

The psychology of food choice: some often encountered fallacies

Egon Peter Köster^{a,b,*}

^aRoyal Veterinary and Agricultural University, Rolighedsvej 30, DK1958 Frederiksberg C, Denmark

^bASAP GmbH, Drachenseestrasse 1, D-81373 Munich, Germany

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Abstract

Sensory science and consumer science are very young compared with the other scientific disciplines from which they have borrowed well-established methods. Methods and practices commonly used in sensory science and in consumer research are critically reviewed from a psychologist's point of view and alternative solutions are suggested. Five frequent fallacies are described and illustrated: the idea that people are uniform, that they are consistent, that they make rational choices, that their perception is more important than their memory of sensory impressions and that situations are characterised by objectively measurable context variables. © 2003 Elsevier Science Ltd. All rights reserved.

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1. Introduction

Sensory science is still a young science with a strong multidisciplinary character that unites people from very different fields such as food chemistry, food technology, nutrition physiology and psychology in their search for understanding eating and drinking behaviour and applying this knowledge to make better and more accepted food products.

In its fervour to be considered a “real” science, sensory food science has often borrowed experimental paradigms that were valid in other fields, but in doing so, it often forgot the true nature of the phenomena studied. This was particularly true for the application of psychology, the study of human behaviour and its explicit (conscious) and implicit (non-conscious) determinants. Sensory psychologists, originally trained in the “higher” senses (vision and audition), applied the same methods on the “lower” senses (smell, taste and touch) without taking the essential differences between these sensory systems into account. Vision and to a certain extent audition are involved in our spatial orientation and they are characterised by strong and inborn mechanisms that guarantee that we all perceive the same

forms and estimate distances and directions in a similar way. The lower senses in the oro-nasal cavity do not have such strictly defined inborn mechanisms, but rely largely on learning. Certainly, at birth we do not like bitter and we seem to love sweet, but we can learn to drink beer and some even try Campari. This lack of inborn rigidity is advantageous to the human race, because we are omnivores and can readily adapt to multiple food sources, but the consequences are that there is no strict inter-subjectivity and that there are large differences in what people perceive and like. Furthermore, vision and audition are almost always in the centre of our conscious attention, whereas the lower senses almost never are. They remain mainly unobserved and hidden. Only gastronomes and French people pay extensive attention to the taste of their food, but even they talk sometimes about other things at the table. Partly as a result of this difference in conscious attention, it is far easier to describe visual forms than to describe flavours. Flavours and smells, on the other hand, are often much stronger related to emotions than visual experiences. All of these differences have serious consequences for the paradigms to be used in psychological research of the different senses. After all, psychology should explain real everyday life behaviour and if a sensory experience normally remains implicit and subconscious, forcing people to make explicit statements about it may defeat its own purpose. In sensory

* Present address: Jan van Scorelstraat 55, 3583 CK Utrecht, The Netherlands. Tel.: +31-30-251-0387; fax: +31-30-254-6071.

E-mail address: ep.koster@wxs.nl (E.P. Köster).

food science and in consumer research it is nevertheless quite common to do so. For certain purposes, such as sensory analysis, where people are used as instruments and trained to use a common language for the description of foods, such a procedure is certainly permissible, as long as the investigator realises that his data serve only a limited purpose, but in hedonic research it may produce very misleading results.

Thus, current practices in sensory science and consumer research are not always satisfactory from a psychologist's point of view and the remainder of this paper will be devoted to the causes of this dissatisfaction and to the illustration of possible remedies. Before engaging in this, the present author would like to make two statements. In the first place, no literature will be cited in this paper, unless it helps to illustrate a possible solution to a problem. Although there are certainly other contributions in the literature, that could have served this purely illustrative purpose, the author has often used those that he was most familiar with. In the second place, it should be remembered that the present author, during the 40 years he has worked in the field, has often been the prey of the fallacies and the mistakes he describes.

2. The problems

The problems a psychologist is faced with when he sees sensory food science research and consumer research are rather diverse, but most of them are related to fallacies that are well known to him, because they occur in the same way in psychology. Here a number of these fallacies will be treated and some ideas for avoiding or at least reducing their effects will be given.

3. The fallacy of consumer uniformity

This fallacy is based on the implicit assumption that behaviour differs in degree, but not in essence. Basically, it assumes that all subjects in an experiment are comparable, i.e. that they perform the same task in the same way and that all inter-subject variability stems only from the fact that some do it a little or even much better than others.

