Nutrition and ambience, the state of the art: influence factors during a meal

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Abstract:

Real eating situations with people eating real foods are rarely objective of studies. To reduce complexity, current research methods are mainly based on laboratory settings. Thus foods rather than meals are studied.

Since research of ambient influence factors has to pay attention to almost infinite complex interactions, the development of new research methods with multifactor studies is needed. Therefore, this essay tries to give an overview of what has been researched so far and where more research is necessary. It seems to be impossible to understand human food choice in laboratory settings by excluding as many environmental factors as possible.

Key words: food choice; meals; evaluation; perception; eating occasion; eating location

Introduction:

Where we eat, what we eat, the characteristics of the environment in which we eat and with whom we eat, all that is likely to be more important in food choice, than the sensory properties of foods. Just imagine all the innumerable situations that is to say where taste plays only a minor role. Studying the factors influencing our food choice and perception in real ambience eating situations is a complex task with a strong multidisciplinary character. Scientists of different fields such as nutrition science, psychology, biology, agriculture, home economics, marketing, sociology and sensory science are trying to understand the real world eating behavior. Today, different food choice models reflect the complexity of understanding human food choice behavior (Conner, 1993; Furst et al., 1996; Nestlé et al., 1998). This could be seen as a result of almost 50 years of research. To study environmental factors and their influence on food choice is not new and it dates back to 1945 when researchers found differences in acceptability of foods served in an air plane or at the ground (Green & Butts, 1945). Today, the study of Green and Butts can be regarded as the starting point of a new branch in consumer science. However it should be noted that originally all research in this area was carried out by military institutions and not as one might think in civil institutions. Up to the 1990's there was only a very limited number of studies carried out researching food choice and the influencing situational variables (Perynam & Gutman, 1958; Sandell, 1968; Stunkard & Kaplan, 1977; Coll et al., 1979; Belk, 1975; Rozin & Tuorila, 1993). This might be due to the complex interactions and study designs in this research area. It was not until the late 1990's that further studies were focused on the various effects related to food choice and the perception and evaluation of food. The modern food choice research still plays an important role in military research and the military continues to utilize and develop new methods and theories. But today, this kind of research is also established at universities (Cardello, 1996; Conner, 1993; Furst et al., 1996; Meiselman & Schutz, 2003; Nestlé et al., 1998; Pettinger et al., 2004).

According to Edwards et al. (2003) the appreciation of food is influenced by three classes of variables: those variables related to the food itself, those related to the individual and those related to the eating location. So far nutrition research for the most part, is focused on the first class of variables. Food is mostly researched at its nutritional values, such as vitamins, fatty acids, sugars, amino acids etc. and its health benefits (Zunft et al., 1997). In the past, most studies that had been carried out were centered on questions trying to explain the reasons for obesity and other nutritional anomalies with the help of nutrient supply and

different eating situations (Stunkard & Kaplan, 1977; Coll et al., 1979; Rolls, 1979). Regarding obesity and other diseases researchers have made attempts to determine variables which may play a role in developing those diseases (Nicklas et al., 2001; Bellisle, 2003). So far, only a few studies have been carried out in real eating situations, with the focus on factors influencing the perception and evaluation of food.

World-wide, the research of food choice behavior still receives relatively little attention and in Europe this field of research is still in its infancy. With the current standard of knowledge, it seems to be generally accepted that factors such as social status, religion, personal beliefs, attitudes, sensory properties and others play an important role in understanding human nutrition, but still little is supported with studies. Today many scientists, rather than regard food choice solely as an instrument to maintain health, have recognized the importance of food choice in view of healthy nutrition and much more besides. One could go as far as to say, that understanding food choice is one of the major keys to provide new methods of resolution for many nutritional diseases. In addition, the research of the perception and the evaluation of food in a real ambience is an instrument of social classification in our every day life. Furthermore, it could be used as a tool for successful marketing and it as well provides facts for new approaches in nutritional education (Story et al., 2002; Lake, Rugg-Gunn et al., 2004). Differentiations in other research areas are also rather conceivable, i.e. improved dietary references.

The early work in understanding food selection was focused on sensory properties such as texture, taste, odour and the overall acceptability of food items.

