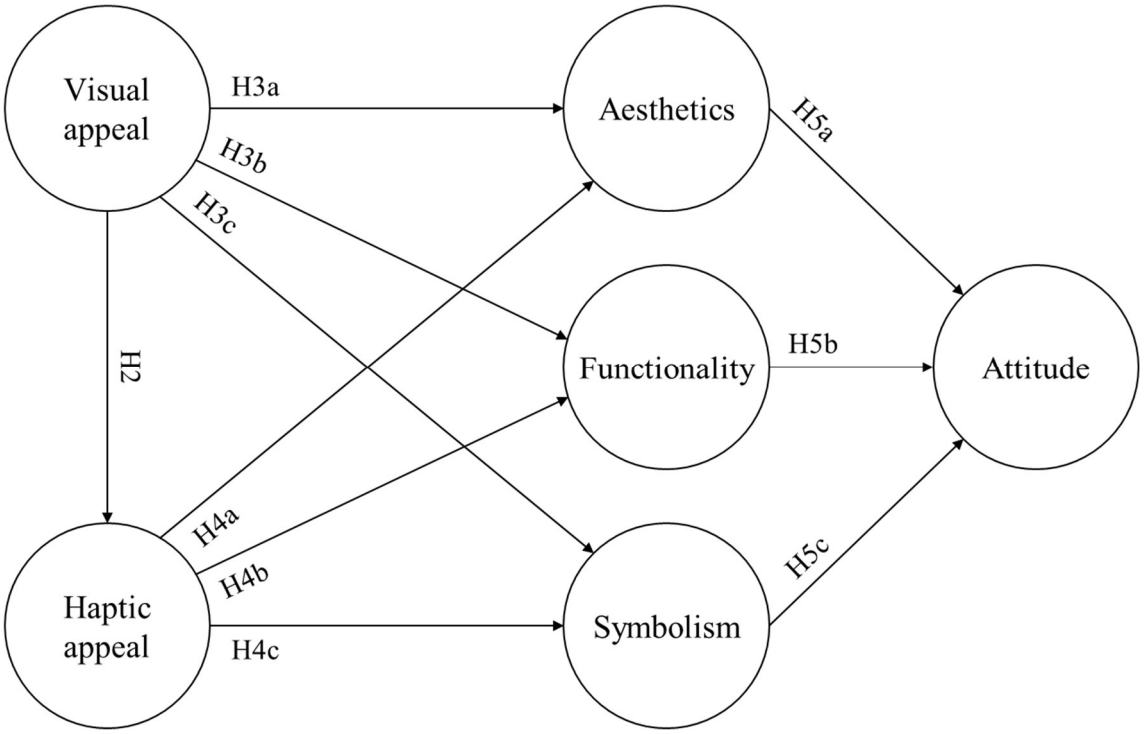
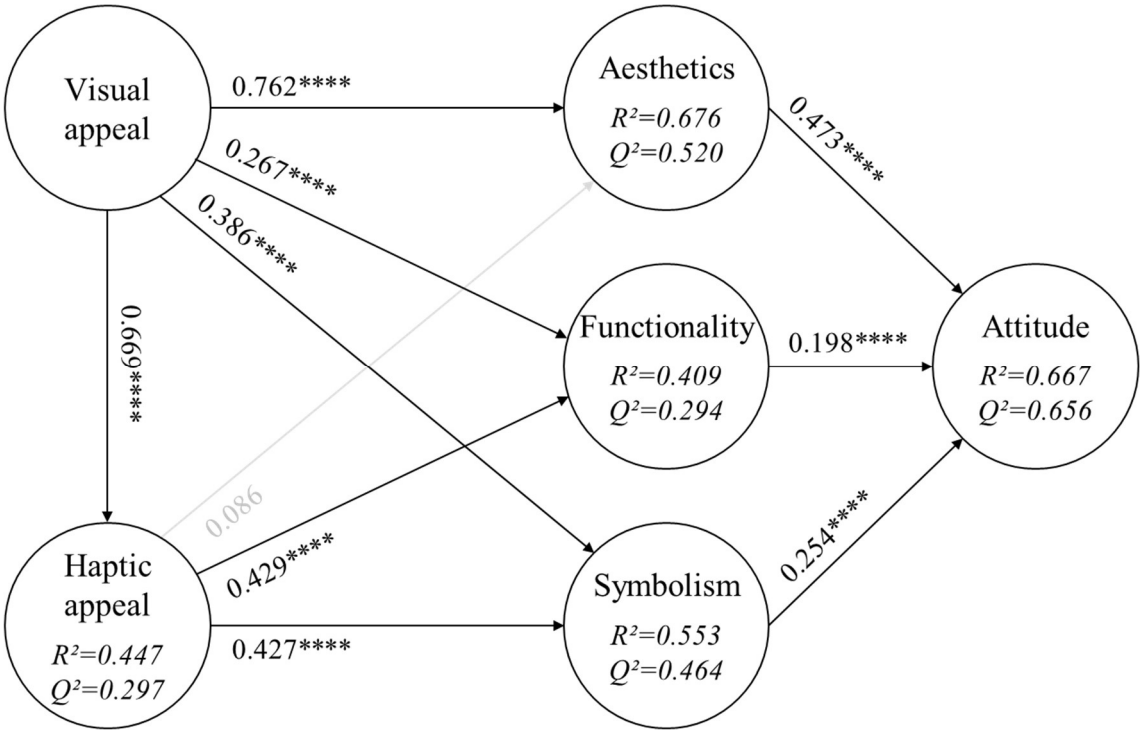


Figure 2: Empirical model



P7:

How to best promote my product? Comparing the effectiveness of sensory, functional and symbolic advertising content in food marketing

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120(8), 1792-1806

How to best promote my product? Comparing the effectiveness of sensory, functional and symbolic advertising content in food marketing

Abstract

Purpose – Advertising is one of the most important components of food marketing. However, there is uncertainty over the optimal means of convincing consumers to buy a product. The purpose of this paper is to examine the effectiveness of advertising content comprising text (sensory, functional and symbolic messages) and pictures (product image) on food product evaluation.