This fallacy is certainly the best recognised of the fallacies to be mentioned here and over the last decades there have been considerable efforts at segmenting subjects on the basis of their experimental results. Individual differences are described at length and normalising or other ways of dealing with such individual differences are often hotly debated. New scaling methods are advocated because they greatly reduce individual variability. At the same time, there is still a lot of averaging over subjects without any verification of possible bi- or

multi-modalities in the data and even if this occurs, there is usually little attention paid to the underlying factors that determine the individual differences. Do people perceive the stimuli differently or do they perceive the task differently? If it is the former, is this a matter of learning or an intrinsic difference in their sensory apparatus? If they perceive the task differently, is it due to a difference in understanding the instruction or is it because they use a different strategy in solving the problem? Or is it a combination of all these factors? To give a simple example: if one asks how familiar a certain product is, the subject has two ways of interpreting the instruction. He may think that one wants to know how often he has encountered this specific product in his life or he may think that one wants to know how much this product resembles other products he knows. In both cases he will search his memory, but in the one case he will look for occasions of encounter, in the other he will scan the other products he knows for similarity. The results may be quite different. Obviously, the question was ambiguous and should be replaced by a more specific one (how often have you encountered this product: (never–very often), or do you know many products like this (very few–very many).

Another and perhaps less obvious mistake, that is based on the uniformity fallacy and may lead to bad results, is the use of stimulus categories that are based on averaged results from another study. Statements such as “six pleasant and six unpleasant odours were used in this study” should be considered with the greatest care in view of the enormous standard deviations that are normally obtained in hedonic odour judgements. The only possibility for the correct interpretation of the influence of pleasantness on the results is to measure the pleasantness in the group under study (either post hoc or in the experiment itself) and to treat the data on the basis of the individually perceived pleasantness. An odour like lavender for instance is strongly liked by those who can recognise it as lavender, but disliked by those who can not identify it (Degel, Piper, & Köster, 2001). The fallacy of uniformity manifests itself also often in the choice of subjects. Although it is well-known that women are more sensitive to odours and flavours than men and probably have better memory for known odours, many studies do not balance for gender and a number of them do not even state the proportion of men and women. Other well known individual differences in sensitivity, such as specific anosmia (Amoore, 1967) and bitter taste sensitivity (Bartoshuk, Fast, Karrer, Marino, Price, & Reed, 1992) which even have a hereditary base (Prutkin et al., 2000; Wissell-Buchey & Amoore, 1973) are also usually neglected.

Group differences are also found in other respects than sensitivity. Knowing them and taking them into account in constituting the experimental groups beforehand, may

be very profitable. Thus, the world of chocolate eaters is divided into two types: “the biters” and “the suckers”. They differ considerably in many respects. Not taking for granted that all people are alike, certainly pays off, when one wants to make a chocolate for one of these types.

Of course, it is a problem to know a priori in what respects consumers of a product may differ. This can only be solved by observation and analysis of consumption behaviour and by verification of this analysis with a representative group of consumers. Recent studies on chewing behaviour (Mioche, Bourdiol, & Monier, 2002) and of salivary constituents and oro-pharyngeal performance (Buettner, 2002) provide examples of complicated analyses of consumption behaviour, but in many cases (e.g. the chocolate example) just simple observation and thinking about the factors involved in eating a product may lead the way.

Multivariate analysis and segmentation of subjects (McEwan, 1996; Schlich, 1995) have brought sensory science a major step forward, but it also has its dangers, when segmentation is accepted without further analysis. In consumer research for instance, life-style typologies in which people are classified as “rigids”, “convenience seekers”, “neophilics”, etc. have been developed and readily applied, but in most cases such typologies are rather gross and cover only a small percentage of the subjects tested, whereas the majority show such tendencies only to a minor degree. Furthermore, it should be remembered that healthy people fulfil many different roles in life and that they may well be rigid in one of these roles (the mother cooking the Sunday family dinner) and convenience seekers in another role (preparing food on weekdays after work). The two situations and their accompanying roles may create very different demands in the same person. How consistent are people?

4. The fallacy of consumer consistency

The fallacy of consumer or subject consistency is based on the implicit idea that people do not change.