When food choice, as mentioned before had become a scientific focus in the late 1990's, scientists not longer concentrated solely on the food itself. They developed new models in which the environment as well as social factors moved into focus. Since those years, more and more articles have come up, suggesting that factors such as social setting, temporal aspects and the environment in which a meal takes place or a food item is consumed, are instrumental in guiding food choice (Bell & Meiselman, 1995).

But food choice research could not be fully understood without a more detailed look on meals. Based on Douglas (1974), meals are highly structured events which are a marker of social relations. She formed the concept of what became known as a "proper meal". But what then is the understanding of a proper meal? The question could not be answered by the tripartite model of Douglas (1974). In fact it is a matter of the individual's subjective sensation. Meals are determined by implicit rules, social interactions, the environment and the occasion. We still know relatively little of what individuals perceive to be a characteristic meal and how these factors are interrelated. The question of how they influence the perception and evaluation of a meal also remains to be answered (Marshall, 1993, 2000; Meiselman et al., 2003). For example Europeans consider a proper meal to consist (depending on the country or region) of a starter or a salad (optional), a main course, a dessert (optional) and a beverage. If one of these parts is missed, lunch is often not regarded as being a proper meal. Today, the theory of a tripartite structure of a proper meal is extended by broader concepts including lunch and snacks as meal types (Marshall & Bell, 2003). According to this, all situations related to the ingestion of food can be regarded as meals. Nevertheless the situations at which a meal takes place will be limited.

The growing importance of studying ambient factors during a meal and to learn more about their influence on the evaluation and perception of food, could be demonstrated by founding the Italian University of Gastronomic Science in Pollenzo and Colorno in January 2003 and by anchoring **C**ulinary **A**rts and **M**eal **S**cience CAMS as a new course of studies at the University of Örebro in Sweden. Both universities are centred on disciplines in gastronomy where the ambience during a meal plays an important role (Gustafsson, 2004; www.unisg.it, 2003).

The present article focuses on some important factors influencing humans during a meal. All factors presented in this paper have been matter of at least two studies. The specific

objectives of this paper are to provide information which can be used as a basis for planning future studies in food choice, nutrition behavior and the research of the evaluation of food. The authors do not want to present all articles published on a specific factor, nor do they claim completeness in what factors have been researched so far. In fact, they try to provide devices for what is possible and has been done so far.

Focus on real ambience studies:

The impact of ambience in non-laboratory settings, with its methodological and theoretical basis, is an interesting scientific challenge. Only since the 1990's, food research has begun with a more systematically approach which was carried out in non-laboratory settings. Bell et al. (1994), were one of the first who came up with a real (non laboratory) ambience study. They demonstrated that the perceived ethnicity of a food could be changed without manipulating the food-item itself. By adding an Italian theme to a Grill Room restaurant, they found changes in food choice behavior, the acceptability of food and the perceived ethnicity of the food served in the restaurant.

Previously a study, carried out by Klesges et al. (1984), observed the number of calories consumed by adults in 14 different restaurants. Two categories were used to distinguish within the restaurant types. Some of the restaurants were described as formal dining restaurants and the others belonged to the fast food category. The social setting, the type of restaurant environment, sex and relative weight, were taken as test variables. It could be shown that more calories were consumed in fast food restaurants compared to formal dining restaurants. Furthermore, the importance of sex in the different eating situations could be demonstrated. Both groups, male and female, ate more in a non-alone eating situation. In groups of the same sex, both sexes ate less, compared to mixed sex groups.

Another study carried out in a real ambience showed interesting results by a direct comparison of the acceptability of the same food. The main findings in the experiment were the consistently higher ratings of the restaurant food compared to food served in a lower category, though the same food was served in all locations. Lower categories in that case are for example refectories, cafeterias or a food science laboratory. There were no differences in the ratings for beverages. Since beverages are pre-prepared products, people seem not to expect them to differ among location (Meiselman et al., 2000).

The finding, that the location has a significant influence on both, the appreciation of a particular food, as well as on overall acceptability of a meal, was demonstrated by a study carried out by Edwards and colleagues (2003). They investigated the acceptability of identically prepared food in ten different locations (for example an army training camp, a residential home for elderly, an university staff refectory and a "white-tablecloth" restaurants). A significant effect of location on food acceptance could be demonstrated. Another interesting finding is that of an age effect. The lowest ratings came along with institutions that cater the younger population (18-35), with more moderate ratings for institutions that cater an older group. Over all age groups the highest ratings came along with the white table cloth category.