Design/methodology/approach – Two online experiments investigating strawberry advertisements were performed. Study 1 incorporated only text, whereas Study 2 investigated combinations of text and pictures. Analyses of variance were conducted to determine any significant differences among the three texts (sensory, functional and symbolic) and among the combinations of text and pictures.

Findings – Study 1 revealed no significant differences. All three texts were well received, which shows the relevance of all the product benefits – sensory, functional and symbolic – for food products. In contrast, Study 2 identified significant differences. The data analysis indicated that advertising effectiveness increases with the complementarity of the text and picture. Notably, the combination of the product picture and symbolic text was scored the highest for effectiveness.

Originality/value – The findings provide new insights into advertising design that food firms can use to enhance consumer product evaluations in terms of expected taste, perceived experience and quality, overall attitude and purchase intention. Further, the results contribute

to the research stream of food product benefits by highlighting the relevance of sensory, functional and symbolic design elements.

Keywords: Advertising design, Advertising effectiveness, Advertising content, Food marketing, Food products, Product evaluation, Product design, Sensory, Functional, Symbolic

Paper type: Research paper

Introduction

Advertising is one of the most important means of appealing to consumers (Sethuraman *et al.*, 2011) and providing product information (Nelson, 1974; Koetz *et al.*, 2017). In marketing practice, there is often uncertainty concerning whether advertising is used most effectively (Aaker and Carman, 1982; Tellis, 2003). Additionally, in the marketing literature, the effectiveness of advertising is a popular topic (e.g., Frazer *et al.*, 2002; Gallagher *et al.*, 2001; MacKenzie *et al.*, 1986; Petty *et al.*, 1983; Woodside, 2016), particularly in the field of food products (e.g., Kareklas *et al.*, 2014; Parker, 2003; Schifferstein *et al.*, 2013; Theocharous, 2015; van Kleef *et al.*, 2005; Vlachvei *et al.*, 2009; Zandstra *et al.*, 2017). One key recurring question in advertising design relates to the content of ads. The content forms associations with the product (Lane, 2000) and is thus essential for the evaluation of the product. By establishing effective advertising messages, firms may improve the perceptional and attitudinal components of product perception (Olney *et al.*, 1991) and may elicit actual purchase behaviours (Resnik and Stern, 1977). Nonetheless, what kind of advertising messages are most effective in the context of food products?

The objective of this paper is to examine the influence of advertising content (in terms of sensory, functional and symbolic advertising designs) on food product evaluation (in terms of gustatory perception, product experience, product quality, attitude towards the product and purchase intention). For this purpose, two exploratory studies are performed to analyse the differences among the three conditions. In line with McQuarrie and Mick (1999) and Pieters and Wedel (2004), this paper considers text and pictures as the two key advertising elements to examine. The first study considers only advertising text. However, because a picture in an advertisement can change consumer perceptions (Edell and Staelin, 1983; Wang, 2013), a second study investigates the combination of three different advertising texts with a picture of the product, which in this paper is strawberries. Using this exploratory approach, this study

examines how the two advertising elements are best assembled to achieve the strongest effect. The paper is organized as follows. First, it provides the theoretical background addressing advertising design in food marketing that leads to the research question. The subsequent section presents the methodology for both studies by providing information on the research design, measures, procedure and stimulus material, which is developed based on two preliminary studies. Then, the findings of Study 1 and Study 2 are presented. Finally, the paper presents the discussion of the results, followed by the conclusion, implications, limitations and future research suggestions.

Theoretical background

Recent elaborations in the field of product design suggest that people essentially value a product's appearance based on three different design dimensions. In detail, these design dimensions are perceived aesthetics, functionality and symbolism (Brunner *et al.*, 2016; Candi, 2007; Homburg *et al.*, 2015; Ulrich, 2011). Aesthetics relates to the perceived beauty of a product and the general hedonic pleasure that a consumer receives from its sensory attributes (Desmet and Hekkert, 2007). Functionality indicates the perceived utilitarian value of a product's design (Bloch, 2011). Symbolism captures all aspects of the meanings, messages and associations that the design of a product transfers to the consumer (Kumar and Noble, 2016). With regard to food products, all of these dimensions are essential in a consumer's product perception and product choice, as recent research showed (Grunert *et al.*, 2000). First, appearance is very important for the holistic evaluation of a food product (Imram, 1999). Accordingly, Michel *et al.* (2014) showed that the perception of a food product's beauty and attractiveness can be a relevant factor for food product evaluation. Second, the functional aspects of food are considered to be very important from a consumer perspective and have been

the focus of several past studies. For instance, van Kleef *et al.* (2005) provided insights into the impact of functional food benefits on consumers' food evaluations. Moreover, Siró *et al.* (2008) wrote a review paper on functional foods that highlighted the impacts of functional benefits on food product perception. Finally, symbolic benefits are significant for food product evaluation as well (Zandstra *et al.*, 2017). For instance, Robinson and Higgs (2012) showed that social information about how much a popular group likes a specific orange juice influences consumers' expectation of whether they will like that orange juice. Moreover, Magnier *et al.* (2016) demonstrated that food packaging that is associated with sustainability leads to higher perceived product quality. Additionally, in her overview paper on the decisive factors for food product evaluations, Jaeger (2006) identified symbolic aspects, such as branding and social issues.