Strangely enough, when asked explicitly, almost no investigator will subscribe to the statement that people do not change and yet most of the methods in sensory food and consumer science are based on this idea. In order to look half decent, these sciences have borrowed their model of thinking from physics and chemistry. Thus, it is assumed silently that an experiment when repeated under exactly the same circumstances will produce the same results. Certainly, there will be some variation due to imprecise measurement and one must take order effects into account, but this can be resolved, by repeated measurement in varying orders and averaging per subject in order to avoid the problem of dependent results. In all of this, it is forgotten that the

subject really might change, because he or she has a memory and therefore the second encounter with a stimulus may not mean the same to him or her as the first one. In many cases, such as intensity measurements, this may not be very important, because the subject just measures the stimulus against an over-learned internal reference system, but in hedonic judgements and choice processes where more personal interest is involved, it will probably play an important role. Long term context effects (see Meiselman, 1996) are examples of factors that lead to changes in choice and even on the short term within a meal sensory specific satiety (see Rolls, 1999) provokes clear changes in preference. In fact, it can easily be shown that changes in preference and choice do take place and even to a degree that casts serious doubts on the predictive validity of hedonic and consumer studies that rely on single measurement sessions. In one publication (Köster, Rummel, Kornelson, & Benz, 2001), changes of preference as a result of exposure to products were studied in 100 East-German and 100 West-German families about 1 year after the reunification of Germany. It could be shown that people on average changed their first preference for the eight product types tested (each represented with two or three different samples) in almost 50% of the cases, but that they did so more for some product types than for others. With respect to this product specificity, early childhood restrictions on the use of a product, due to its scarcity or to health considerations, seemed to have played a role in stabilising the liking for that product. In a more recent paper (Köster, Couronne, Léon, Lévy, & Marcelino, 2003), the results of Léon (1998), Léon, Couronne, Marcuz, and Köster (1999), Lévy and Köster (1999) and Marcelino (2000), who all exposed their subjects several times to the same stimuli over at least two sessions were analysed for individual repeatability of their most preferred choice. It could again be shown that less than 50% of the subjects in these experiments remain with their first choice in subsequent sessions. As a consequence, it was concluded that single hedonic measurements have little predictive value for future liking and that the idea that people change their behaviour should be incorporated in testing the reliability of hedonic methods.

4.1. Psychological theories

Psychological theories about choice and preference behaviour also predict change rather than stability of such behaviour. Thus, the “mere exposure” theory of Zajonc (1968) claims that the more people are exposed to new stimuli, the more they will like them. This theory was tested in the food demesne by Pliner (1982), who indeed found positive changes in liking, which she ascribed to the dissipation of neophobia. Nevertheless, it can be shown that not all stimuli have such a positive

change in liking and that for a number of stimuli a clear decrease in liking is found. Therefore, it has been argued (Köster et al., 2003) that the “mere exposure” theory of Zajonc represents a special case of Berlyne’s more general “arousal” theory. Berlyne (1970) made a distinction between specific exploratory behaviour and diversified exploratory behaviour. In specific exploratory behaviour, where the subject is still in a conflictual state, due to a lack of information about the nature of a stimulus, curiosity (individual characteristic) and novelty (stimulus property) prevail, whereas in the diversified exploratory behaviour, where the individual is no longer in this conflictual state, other stimulus properties like arousal potential of the stimulus and (perceived) stimulus complexity become predominant. The complexity is either defined a priori on the basis of information-theoretical considerations (number of bits in a pattern) or is measured with the help of rating scales or paired comparison. Also according to Berlyne, there is an inverted *U*-form relationship between arousal potential (perceived complexity) and liking, indicating that for each individual there is an optimal arousal potential level below and above which stimuli are liked less. This optimal level is different for different people and depends on learning and experience as Berlyne (1974) showed for the aesthetic appreciation of paintings and music, where groups of complete laymen, of visitors of musea and concerts and of artists or musicians, showed clearly different optimal levels of perceived complexity. In Dember and Earl’s “complexity-pacer” theory (1957; Dember, Earl, & Paradise, 1957; Dember, 1970, chap. 10) this learning is explained by assuming that exposure to stimuli that are a bit more complex than the optimal level (so-called “pacers”) would make the subject change his optimal level in the direction of this more complex stimulus, whereas exposure to stimuli of a lower than optimal complexity level would leave the optimal level unchanged.

Lévy (1998) and Lévy, MacRae, and Köster (in press), using seven very similar orange drinks that were initially equally liked, but differed significantly in perceived complexity, indeed showed that exposure to the drinks, that were simpler than the optimal complexity level of the subjects, had no differential effect on either the perceived complexity or the liking for the drinks, but led to a general decrease in liking for all of them that could be due to product boredom. Exposure to drinks that were more complex than the optimal level on the other hand, did decrease the perceived complexity of all stimuli, but raised the liking for the complex drinks, while reducing the liking for the simple ones, as would be expected on the basis of the theory. Furthermore, she showed that this was true when the data were analysed both at group level and at individual level and that, under the influence of exposure to more complex stimuli, the individual levels of optimal complexity had

shifted to a higher level. The results of the group data are illustrated in Figs. 1 and 2. They will be published in full, together with the individual data elsewhere.

