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The consumer's perception of artificial food additives: Influences on acceptance, risk and benefit perceptions



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ABSTRACT

Food additives, such as food colours or sweeteners, play an important part in food supply. For a variety of reasons, some consumers might regard the use of food additives, especially artificial ones, with suspicion; food additives are considered unnatural, unhealthy or even a public health risk. The goal of this study was to investigate consumers' perceptions and the most essential variables related to the acceptance of food additives. Two versions of a paper-and-pencil questionnaire, one investigating artificial food colours and the other investigating artificial sweeteners, were distributed to a large sample of Swiss German households. The final samples for artificial food colours and artificial sweeteners comprised 506 and 487 participants respectively. The questionnaires contained items on consumers' acceptance, risk and benefit perception, trust in regulators, knowledge of regulation and their preference for natural products. The relationships between variables were investigated in a path model, which was constructed based on a review of previous literature. The path coefficients suggested that risk and benefit perceptions significantly influence the acceptance of the two selected food additives. The risk and benefit perceptions were influenced by consumers' knowledge of regulation, their trust in regulators, and their preference for natural products. In the discussion, the study's findings are examined in terms of their implications for further research and for the development of concrete communication materials.

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Introduction

Food additives are substances of natural or synthetic origin, which are added to foods to serve a certain technological or sensory function, for example, to counter food perishability and bacterial degradation, give or restore colour or impart flavour to foods (Emerton & Choi, 2008). Preceding the approval of new food additives, intensive risk assessments usually based on animal studies, are undertaken and food additives already in use are periodically re-evaluated (Emerton & Choi, 2008). While a small amount of uncertainty on food additives' potential harmfulness cannot be ruled out, food safety experts generally agree on the safety of this approach (Carrington & Bolger, 2010; Emerton & Choi, 2008). Nonetheless, in terms of the safety of the food supply, experts and lay-people's perceptions do not necessarily accord, not least because of different appraisal strategies and resources (Hansen, Holm, Frewer, Robinson, & Sandøe, 2003; Krystallis et al., 2007; Sparks & Shepherd, 1994). The scientific risk assessment of food

additives is a highly complex process and lay consumers do not necessarily have the time or motivational capacity to process this kind of information (Hansen et al., 2003). Nevertheless, previous research suggests that consumers are worried and would like to be better informed about the potential health implications of food additive use and consumption. For instance, in a Hungarian focus group study (Tarnavölgyi, 2003), consumers expressed a variety of concerns related to food additives' potential health effects. Tarnavölgyi (2003) suggested that informational campaigns might decrease this concern. However, ill-advised communication attempts might even enhance public insecurities, as case studies on aspartame, food colours, and monosodium glutamate demonstrate (Lofstedt, 2008, 2009; Mosby, 2009). Therefore, communications aimed at allowing consumers to make informed decisions related to food additives should be carefully designed and contain the central topics from a risk-related perspective, as well as from consumers' viewpoints (Hansen et al., 2003). Thus, the main aim of this study was to examine a model predicting consumers' acceptance and perceptions of food additives. Based on the previous literature, the following variables were chosen and included in this model: risk and benefit perceptions, acceptance of food additives, knowledge about the regulation and trust in the regulators of food additives.

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Theoretical background and research questions

Food additives and their regulation

The safety of food additives is tested in studies investigating acute toxicity, short-term exposure at various doses, and life-time exposure over several generations (Emerton & Choi, 2008). If not generally considered safe, a maximum dose is set for use in specific foods (i.e., Acceptable Daily Intake (ADI)), which can be safely consumed daily over a lifetime without causing an effect in humans (Emerton & Choi, 2008). This ADI is based on the dose that did not have an observable effect on the tested animals (i.e., No Observed Effect Level (NOEL)), which is additionally divided by a safety factor of 100 (Baltes & Matissek, 2011). This safety factor accounts for potential differences between animals and humans, and between different humans, such as children and adults or males and females (Emerton & Choi, 2008). In Europe, all food additives have to be declared on food labels according to their functional category (e.g., sweetener) and either by their specific name (e.g., Aspartame) or E-number (e.g., E91) (Emerton & Choi, 2008). Despite the intensive risk assessment, a small uncertainty factor remains and food additives can never be considered one hundred per cent safe. However, experts regard the use of food additives as justified by weighing up the minor risks linked to this uncertainty with the major benefits. Without food additives, it would be impossible to maintain the high standards of security, selection and convenience in our food supply (Branen, Davidson, Salminen, & Thorngate, 2002; Emerton & Choi, 2008). Expert and lay-people's risk-and-benefit assessments do not necessarily match, because lay-people include more complex factors in their risk assessments than experts (i.e., personal values, affect), as Hansen et al. (2003) summarised in their review paper. This might lead to consumers rejecting food additives despite their benefits. In this case, the goal of risk communication should be to consolidate these views and enable consumers to make informed decisions about food additives.