In the literature, sources of the product evaluation process are typically divided further into intrinsic and extrinsic product factors. Intrinsic factors are inextricably linked to the product, including specific sensory attributes such as the colour or texture of a food product. Conversely, extrinsic factors include all context influences that are somehow related to the product, such as the packaging, point of sale and all other sources of information provided by advertising (Krishna *et al.*, 2017; Mueller and Szolnoki, 2010; Piqueras-Fiszman and Spence, 2015). As previously mentioned, advertisement is a powerful tool to influence consumer perceptions of a product in general. Accordingly, previous research in this area has investigated different relationships between advertising design and subsequent product evaluation (e.g., Boerman *et al.*, 2017; Chang and Yen, 2013; Friedman *et al.*, 1976; Wilkinson *et al.*, 1975). Among others, one important factor in advertisement is the content design. In particular, the wording of an advertisement, either written or spoken, affects the generated frame in which the product is perceived (Decrop, 2007). Correspondingly, in their research on transformational advertisement appeals, Naylor *et al.* (2008) found evidence regarding the influence of

advertising messages on hedonic, functional and symbolic product benefits. For food products, hedonic and aesthetic benefits are mainly based on the sensory attributes of the product (Schifferstein, 2015). Moreover, utilitarian and functional benefits predominantly emerge from the nutrients and ingredients of the food (Siró *et al.*, 2008). However, further contextual information about a food's origin and methods of manufacturing are the main drivers of symbolic benefits (Troye and Supphellen, 2012).

Based on the seminal framework of food acceptance by Cardello (1994) and the model of food information processing by Cardello and Wright (2010), contextual factors such as advertisement messages are also highly relevant for consumers' food perceptions. In accordance, recent findings have further emphasized the importance of contextual aspects for food product evaluation. For example, Schifferstein *et al.* (2013) found differences in consumers' food perceptions among the various stages of user-product interaction, such as choosing a product on a supermarket shelf and unpacking the product at home. Moreover, research from Piqueras-Fiszman *et al.* (2012) and Velasco *et al.* (2013) provided evidence for contextual and environmental effects on perceived taste. Piqueras-Fiszman *et al.* (2012) demonstrated that the colour of the plate that a food is served on influences the taste perception, such as the sweetness of the food. Similarly, Velasco *et al.* (2013) showed the contextual effects on perceived taste by varying the atmosphere in terms of multisensory attributes. Amid this background of contextual effects and with regard to food advertisements, Jaeger and MacFie (2000) showed, based on the MECCAS (Means-End Conceptualization of the Components of Advertising Strategy) framework, how different contents of health-related advertisements can influence consumer perception and behaviour. Furthermore, Kareklas *et al.* (2014) found positive effects of specific advertisement claims on organic food perception. However, because research on the relationship between advertising design and food product evaluation is still scarce, there remains a need to focus on investigating the general effectiveness of different

advertising content designs (e.g., sensory, functional and symbolic product information) on food product evaluation (Jaeger and MacFie, 2001; Wyer *et al.*, 2008). Based on these remarks and the aforementioned three-dimensional model of product design, the general research question of this paper is postulated as follows:

RQ: Do significant differences exist between sensory, functional and symbolic advertising designs with regard to food product evaluation?

Methodology

Research design

To explore the research question, quantitative data analysis was chosen for the present studies. The findings are based on two online studies carried out in Germany. The studies investigate two different scenarios with regard to advertising design. The first study considers only advertising text with sensory, functional and symbolic messages and tests for differences in food product evaluation. The second study considers the combinations of the three advertising texts with a product picture (here, an image of strawberries) and again checks for differences in food product evaluation. This approach is used to identify how the two advertising elements (i.e., text and pictures) are best arranged to achieve the greatest possible effectiveness. Before the research question was investigated, two preliminary studies were conducted to establish the stimulus material for the main studies. Therefore, an association task based on the MECCAS model and a subsequent manipulation check were used to develop the three advertising texts (i.e., sensory, functional and symbolic).

Measures

For the two main studies, the same questionnaire was applied (differing only with regard to the stimulus material). The questionnaire assessed the variables gustatory perception, product experience, product quality, attitude and purchase intention because they have been identified as relevant key factors in the context of food product evaluation (e.g., Paul and Rana, 2012; Raghunathan *et al.*, 2006; Spence and Piqueras-Fiszman, 2014). To measure gustatory perception, the sensory perception item set (SPI) established by Haase and Wiedmann (2017) was applied. The measurement of product experience relied on the original scale of Brakus *et al.* (2009), and product quality was measured via the scale of Low and Lamb (2000). The measurement of the other two outcome variables was based on single-item scales. To capture the attitude towards the product, the statement "I have a positive attitude towards the product" from Burton *et al.* (1998) was used. Purchase intention was measured by the item "I intend to buy the product in the future" according to Esch *et al.* (2006). All items were specified to the product context of strawberries. Finally, they were rated using a five-point Likert scale (1 = strongly disagree, 5 = strongly agree), except for product quality, which was assessed using an eleven-point semantic differential (e.g., 1 = insufficient, 11 = excellent). To increase the quality of the main studies, five independent subjects checked and confirmed the final questionnaire with regard to its readability, comprehensibility and length (Hunt *et al.*, 1982).

Procedure

For data collection, the questionnaire for Study 1 and Study 2 was sent out via an online link by marketing students in exchange for course credit. The structure of the questionnaire was as follows. The first section included introductory questions regarding, for example, the participants' familiarity and involvement with strawberries. Next, by random selection, either one of the three advertising texts (Study 1) or a combination of one of the three advertising

texts and the product picture (Study 2) was shown. Subsequently, the second and main section included inquiries about the given test variables. Based on the advertisement shown, subjects evaluated the described product (i.e., the strawberries) with regard to their gustatory perception, perceived product experience, product quality, attitude towards the product and purchase intention. Finally, the third section contained social demographics (e.g., age and gender).