The finding of product boredom with exposure to simple stimuli is also important, since this phenomenon is probably one of the main causes for the many flops of food products in the market. A famous example of such a flop is the one of muesli bars, a product that was generally liked at first, but of which almost nobody ate more than five. Product boredom is rather a general phenomenon with new and non-traditional products and it may easily be explained in terms of the Dember and Earl theory with the help of one small corollary forwarded by Walker (1980). He assumed that prolonged experience with a stimulus (even one of optimal complexity) will reduce its perceived complexity to some extent. If one accepts the idea that this is the cause of product boredom, it becomes clear that selecting the most liked product for introduction in the market, as is customary in consumer research, is a mistake. It would be better to introduce a slightly less liked, but somewhat more complex product, which will act as a “pacer” and that, in becoming at the same time somewhat less complex through exposure, will meet the consumer half way. Another cause of flops, that should be clearly distinguished from product boredom, is slowly rising aversion. Slowly arising aversion occurs in products that are generally well liked, but that at the same time have a minor defect that raises a slight feeling of doubt in the consumer. Over time, this feeling of doubt will grow, whereas the general positive feelings about the product will slowly diminish as a result of habituation. In the long run, this will lead to a dislike for the product. There are two reasons why this phenomenon should be distinguished from product boredom. In the first place, the effects of the two phenomena, although seemingly similar, are different. Product boredom leads to indifference with regard to the product, slowly rising aversion leads to real dislike. In the second and more important place, the remedies for the two phenomena are quite different. With product boredom, raising perceived complexity will solve the problem, but with slowly rising aversion, the source of the minor dissatisfaction must be identified and eliminated. Nevertheless, both phenomena are living examples of the changes that may take place in the appreciation of the consumer and of the necessity to do prolonged hedonic research with the same group of people before putting a product in the market. Single hedonic measurements with large groups are good to measure immediate acceptance, but they will never provide information about long term appreciation of a product. Only a combination of repeated laboratory testing with intermediate well controlled in-home-exposure will provide such information. Although changes in hedonic judgement are much more frequent, shifts in perceptual