Surprisingly the study did not show any gender differences, but a significant effect between the age groups. The younger the participants the lower food acceptability was, whereas the highest ratings were among the 45 -65 years age group. This is in accordance with the age effect of the institutional rating. That there is no gender effect is in contrast to the findings of other studies which found indications of significant gender differences (Zylan, 1996; Edwards, 2000). Another group of people was served the same meal in two different locations. Ratings of the food served in these two locations did not differ. This finding was true for the lower catering categories but not for the restaurant types (Edwards et al., 2003).

Even in the highly standardized field of sensory science the context is an important factor. The ratings of wine are consistently higher in situations were conversations are allowed (except conversations about wine) and food is served. Furthermore expert ratings of the

same wine seem to be influenced by the classification on the label. That finding was independent of the highly standardized sensory test environment (Hersleth et al., 2003; Brochet & Morrot, 1999).

But what does this mean to sensory scientists and the consumer researchers? This question cannot be answered in a satisfactory way. Only that much, the results of the studies show that we need to learn a lot more and that we possibly need to develop new methods of research which are more oriented to the consumer and the product's success on the market. The next step would be a transfer of the results in new methods of sensory science. The important thing here is to pay attention to several aspects which every scientist of this field always does wrong.

Another aspect not only important to real ambience studies is that of the questions asked at the experiment. Simple questions lead to simple answers. That, for instance, is what you often want to achieve in studies. But is that what you really want in consumer research? To find out about the reasons why consumers eat a certain food can not be answered in a satisfactory way by asking why they eat. When asking consumers why they eat, they often answer in a very dissatisfactory simple way – they like the taste - and this is all you get as an answer in most cases (Marshall, 1995; Köster, 2001). Consumer food choices are not solely affected by measurable "hard-facts". It seems more likely that they are mostly influenced by inner cues and the expectations of the consumer. The problem of asking the right questions is discussed in detail at Köster (2003). He refers to some often made fallacies in consumer research and other disciplines. This article is a helpful tool in planning studies in consumer science.

The previously mentioned studies are only examples of what have been carried out in a real ambiance so far. Other studies are not mentioned in the text (de Castro et al. 1986; de Castro, 1999; de Castro, 2000; Mathey et al., 2001; Rozin, 2003). It should be noted that de Castro often worked with food diaries as a rich source of information which can easily be used to study real world eating behavior (de Castro, 1999).

Focus on influence factors

Going from a broader view to a more detailed sight of the things. As mentioned before, human food choice, the perception and the evaluation of food, is mediated by a complex net of different factors including, for example the consumer's expectations towards a food item, sensory specific satiety, perceived risks that are associated with the ingestion of a food, and the level of uncertainty about the product's identity and its sensory specific characteristics (Bell & Marshall, 2003). Another research area that has recently been developed is that of involvement (Rozin et al., 1999; Olson, 2001; Bell & Marshall, 2003).

Focusing on ambient factors influencing real life eating situations, i.e. a meal, they can be divided in explicit (conscious) factors, perceptible with the higher senses such as vision and audition, and implicit factors (non conscious), perceptible with the lower senses such as smell, taste and touch (Köster, 2003). Except in sensory science, the research of environmental studies very much concentrates on explicit factors. This might be due to the fact that those factors can easily be described when people are asked to do so. In addition, a third class of factors is important, which does not necessarily belong to one of the previously mentioned variables. These factors could be abstracted as indirect personal effects, for example norms, beliefs, knowledge, attitudes and others. In short, factors which in the literature are often described as inner cues or social factors (Messer, 1984; Rozin, 1996; Rozin, 1999). In an approach of Bell & Meiselman (1995) the variables are divided in factors antecedent to food choice and those present to food choice.

In the following section, ambient factors are put in quotation to provide a better overview. The discussed variables are verified by studies. It is very likely that there are much more influence factors with varying importance, and it is not the intention of the authors to put record on all.