Data analysis

All analyses were conducted with the software SPSS 24.0. For the selection of the stimulus material and the description of sample characteristics, the frequencies and means of the participants' responses were computed. For the investigation of possible differences and/or similarities across the three advertising texts, the measurement models were first checked for validity and reliability based on a series of confirmatory factor analyses. In this regard, several quality criteria (i.e., factor loadings, average variance extracted (AVE) and Cronbach's alpha) were used for the evaluation. Then, analyses of variance (ANOVAs) were conducted to determine the significant differences between the three groups.

Stimulus material

To develop and select the stimulus material, two preliminary studies were conducted, one for the text generation and another for the manipulation check. First, to investigate the effectiveness of different advertising contents with regard to consumer product evaluation, three different advertising texts appealing to the consumer in a sensory, functional or symbolic way were developed. Therefore, our approach followed the established MECCAS paradigm for creating text advertisements. Using the MECCAS model, the elements of the means-end chain (MEC) for the product of interest are collected and translated into strategic MECCAS elements in terms of message elements with consumer benefits. These elements provide a

framework for communicating important product characteristics in a targeted manner (Reynolds and Whitlark, 1995). Accordingly, for text generation, 40 marketing students who were recruited in exchange for course credit completed a word association task. A sample primarily consisting of students was chosen to obtain a balanced set of data with regard to age, education and other demographic characteristics (Agrawal *et al.*, 2001; Dawar and Parker, 1994). The students were asked to provide as many positive attributes of strawberries as they could think of. In total, 301 associations were received (e.g., sweet, rich in vitamins, and natural). Next, the respective attributes were assigned to the sensory, functional or symbolic category by two independent researchers. With frequency analyses for each category, the attributes that were most frequently associated with strawberries were selected and thus included in the advertising texts. In detail, 15 attributes (five per text) were specifically implemented. Each text consisted of a catchy heading and a slogan touting strawberries in a sensory, functional or symbolic way. The sensory text emphasized the good taste, juiciness, sweet aroma, fruity scent and intense red colour of the strawberries. The functional text highlighted the quality and excellence, the value for the money, and the richness in nutrients and vitamins. The symbolic text created a context around the strawberries by describing them as an organic food product and emphasized the sustainable and local cultivation, naturalness, and fresh harvest from the farmer. A second preliminary study conducted with 36 marketing students tested for the successful manipulation of the three advertising texts. The participants were randomly assigned to one of the three text conditions. After exposure to the advertisement, they were asked to rate the degree to which the shown advertisement delivered sensory, functional and symbolic value. The measures were assessed using a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). A mean comparison was applied to check for the intended effect of each text. The results revealed satisfactory values. The sensory,

functional and symbolic perceptions of the promoted strawberries were the strongest when the respective text was read.

The three texts were used for both Study 1 and Study 2. In addition, for Study 2, a picture of the product was combined with the three texts (see Figure 1). The picture showed strawberries as they can also be found in the supermarket display. As a result, the stimuli used are more realistic, increasing the practical relevance of this study.

Insert Figure 1 about here.

Results

Study 1

The first study tests for significant differences between the three advertising texts with regard to food product evaluation. Marketing students recruited the respondents in exchange for course credit. In total, 157 respondents participated in the study (see Table 1). The ages ranged from 17 to 61 years with an average age of 29.34 years. The gender distribution was nearly equal (47.1% female, 52.2% male).

Insert Table 1 about here.

First, the measurement models were checked by means of different quality criteria (Henseler *et al.*, 2009). The results revealed satisfactory values for all factors. The factor loadings ranged from 0.676 to 0.928, thus exceeding the critical limit of 0.5 (Bagozzi and Yi, 1988). Moreover, the AVE surpassed the limit of 50%, showing a minimum value of 52.4% (Fornell and Larcker, 1981). Finally, Cronbach's alpha values ranged from 0.695 to 0.881, which is above the limit of 0.5 (Nunnally, 1967). Subsequently, one-way ANOVAs were conducted to check the research question. For this purpose, advertising content was the independent variable, and the five factors representing food product evaluation mentioned above were the dependent

variables. The results are reported in Table 2. The data analysis shows that the participants do not significantly differ in their product evaluation ($p > 0.1$). Thus, the product itself has been well evaluated for each text since it has a mean value above 8.4 for product quality and mean values primarily above 4 for the other constructs.

Insert Table 2 about here.

Study 2

The use of a picture in an advertisement can alter consumer perception (Edell and Staelin, 1983; Wang, 2013). Thus, a second study was conducted to analyse the combinations of the three advertising texts with a picture of the product. Similar to Study 1, marketing students recruited the respondents in exchange for course credit. In total, the sample consisted of 165 respondents (see Table 3). The participants' ages ranged from 16 to 79 years, with an average age of 27.18 years. With regard to gender, 46.1% were female, and 53.3% were male.

Insert Table 3 about here.