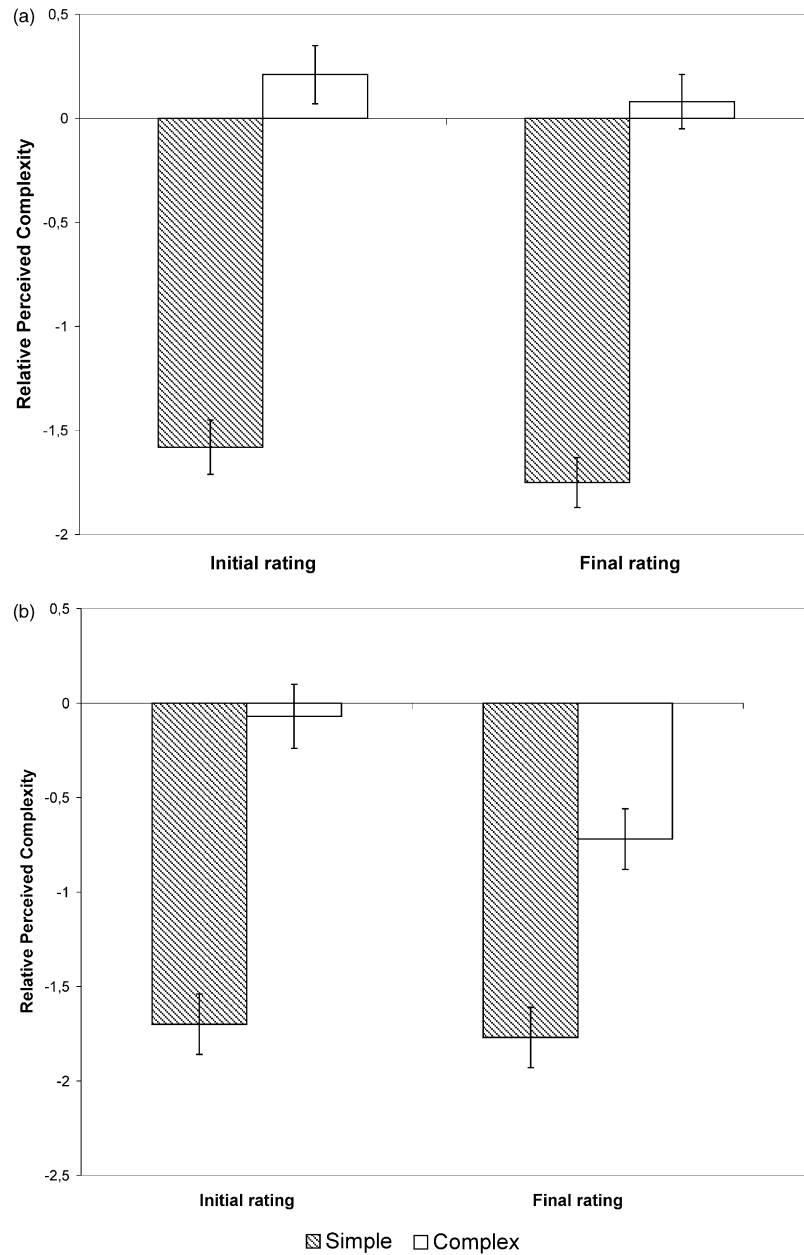


Fig. 1. Means and standard errors of relative perceived complexity (the measured complexity for each subject minus his optimal complexity, i.e. the complexity of the most liked stimulus) for simple and complex products before and after exposure to simple (a) and complex (b) products.

measurements do also occur, especially when untrained subjects are used. Certain foods are too complex in flavour to grasp all the aspects of them at once. Sensory adaptation also plays an important role in these shifts, since it may be much more rapid and/or long-lasting for certain aspects of the stimulus than for others. Thus, the second beer usually tastes quite different from the first one, and therefore it is often customary to systematically vary the presentation order in beer description sessions and to introduce a different specimen of one of the samples as a dummy (the results of which are not analysed) at the first place in each of the different orders. In countries like Holland or Germany,

where many beers or large quantities of beer are drunk and where as a consequence the drinkability of the second glass plays an important role, this is a good procedure, but in a country like France, where most people drink only one (small) glass, throwing away the results of the dummy is not a reasonable thing to do.

Moreover, foods and drinks are usually eaten in different combinations and this may strongly influence the perception of them. Who does not know the wonderful marriages between wines and certain dishes or between pears and gorgonzola cheese, that bring out unexpected qualities in both constituents?

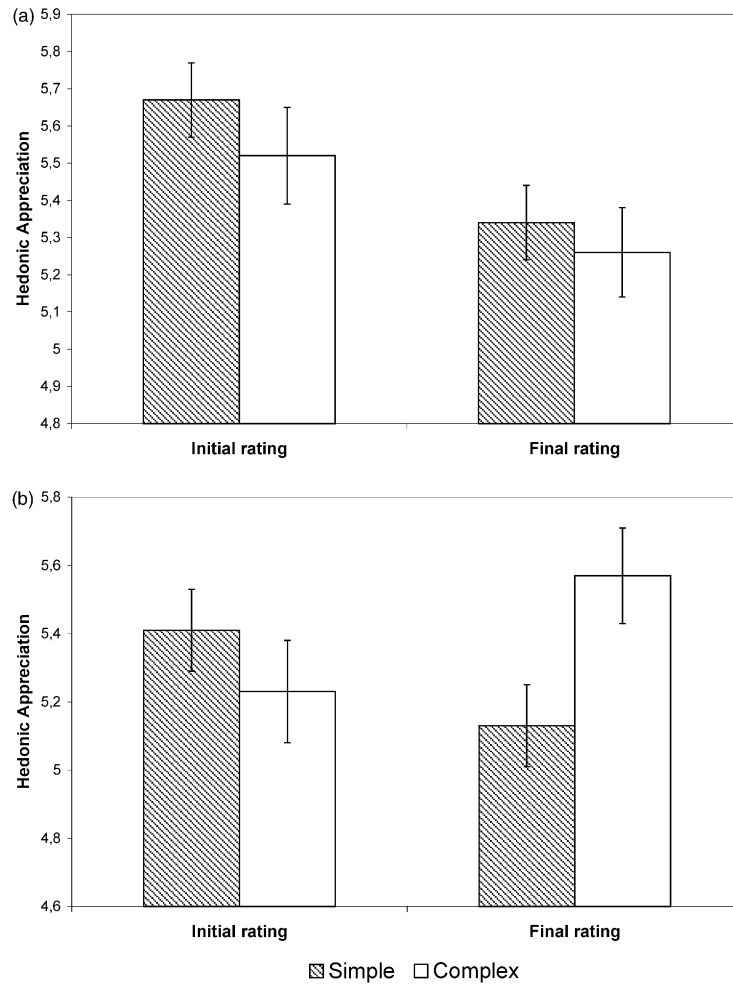


Fig. 2. Means and standard errors of hedonic appreciation for simple and complex products before and after exposure to simple (a) and complex (b) products. (0 = Very unpleasant, 10 = very pleasant on a 10 cm line scale).