Social factors: Social facilitation and commensality

When eating in company with others, people tend to eat more. This phenomenon seems to occur independently of the type of meal (breakfast, lunch, dinner or snacks), the time (week days or weekend days) and the place where the meal takes place (at home, in a restaurant or elsewhere). Even the occasion at which the meal takes place seems to be secondary (de Castro et al., 1986; de Castro, 1990; Clendenen et al., 1994; de Castro, 2000; Sobal & Nelson, 2003; Weber et al., 2004). Many scientists consider this to be due to social facilitation, which is defined as the enhancement of certain behavior to the sheer presence of others (Zajonc, 1965). By expanding social facilitation with the factor meal duration, it gets more clearly, that the more people are present at a meal the more time is spent eating and drinking together. Surprisingly, with more other people present, the subjects were not hungrier and food did not taste better (Feunekes et al., 1995). The effect of social facilitation seems to occur regardless of the circumstances, but the limited number of studies regarding social facilitation has to be kept in mind.

A significant positive correlation between group size (number of people at a table) and meal duration could recently be demonstrated in a study of Bell & Pliner (2003). Although it is generally assumed that food intake is controlled above all by physical variables, the social environment seems to be of similar importance. That considerable effect of social facilitation was the result of several other studies (Klesges et al., 1984; Bellisle et al., 1999; Patel & Schlundt, 2001; Kristensenet al., 2002). Aside from the mentioned aspects, commensal eating fulfils the function of sociability, comradeship and stress management (Sobal & Nelson, 2003).

In addition, it is interesting that not all group eating situations lead to the previously described effect of eating more. It is important to keep in mind that the presence of others affects the amount eaten in every possible way. For example, people having a meal with others who they believe do consistently eat less, leads to a consumption significantly below the level that would usually be eaten. The contrary situation is with unrestraint eaters. In that case one would eat more than he would do without the person he knows to be an unrestraint eater. (Herman et al., 2003). Another good example for that is the study of Mori et al. (1987) in which could be demonstrated that women ate less in the presence of men for the reason of their femininity.

With a more theoretical approach of an expert workshop Booth et al. (2001) collected what they thought to be important environmental and social influence factors at a meal. With their data they developed different models which contained the assessment of the importance of the factors they found to influence eating behavior.

Inner cues

As previously mentioned, human eating behavior is very much controlled by subconscious factors. Asking participants of a study to describe those factors always results in an incapability of the participants to find the right words or even to identify the right factors. An experiment of Rozin et al. (1998) showed, what happens when the amount consumed is made salient by presenting the wrappings of the food. A suppression of food intake of all participants was the result. It seems very likely that humans keep some sort of record of what has been consumed. This does not mean that one does remember exactly and consciously what was eaten; it is a subconscious perception and evaluation. Furthermore, meal termination seems to be the result of what we have learned from our parents or other social norms prevalent in all parts of our society, combined with more physiological functions such as satiety. Meal termination is to be seen as a part of our inner legislation (Cheung et al., 1980; Zylan, 1996).

Environmental factors

While it is obvious that ambience is made up of and affected by numerous factors and their nearly infinite combinations, some are considerably more controllable than others. Music is an easy to control ambient factor with an unlimited application area and its effects on human behavior are unquestioned. It can be found everywhere in our daily life and it is generally assumed that it affects human behavior in many different ways. The effects of music on human eating behavior could be of interest to psychologists, gastronomes, consumer researchers and the marketing.

A study carried out by Ragneskog et al. (1996) showed the importance of music as an easily controllable factor. It was found that music significantly improved the nutrition behavior of patients. When music was being played during dinner, patients who had previously been unable to feed themselves were now able to help themselves. Furthermore, patients spent more time at dinner and thereby improved their nutritional status compared to the time before the study. But music affects human nutrition in much more situations. Background music in a restaurant increased the consumption of alcoholic drinks, but not food (Milliman, 1986). One should notice that these findings are highly dependent on the kind of music, its volume, the age of the guests and other factors. Analog is the finding of McCarron & Thiery (1989), who found an increased soft drink consumption by playing loud music. Due to the small sample size used in this study, the results are to be interpreted as a hint.

Other findings showed that playing classical music in restaurants led to a higher spending of the customers on both, drinks and food. The findings only seem to be true for music of moderate complexity and unobtrusiveness (North & Hargreaves, 1996; North et al., 2003).