The results of the factor analyses showed satisfactory values for all variables. The factor loadings were between 0.641 and 0.943, and the AVE values were between 0.54 and 0.727. Finally, the minimum Cronbach's alpha was 0.716, indicating reliability for all factors. Thus, as the measurement models are valid and reliable, the research question can be tested in the following. The results of the one-way ANOVAs are presented in Table 4. In this case, the data analysis revealed significant differences between the different groups in all variables. In detail, advertising content (i.e., sensory, functional or symbolic) has a significant impact on gustatory perception ($F (2, 162) = 4.956$, $p \leq 0.05$), product experience ($F (2, 162) = 2.863$, $p \leq 0.1$), product quality ($F (2, 162) = 3.329$, $p \leq 0.05$), attitude towards the product ($F (2, 162) = 3.232$, $p \leq 0.05$) and purchase intention ($F (2, 162) = 2.488$, $p \leq 0.1$). To identify significant differences between single groups, Scheffé post hoc tests were conducted. For all five factors, the results

indicated significant differences between the sensory and symbolic advertising text. In addition, for gustatory perception, the perception of the strawberries also significantly differed between the sensory and functional text. With regard to the magnitude of the measures, both the functional and symbolic groups showed greater values than the sensory group ($M_{sensory}$ = 3.878 vs. $M_{functional}$ = 4.257, $p \leq 0.05$; $M_{sensory}$ = 3.878 vs. $M_{symbolic}$ = 4.240, $p \leq 0.05$). Furthermore, participants with symbolic text also rated the product experience significantly higher than those with sensory text ($M_{sensory}$ = 2.667 vs. $M_{symbolic}$ = 3.068, $p \leq 0.1$). The same applied for product quality ($M_{sensory}$ = 8.519, $M_{symbolic}$ = 9.224, $p \leq 0.05$), attitude towards the product ($M_{sensory}$ = 3.722 vs. $M_{symbolic}$ = 4.145, $p \leq 0.1$) and purchase intention ($M_{sensory}$ = 3.722 vs. $M_{symbolic}$ = 4.091, $p \leq 0.1$).

Insert Table 4 about here.

Discussion and conclusions

Discussion of the results

The two presented studies provide new insights into the effectiveness of advertising design for food products. Study 1, which focused on advertising text, shows that the perception of the strawberries was not significantly different regardless of whether the sensory, functional or symbolic advertising messages were provided. However, in terms of the descriptive statistics, in all three text conditions, the test persons were convinced about the product. Regarding product experience, the mean evaluation of the strawberries was in the middle range. For the other four outcome variables (gustatory perception, product quality, attitude and purchase intention), the means were all clearly in the field of agreement. Hence, it appears that all three product design dimensions (sensory, functional or symbolic) are important in the context of food products and that it makes no crucial difference which type of product benefits in

particular are emphasized. Hence, no single dimension comes to the foreground. This finding applies to the case when only text is considered.

However, because a picture in an advertisement can change the consumer's perception, a further study that included a product picture next to the three text conditions was performed. In contrast to Study 1, Study 2 showed significant differences between the groups. In combination with the picture, the sensory and symbolic texts now produced significantly different product evaluations for all five outcome variables. In the case of gustatory perception, the analysis even found an additional significant difference between the sensory and functional text. In terms of the descriptive statistics, it was generally evident that the sensory text scored worse than both the functional and symbolic text. Except for gustatory perception (in which the functional text performed slightly better than the symbolic text), the symbolic text consistently led to the best product evaluation. Hence, when a picture is added, it makes a notable difference concerning which product design dimension the accompanying text appeals to. The picture itself already provides information about the product and thus partially forms the consumer's perception (Steenkamp, 1990). In the present case of the food product, the picture particularly appeals to the sensory dimension because it directly displays sensory attributes (e.g., red colour and firm shape) or indicates them (e.g., fruity scent and fresh taste). The sensory advertising text only confirms the impressions evoked by the picture, which makes it less informative from a consumer perspective and consequently less effective. Thus, an effect of mutual enhancement was not found. Concerning the functional dimension, the picture provides only a partial idea of the features (e.g., of quality but not of nutritional values). This result explains why functional advertising text performs better. Referring to the symbolic dimension, the picture provides no information about the symbolic product benefits (e.g., organic farming). Consequently, symbolic advertising text works best. These findings are also in line with assumptions from former literature. Jaeger and MacFie (2001) stated that

advertising texts and images may provide different information, which nevertheless should fit together and thus further strengthen each other in order to have a stronger positive influence on the consumer. This effect is grounded in consumers' tendency to reduce uncertainty in their buying decisions. Consumers generally prefer decision-making situations where they can feel certain about the expected value of the decision outcome. Relevant decision information can therefore help to reduce uncertainties with regard to the expected product benefits (Dodds *et al.*, 1991; Urbany *et al.*, 1989).

Conclusion

The aim of this paper was to determine whether there are significant differences among sensory, functional and symbolic advertising designs with regard to food product evaluation. When considering text as the only advertising element (Study 1), the findings show no significant differences among the three groups. Because the product evaluation was generally positive, all three product design dimensions were found to be important in the case of food products. When a picture of the product was added to the advertisement (Study 2), however, significant differences were found among the three text conditions. More precisely, the data analysis indicated that the effectiveness of the advertisement increases with the complementarity of the two advertising elements, the text and the picture. Accordingly, alongside the primarily sensory picture, the symbolic text providing the most new information led to the best evaluation of the food product, whereas sensory text that was redundant to the picture scored the worst. To conclude, an intelligent combination of a picture and text is essential to optimize the effectiveness of food product ads. In marketing practice, a visual impression of the product is frequently present. Therefore, the findings emphasize the importance for marketers to be aware of the messages that non-textual cues transfer to the consumer. Based on this knowledge, it is possible for marketers to use advertising text

effectively to provide consumers with additional information about product benefits. In addition, pictorial information is much easier to process than textual information. Hence, the integration of a product picture is a valuable means of efficiently communicating further relevant information about the product that may be crucial to the consumer decision process. Through this approach, firms can improve consumer perception in terms of the expected taste, the perceived product experience and quality and the overall attitude towards the product. Finally, consumers will likely show much stronger intentions to purchase the product, which ultimately contributes to market success.