Although it is perhaps too far fetched to subsume a general phenomenon like adaptation under the heading of consumer inconsistency, the very existence of such a general principle demonstrates that even nature itself has equipped us with a mechanism to avoid monotony and to foster change. Change through such mechanisms is not under conscious control.

Is this different for food choice?

5. The fallacy of conscious choice

The fallacy of conscious choice is based on the implicit idea that people are “reasonable” and make rational choices.

Most people, at least in the Western world, see themselves as autonomous creatures, that make decisions based on rational grounds, except perhaps in extremely emotional situations. All our daily conversations about our actions and even our law system are based on this questionable conviction. In fact, we rationalise our motives and in doing so we falsify them, we over-stress

certain points in our story in order to make the one who listens to us understand it better and we under-stress certain socially undesirable aspects of our decisions. Consumer research is full of such falsified stories as we shall see later. Is science too?

Certainly, in science we seem to apply strict rules of logic and we criticise others when they do not, but even there we often favour certain hypotheses over others without knowing exactly why. Thus, it may well occur that the right hypothesis is never tested or, if it is tested and is proven to be justified, we may have great difficulty to get it generally accepted or even published. It would be interesting to make a study of the time and critical effort spent by reviewers of journal articles on results that meet their intuitive convictions and on results that do not. Putting money on the fact that more logical errors are overlooked in the first case than in the second, would be a safe bet. In psychology, sensory science and consumer research, the fallacy of conscious choice becomes particularly dangerous, because it joins up with the special problem that, whenever one puts a question to a subject, one always gets an answer, even if

the question is in principle unanswerable. People are polite and do not want to disappoint the investigator or they simply do not want to look stupid and as a result they think up an answer to any question. In this connection, the psychological literature on “demand characteristics” should be mentioned. Subjects try to guess what is the purpose of the experiment and respond to what they think the investigator would like to know (see for instance Knasko, 1993; Knasko, Gilbert, & Sabini, 1990). They may want to please or to look “modern” and therefore they may give a socially desirable answer. Above all they want to look “reasonable”. This means that they think up an answer, instead of saying that they do not know and since in a given culture most people have learned to think in the same way, the consequence is usually that a large proportion of them give the same response to an unanswerable question. This then in turn strengthens the investigator in his conviction that his question was perfectly legitimate.

Of course there is no harm in asking useless questions, as long as one does not base conclusions on the answers, but unfortunately many investigators believe in the false supposition that “If everybody says so, it must be true”. A simple mind experiment might perhaps cure this tendency. Consider the following. If a hundred years ago one had asked whether God had a beard, almost all people would have said “yes”. If now, after the feminist revolution, one would have asked the same question, many women would have said “no, since God is a woman”. The question then becomes: “Is there heavenly trans-sexualism?” Absurd as it seems, consumer research is full of similar questions. The only difference is, that due to the fallacy of conscious choice, they are not so easily recognised as absurd and unanswerable. Normal people enjoy eating and drinking without analysing their experiences and even when they occasionally do analyse them, they have great difficulty finding the right words to express their experiences. Thus, when confronted with a seemingly simple question about their preferred food they have to invent an answer to satisfy the person asking. If for instance in Germany one asks the question “Why do you like this coffee?” the chances are high that 80% of the people answer “Because it is mild”. They do so, because they have no clue why they like it, but they have read or heard the word “mild” in almost every coffee advertisement. The problem is that nobody knows what this word means in terms of coffee. “Fresh” is another and even more widely spread example.

What then are bad questions and what are good questions? In a field so closely connected to the “lower” senses, which are characterised by the fact that they are almost never in the centre of attention, direct and explicit questions such as “why” questions are usually “bad”.

Just quickly try to think what you would answer when asked why you like a particular cheese and you will

come up with a number of platitudes, but almost certainly not with the real reasons that make you prefer it over most other cheeses. On the basis of your escapist response the poor investigator may indeed think that you find it important that “it is easy to cut” or that “it keeps well in the fridge” or that “it is less fat or salty”, but you vaguely know (or perhaps even do not know) that it is really some indescribable combination of texture, flavour and a strange feeling of warmth in your throat when you swallow it, which gives you pleasure.

5.1. *The use of indirect methods*

Indirect questions on the other hand are much better, especially when they are about the frequency of behaviour and not about feelings. In environmental odour pollution research, questions like “How often do you close your windows, because you do not like the smell outside?” or “Do you ever hesitate to invite friends to your garden party in the summer, because of the pollution?” prove to be much better questions to estimate the pollution in an area compared to other areas than “How bad is the odour pollution in this neighbourhood?”