Time is another important factor in food choice and during a meal. Everything in our life is dependent on time. How we perceive and evaluate a meal is highly dependent on time (daytime, month, year and others), and it is unquestioned that various forms of time exist. As music, the linear time can easily been controlled, for example the time of day at which a study takes place. But it is very likely that a real ambience experiment leads to different results, even if the study is carried out at the same time. Studies which had time aspects as a main objective researched seasonal rhythms in human nutrition (de Castro, 1991), the time of day at which a meal takes place (Birch et al., 1984) and the mealtime behavior of families (Boutelle, 2001).

Further influence factors

This paragraph is about factors which should not be left unmentioned. Those are socio-economic factors, the education level and the social environment. Even though they are not a part of the paper, they should be kept in mind because of their possible influence on the evaluation and perception of a meal. Since the first studies which researched food choice, the discussion about the various influence factors and their importance started. Numerous research projects illustrate the interests that scientists in the field of food choice behavior have.

Studies researched certain aspects of food choice; such as the following: the role of appearance and the expectation of liking of a food product (Hurling & Shephard, 2003), the aspect of convenience of at home evening meals (Jaeger & Meiselman, 2004), the quality the consumer wants (Köster, 2001), longitudinal dietary changes (Lakeet al., 2004), temperature (Baron & Bell, 1976), alcohol and ambience (Lindman et al., 1987), the role of odours in retail environments (Schifferstein & Blok, 2002), texture, flavor and odour aspects (Levy & Köster, 1999; Mojet & Köster, 2002), restaurant facades (Cherulnik, 1991), ethnic ambience in Asian restaurants in Germany (Buettner, 2003), food choices in different ethnic groups (Devine et al., 1999), social and biocultural determinants of food choice (Krondl & Coleman, 1986), the impact of moods on eating behavior (Patel & Schlund, 2001), perceived risks associated with food ingestion (Rozin et al., 1994; Sparks & Shephard, 1994) and the portion size (Young & Nestlé, 2002; Rozin, 2003; Kral et al., 2004).

Not all aspects are equally important and some seem to be of interest to only a limited area in science. But all are part of the ambience which most probably determines the perception and evaluation of a meal.

Conclusion:

What can we infer from all the factors we know to influence the perception and evaluation of a meal? First, and this is most arguable, all factors are not hard facts as mathematical functions are. It is impossible to repeat a study under exactly the same circumstances, because many variables change by and by. This is mainly due to the different cultural context in which a repeated study most probably will take place. Second, time which has been discussed previously is an important influence factor, which is only controllable in its linear dimension. But is there any sense standardizing a study design as much as possible? Depending on what researchers want to find out, it could be answered with yes. For example, the industry in sensory science would probably not exist without a high grade of standardization, and scientific studies would not be comparable. Only an exact study design enables researchers to support or to disprove findings. What is needed is a juxtaposition of both directions. Highly standardized studies, those which try to exclude as many disturbing factors as possible, and those which try to make a portrayal of real life situations by influencing the situation as less as possible. Bringing together the results of both approaches is what is needed to develop new successful models, theories in understanding human nutrition behavior.

Another notable fact is that approaches to examine the role of eating location with the evaluation of a meal has so far only been conducted in the United States and the United Kingdom. All other countries, with a few exceptions, are a blank space in this field of research. It would be quite interesting to get some data from other countries all. And only with further studies, the picture of human nutrition could be broadened. Even though, with new study designs and new theories, it would never be possible to make some universally valid statements about the influence of location on the evaluation of a meal. This is because time is changing and with it various influence factors might also change. Furthermore, it is surprising that nutritionists seem not to have worked in this research area so far, except in sensory science. The driving force comes from other scientific disciplines. This is surprising just because nutritionists should have a fundamental interest in understanding all that is related to human nutrition.

In future studies some factors which have previously been considered to be important might lose their importance. To get more results, scientific disciplines ranging from biology to sociology, from psychology to marketing and from nutrition sciences to medicine, have to work together. In addition, the step of further studies needs to be taken to get data also from other countries, cultures and environments. Those data could serve as a basis for a better understanding of food choice.

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