Theoretical implications

This research contributes in several ways to the existing literature. The results show that for food products, all of the three investigated product design dimensions (i.e., sensory, functional and symbolic) are of high relevance in consumers' decision process. Therefore, the findings emphasize the importance of considering the three product design dimensions when analysing product value perception in the context of food products (e.g., Homburg *et al.*, 2015). Furthermore, this paper adds new insights to existing research on food advertisements (e.g., Kareklas *et al.*, 2014; Parker, 2003; Schifferstein *et al.*, 2013; Theocharous, 2015; van Kleef *et al.*, 2005; Vlachvei *et al.*, 2009; Zandstra *et al.*, 2017). In particular, the findings extend the current literature on the use of texts and images in advertisements (e.g., Jaeger and Macfie, 2000; McQuarrie and Mick, 1999; Pieters and Wedel, 2004) by taking into account the interaction between these two elements. The results indicate that when only text is included in the advertisement, there is no difference in product evaluation depending on the product design dimension emphasized by the advertisement. When a product picture is added, however, there actually is a significant difference in product evaluation depending on which product design dimension the accompanying text appeals to. Thus, the findings also relate to consumers' value

perceptions under uncertainty (Dodds *et al.*, 1991; Urbany *et al.*, 1989). The more relevant the information is provided by the two different advertising elements (text and image), the more effective the influence on product evaluation is. When the product benefits indicated by the picture are confirmed only by text, such an advertisement as a whole is less effective than an advertisement with complementary elements. In contrast to the possible considerations in the field of (multi)sensory marketing, there is no effect of mutual enhancement in the current context (Lwin *et al.*, 2010). Instead, the reduction in uncertainty seems to be the main driver in this case.

Managerial implications

The results provide some interesting managerial implications. First, as the product evaluations for all three texts (without picture) were rated equally high, it appears to be primarily important to communicate product benefits in some way. For food products, sensory, functional and symbolic product benefits are all important. Thus, firms must generally highlight product benefits so that consumers can feel confident about making an intelligent decision in the marketplace in favour of the product (Resnik and Stern, 1977). In the context of strawberries, it appears to make no crucial difference whether sensory, functional or symbolic product benefits are especially emphasized when the advertisement consists solely of text. Furthermore, when food firms want to use more elements than just text in advertising – for example, a product picture – the information given in the text needs to be carefully selected. Advertisements are most effective when the advertising elements differ in the information they provide; the text should provide additional positive information that goes beyond the product presentation of the picture. In fact, more information on the different product benefits reduces consumers' uncertainty, improves their product evaluations and encourages them to make a decision in favour of the product (Dodds *et al.*, 1991; Urbany *et al.*, 1989). In summary, for the

effective application of food product ads, the two elements of text and pictures may be combined in a complementary rather than mutually enhancing way.

Limitations and future research

This paper has study limitations that provide interesting possibilities for future research. First, the paper focused on the food industry and used strawberries as the specific product studied. Therefore, it would be insightful to examine the relationships for other food products and sectors. Moreover, the paper considered text and pictures as key advertising elements. Notably, other advertising elements (e.g., brand logos) can also have a crucial influence on consumer perception. Hence, subsequent studies may analyse the effectiveness of further combinations with diverse advertising elements to extend the knowledge regarding powerful advertising design. In addition, the picture used in the second study was a simple photo of the product. Examining the effectiveness of other picture types (e.g., enhanced by different cues or showing a situation with happy people eating the product or a friendly farmer in the fields) per se and in combination with the different advertising texts may be an interesting research opportunity for future studies. When investigating the perception of pictures in more detail, the subconscious mind comes to the foreground. In contrast to the processing of text, which often involves significant mental effort, the processing of pictures is primarily automated and unconscious (Mueller *et al.*, 2010). As a consequence, in addition to direct measures, future studies could also incorporate indirect measures to capture the consumer's unconscious perception (e.g., reaction time measurement and electroencephalography) and hence to gain an even better understanding of the processing of advertisements. Finally, the data analysis was limited to group comparisons using one-way ANOVAs. To examine the effect of advertising design on product evaluation, the application of other statistical analysis methods (e.g.,

structural equation modelling to investigate causal relationships between the attitude towards the advertisement and product-related outcomes) may provide further interesting results.

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Tables

Table 1: Demographic profile of the sample (Study 1)

Variable	Characteristics	n	%
Age	17 – 20 years	48	30.6
	21 – 30 years	68	43.3
	31 – 61 years	41	26.1
Gender	female	74	47.1
	male	82	52.2
	no answer	1	0.6
Marital status	single	120	76.4
	married	28	17.8
	divorced	7	4.5
	widowed	2	1.3
Education	pupil	2	1.3
	junior high school diploma	12	7.6
	senior high school diploma	87	55.4
	university degree	56	35.7
Occupation	scholar	2	1.3
	trainee	1	0.6
	student	97	61.8
	full-time employee	48	30.6
	part-time employee	5	3.2
	retired	2	1.3
	unemployed	2	1.3
Income	very low income (< 1000 €)	29	18.5
	low income (1000 – 2000 €)	26	16.6
	middle income (2000 – 3000 €)	26	16.6
	high income (3000 – 4000 €)	19	12.1
	very high income (> 4000 €)	32	20.4
	no answer	25	15.9
Total sample size		**157**	**100.0**

Table 2: Results of the one-way ANOVAs testing the effects of advertising content (sensory, functional and symbolic) on food product evaluation (Study 1)

Dependent Variables	Means (standard deviations)			F	p
	Sensory (n = 51)	Functional (n = 54)	Symbolic (n = 52)		
Gustatory perception	4.129 (0.942)	4.252 (0.692)	4.208 (0.731)	0.318	0.728
Product experience	2.995 (0.846)	2.982 (0.934)	2.928 (0.903)	0.082	0.922
Product quality	8.726 (1.591)	8.469 (1.699)	8.968 (1.350)	1.363	0.259
Attitude	4.137 (0.980)	4.074 (0.908)	4.096 (0.891)	0.062	0.939
Purchase intention	4.039 (1.095)	4.037 (1.027)	4.096 (0.891)	0.058	0.944