Consumers' perceptions of food additives

Most previous studies have focused on people's perceptions of food additives in general (Kajanne & Pirttilä-Backman, 1996; Tarnavölgyi, 2003), but there are reasons to assume that consumers do not perceive all food additives in the same way. Firstly, despite the fact that in science and regulation there is no strict differentiation between food additives of natural and artificial origin, previous literature suggests that consumers differentiate between them (Stern, Haas, & Meixner, 2009; Tarnavölgyi, 2003). In a study by Varela and Fiszman (2013), consumers were asked to indicate what they associated spontaneously with the term "food additives." The authors found that there was some confusion among consumer what exactly denotes a food additive, as consumers mentioned salt, sugar or other spices. In terms of food additives, participants frequently mentioned colours, preservatives and sweeteners. Due to this salient distinction in consumers' minds, this study focuses solely on artificial food colours and artificial sweeteners.¹

Secondly, different food additive categories, such as preservatives, sweeteners or food colours might be perceived differently, as they serve various purposes and different people benefit from their use to differing degrees (Eiser, Coulson, & Eiser, 2002). Food colours and sweeteners are probably the most disputed and controversial food additives, as they are not necessities for food

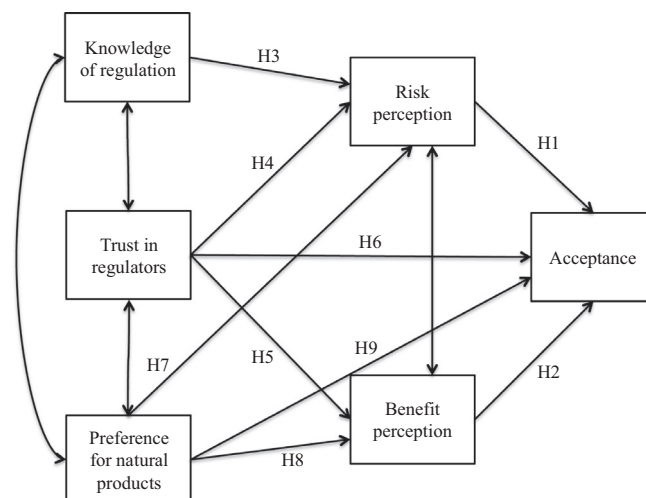


Fig. 1. Working model (double-headed arrows represent expected correlations).

safety, such as preservatives. Food colours enhance the foods aesthetically, either by restoring colour, lost during processing or by imparting colour to food; as the name suggests, sweeteners² are used to sweeten foods (Emerton & Choi, 2008). While sweeteners bring about a variety of benefits for the consumer (e.g., in terms of caloric content or cariogenic properties of foods), food colours have no health benefits for the consumer (Emerton & Choi, 2008).

Thus, this study investigated the working model (cf. Fig. 1) for artificial colours and for sweeteners to uncover relationships and important differences in the views and strengths of their associations. Subsequently, the literature on consumer's perceptions of food additives is presented and the research questions investigated in this study are discussed in light of these previous findings. Fig. 1 shows the investigated model including all hypotheses H1–H9.

H1 and H2: Acceptance, risk and benefit perception

Quantitative studies specifically investigating the consumer's view of food additives and their regulation are rather scarce. However, qualitative studies and studies on general food risks give some indication that food additives, especially those of artificial origin, are a source of insecurity and anxiety to the consumer. In two large-scale Australian surveys about general food risk perceptions (Buchler, Smith, & Lawrence, 2010; Williams, Stirling, & Keynes, 2004), food additives were frequently mentioned as potential food hazards and respondents indicated to prefer foods that did not contain additives. In an English questionnaire study (Eiser et al., 2002), high school students were asked to compare foods with and without food additives. Participants mentioned concerns in terms of food additives' safety for health, but also stated to prefer foods with additives due to ease of preparation. Considering these findings, it is sensible to assume that risk and benefit perceptions are important factors in people's decision to accept food additives. The perception that food additives are unhealthy reduces acceptance, while conversely the perception of benefits encourages people to accept them. Thus, in our working model, the first two hypotheses are that acceptance of food additives is negatively related to risk perception (H1) and positively related to benefit perception (H2).

¹ For the purpose of simplicity, 'artificial food colours' and 'artificial sweeteners' will be called 'colours' and 'sweeteners' throughout the paper

² The term 'sweetener' actually refers to two types: bulk and intense sweeteners. Due to their higher salience in consumers' minds, the present research focuses on intense sweeteners, such as aspartame or saccharin.

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