In a study about the quality of drinking water in 20 Dutch cities, two different questions were asked: “How do you like the water in your city?” and “How often in a day do you drink a glass of water from the tap?”. The first question was answered almost the same in all cities and showed no significant correlation with the quality of the different waters judged by an independent panel in a blind test. The number of glasses varied from city to city and correlated very significantly with the panel judgements (Zoeteman, 1978). Obviously people accept their drinking water because they cannot change it, but they do not drink it if it is not good. Thus, both questions provide interesting information, but if one wants an answer to the first question, asking the second one is the better solution.

That indirect questions are also better than simple questions about liking, even when no such complicated feelings as in the previous example are involved, was shown in the following experiment by Mojet and Köster (1986). Four Dutch beers were tested for liking by four groups of subjects, each consisting of drinkers of one of the beers, without a clear result. All groups liked all beers equally well. Then they were invited for another experiment. At the beginning of the session they were told the following story:

Traditional beer brewing is a long process that takes several days, but now a new method has been invented that makes it possible to make beer in three and a half hours. However, it is the question whether this new beer has the same taste as the traditional one, made with the old method. In order to find this out, we will give each of you

twenty glasses of beer, containing either old-fashioned or new beer and we ask you to smell and take a little sip of each of them and to judge whether it is such a new beer or a traditionally brewed old one.

Each of the four beers was presented five times in a random order in the series. All four groups now discriminated significantly between the beers and indicated their own brand as the traditionally brewed one. This “authenticity” method (Köster, 1990, chaps. 5 and 6) was later successfully used to find out how much one could reduce the percentage of alcohol in beer, before it was no longer considered to be a real (old-fashioned) beer. A similar experiment was recently carried out with milk varying in fat content by Kjeaurulf (2002). She asked a group of Dutch drinkers of 1.4% fat milk to pick their own milk out of a series of milks varied in fat content from 0.1 to 1.4%. They did not discriminate between them and indicated all milks about equally often as their “own” milk (see Fig. 3). In another session she told them that there was a possibility to import cheaper milk from outside the country, but that it was important to know whether the taste was all-right and presented them with the same samples varying in fat content, but in this session they had to indicate whether the samples were “Dutch” or “Foreign”. Now the frequency with which they indicated that the milk was “Dutch” was clearly related to the fat content and was highest for the 1.4% fat the subjects were used to.

Obviously, the indirect “nationalistic” question was the better one, probably because it led the subjects away from an analytical attitude and made them react more spontaneously on the basis of “gut” feelings. The irritation over the fact that one wanted to replace something they liked by something new just to make a better profit, both motivated them to be more critical and set them free from rational control over their immediate feelings. On the other hand, to be asked to judge whether a milk is your own or not, is likely to induce analytical attitudes that may disturb the natural

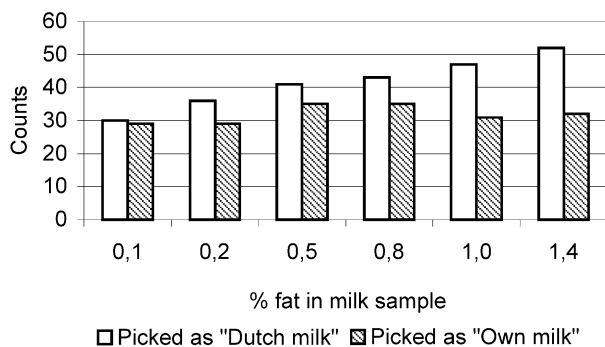


Fig. 3. Number of times Dutch milk drinkers (accustomed to drink 1.4% fat milk) judged milks of different fat content to be their “own” milk or to be a Dutch (not “foreign”) milk.

(subconscious) relationship with the product. The same method was used successfully in an experiment by Wolf Frandsen, Dijksterhuis, Brockhoff, and Martens (2003) to detect differences, that could not be demonstrated by a trained panel of assessors, in milk from differently fed cows.

Direct questions are therefore not always as simple and direct as they seem and may easily lead to misleading conclusions. This is especially true, when generally accepted ideas about desirable behaviour and about the relationship between health and eating are involved. In such cases subjects may even directly tell lies and answer with socially desirable answers.