Table 3: Demographic profile of the sample (Study 2)

Variable	Characteristics	n	%
Age	16 – 20 years	61	37.0
	21 – 30 years	69	41.8
	31 – 79 years	35	21.2
Gender	female	76	46.1
	male	88	53.3
	no answer	1	0.6
Marital status	single	138	83.6
	married	21	12.7
	divorced	5	3.0
	widowed	1	0.6
Education	pupil	6	3.6
	junior high school diploma	15	9.1
	senior high school diploma	98	59.4
	university degree	45	27.3
	no degree	1	0.6
Occupation	scholar	7	4.2
	trainee	3	1.8
	student	102	61.8
	full-time employee	40	24.2
	part-time employee	4	2.4
	retired	5	3.0
	unemployed	2	1.2
	housewife/househusband	2	1.2
Income	very low income (< 1000 €)	38	23.0
	low income (1000 – 2000 €)	23	13.9
	middle income (2000 – 3000 €)	25	15.2
	high income (3000 – 4000 €)	21	12.7
	very high income (> 4000 €)	31	18.8
	no answer	27	16.4
Total sample size		**165**	**100.0**

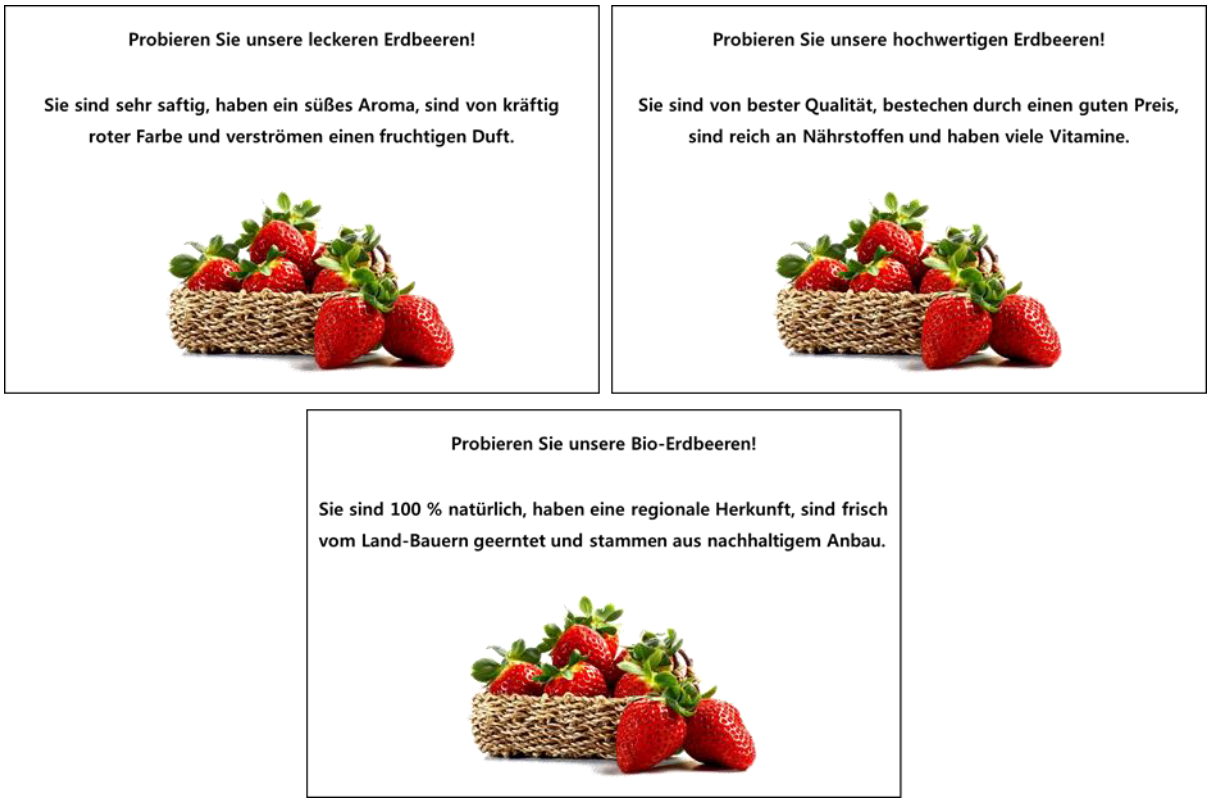
Table 4: Results of the one-way ANOVAs testing the effects of advertising content (sensory, functional and symbolic) on food product evaluation (Study 2)

Dependent Variables	Means (standard deviations)			F	p
	Sensory (n = 54)	Functional (n = 56)	Symbolic (n = 55)		
Gustatory perception	3.878 (0.870)[a,b]	4.257 (0.649)[b]	4.240 (0.586)[a]	4.956	0.008
Product experience	2.667 (0.920)[c]	2.839 (0.892)	3.068 (0.823)[c]	2.863	0.060
Product quality	8.519 (1.500)[d]	8.708 (1.647)	9.224 (1.267)[d]	3.329	0.038
Attitude	3.722 (1.071)[e]	4.036 (0.808)	4.145 (0.803)[e]	3.232	0.042
Purchase intention	3.722 (0.940)[f]	3.929 (0.871)	4.091 (0.776)[f]	2.488	0.086

Note: Same letters (a, b, c, d, e, f) indicate significantly different means for that dependent variable based on Scheffé post hoc tests. For gustatory perception and product quality, the differences are significant at the $p < 0.05$ level (a: $p = 0.031$; b: $p = 0.022$; d: $p = 0.048$). For product experience, attitude and purchase intention, the differences are significant at the $p < 0.1$ level (c: $p = 0.061$; e: $p = 0.052$; f: $p = 0.087$).

Figures

Figure 1: Advertisement with sensory (top left), functional (top right), and symbolic (bottom) text



Evidence of co-authorship and definition of responsibilities

The presented research papers were jointly developed by co-authors. All content is completely based on collective and collaborative elaboration, whereby the following responsibilities were defined within the respective modules:

Module 1: Development and validation of a measurement concept for sensory perception

Responsibilities of *"The sensory perception item set (SPI): An exploratory effort to develop a holistic scale for sensory marketing"*: Janina Haase: Introduction, review of existing measurement approaches, development of the sensory perception item set (SPI), discussion; Klaus-Peter Wiedmann: Supervision.

Responsibilities of *"The implicit sensory association test (ISAT): A measurement approach for sensory perception"*: Janina Haase: Introduction, review of response latency measurement approaches, the implicit sensory association test (ISAT), evaluation of the implicit sensory association test (ISAT), discussion; Klaus-Peter Wiedmann: Supervision.

Module 2: Application of the measurement concept in diverse contexts and investigation of the relationships with marketing-related performance indicators

Responsibilities of *"Effects of consumer sensory perception on brand performance"*: Janina Haase: Conceptual model and the development of hypotheses (H1-H3), measurement, findings, discussion of the results; Klaus-Peter Wiedmann: Supervision; Franziska Labenz: Introduction, conceptual model and the development of hypotheses (H4-H8), data collection and sample, data analysis, managerial implications, limitations and future research, conclusion.

Responsibilities of *"Sensory stimuli in print advertisement – Analyzing the effects on selected performance indicators"*: Franziska Labenz: Theoretical background and hypothesis development (H2b, H3b, H5a, H5b, and H6), methodology, discussion; Klaus-Peter Wiedmann: Supervision; Jannick Bettels: Introduction, theoretical background and hypothesis development (H2a, H3a, H4a, H4b, and H4c), conclusion and outlook; Janina Haase: Theoretical background and hypothesis development (H1), findings.

Responsibilities of *"Sensory imagery in advertising: How the senses affect perceived product design and consumer attitude"*: Janina Haase: Methodology, results, discussion; Klaus-Peter Wiedmann: Supervision; Jannick Bettels: Introduction, theoretical background.

Responsibilities of *"It's not all about function: Investigating the effects of visual appeal on the evaluation of industrial products using the example of product color"*: Klaus-Peter Wiedmann: Supervision; Janina Haase: Methodology, findings, limitations and further research; Jannick Bettels: Introduction, literature review and hypothesis development, discussion and implications; Christian Reuschenbach: Support in data collection.

Responsibilities of *"How to best promote my product? Comparing the effectiveness of sensory, functional and symbolic advertising content in food marketing"*: Janina Haase: Introduction, results (study 2), discussion of the results, conclusion, limitations and future research; Klaus-Peter Wiedmann: Supervision; Jannick Bettels: Theoretical background, theoretical implications; Franziska Labenz: Methodology, results (study 1), managerial implications.

Further publications

Wiedmann, K.-P., **Haase, J.**, Labenz, F., & Hennigs, N. (2018). Multisensory marketing in the luxury hotel industry: Effects on brand experience and customer perceived value. *Luxury Research Journal*, forthcoming.

Wiedmann, K.-P., Labenz, F., **Haase, J.**, & Hennigs, N. (2018). The power of experiential marketing: Exploring the causal relationships among multisensory marketing, brand experience, customer perceived value and brand strength. *Journal of Brand Management*, 25(2), 101-118.

König, J. C. L., **Haase, J.**, Hennigs, N., & Wiedmann, K.-P. (2018). ...and they lived luxury ever after: Storytelling as a driver for luxury brand perception and consumer behavior. *Luxury Research Journal*, 1(4), 283-302.

Wiedmann, K.-P., **Haase, J.**, & Bettels, J. (2018). Sensory imagery in the context of beverages: How the senses affect product design and attitude. Paper presented at the 2018 AMS World Marketing Congress, Porto, Portugal, June 27-29.

Wiedmann, K.-P., **Haase, J.**, & Bettels, J. (2018). Challenges of exploring the perception and impact of sensory communication. Paper presented at the 2018 AMS World Marketing Congress, Porto, Portugal, June 27-29.

Wiedmann, K.-P., Bettels, J., & **Haase, J.** (2018). Vertical vs. horizontal packaging design: Investigating the effects of packaging form on consumers' perception of utilitarian food products. Paper presented at the 2018 AMS Annual Conference, New Orleans, USA, May 23-25.

Wiedmann, K.-P., **Haase, J.**, Bettels, J., & Labenz, F. (2018). Advertising design in food marketing: Comparing the effectiveness of sensory, functional and symbolic ad content for product evaluation. Paper presented at the 2018 AMS Annual Conference, New Orleans, USA, May 23-25.

Wiedmann, K.-P., **Haase, J.**, & Bettels, J. (2017). Sensory marketing in a business-to-business context: Investigating the effects on product design, attitude, and customer behavior. Paper presented at the 2017 Summer AMA Conference, San Francisco, USA, August 4-6.

Wiedmann, K.-P., Labenz, F., **Haase, J.**, & Bettels, J. (2017). The role of multisensory marketing and customer experience in the luxury hotel industry. Paper presented at the 2017 Summer AMA Conference, San Francisco, USA, August 4-6.

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Wiedmann, K.-P., **Haase, J.**, Labenz, F., & Hennigs, N. (2016). Multisensory marketing in the luxury industry: Effects on brand experience and customer perceived value. Paper presented at the 2016 Monaco Symposium on Luxury, Monaco, April 7-8.

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