Köster, Beckers, and Houben (1987) presented a specially designed healthy snack, low in saturated fat and sodium) at normal price during three weeks in four canteens of a big industry in the south of the Netherlands. In two of the canteens it was presented as a “new” snack and in the other two it was presented as a “healthy” snack. After the three weeks a free snack was presented to each of the 400 visitors of the canteens with a questionnaire about its sensory aspects, liking, and buying intentions. There was also a question about how often the subject had eaten the snack over the last three weeks. The results were remarkable. The percentage of the people that bought the snack during the three weeks was significantly higher when it was sold as “new” (5.2%) than when it was sold as “healthy” (3.8%). Obviously, people had learned that something “healthy” can not taste good. In the questionnaire however, the people in the “healthy” condition rated the snack significantly higher on liking and indicated that in future they would eat much more of it, than the people in the “new” condition. They were either surprised by the fact that it tasted much better than they had expected or they acted out of guilt feelings towards something that was healthy and which therefore they should have eaten, but did not. Finally, and most remarkably, in answer to the question how often they had bought the snack over the last 3 weeks, many of the people in the “healthy” condition told a down-right lie, because together they indicated that they had bought twice as many snacks as were actually sold in the “healthy” canteens. The people in the “new” condition on the other hand, did not lie and overestimated their actual consumption by less than 10%.

5.2. The use of questionnaires on attitudes and values

Notwithstanding the untrustworthiness of what people state about their intentions, there are still a large number of investigators, who report the results obtained in questionnaires about attitudes and values without ever checking whether their results are related to actual food choice. They just relate them to declared buying intentions or to other similarly measured attitudes.

According to an analysis of the abstracts of a number of recent conferences on food choice and consumer behaviour, 68% of the papers that measured attitudes, belonged to this category and of the 32% authors that did relate their results to actual behaviour only 8% found a positive effect of attitude on food choice behaviour, whereas the other 24% either found no effect on behaviour at all (18%) or came to the conclusion that the taste of the product was much more important than the attitudinal effect (6%).

It is difficult to find a more convincing illustration of the fallacy of conscious choice. And finally, it is what people do and not what they say they do, that counts.

6. The perceptual fallacy: forgetting memory

The perceptual fallacy is based on the implicit assumption that what can be perceived will be remembered and that what is not perceived can not be remembered.

Almost all sensory and consumer research is based exclusively on perception and the role of memory in food choice is—ironically enough—systematically forgotten. Even in most research on “expectations”, where one would suppose that memory of previous experiences with the product or similar products plays a major role, most investigators have preferred to remain in the perceptual demesne. They investigate the influence of the perception of the packaging on the perception of the product, but not what is remembered of the product itself. Only recently, some attempts have started to see what perceptual aspects of the product are better remembered than others and what is not remembered at all. Before describing this research in more detail, a point should be made about the second statement in the first sentence of this paragraph: the idea that what can not be perceived can not be remembered.

When taken in its absolute form, this idea can probably not be denied, but much depends on what is considered to be perception. If explicit conscious perception is meant, the statement is almost certainly wrong, because there are many examples, especially from the lower senses, in which stimuli that remained implicit and unnoticed in the learning phase, are later remembered (Degel & Köster, 1998, 1999; Degel et al., 2001). That incidentally and probably unconsciously learned odours and flavours are remembered in everyday life has also been demonstrated in a number of studies (Baeyens, Wrzesniewski, De Houwer, & Eelen, 1996; Garcia, Simon, Beauchamps, & Menella, 2001; Haller, Rummel, Henneberg, Pollmer, & Köster, 1999). Furthermore, everyday experiences, which occur when we are shocked because the industry has changed a minor detail in the taste of our favourite product, make us realise that we have learned, unintentionally and

without any previous analysis, much more about the properties of such a product than we know. In the experiments to be described here, this incidental learning and the memory that results from it are tested for aspects of texture (Mojet & Köster, 2002, *in preparation*) and for three of the basic tastes (Köster, Prescott, & Köster, *in preparation*). In these experiments the subjects were invited to the laboratory under the pretence that they were going to participate in an experiment on “hunger feelings”. For this, it was explained to them, they had to come without having eaten anything in the morning, but a fixed breakfast would be provided to them in the laboratory after the first measurement of their hunger feelings. This breakfast, which they had to eat entirely, contained several items that were later to be used as target items in a memory sessions at the end of the day. The subjects were left unaware of the true purpose of the experiment and just ate or drank the target items without any learning intention. After the breakfast they measured their hunger feelings at regular intervals during the day, before they returned to the laboratory. When they returned they were first asked to describe what, according to them, was the real purpose of the experiment. No one mentioned memory or learning and almost all were convinced that the experiment was really about “hunger feelings”. They then were presented with series of stimuli for each of the target items, which contained samples that were equal to the one that they had eaten at breakfast and samples that differed from the target items. They were just asked to tell whether each of the presented samples was the same as the one they had eaten that morning or not.

After this they received each of the distractors and the target once more in a random series under new codes and were asked to rate their liking for them and to indicate whether they liked the presented items less than, equally well as or more than the item they ate at breakfast and whether they judged them to have less, equally or more of a number of relevant (varied in the distractors) and irrelevant (not varied in the distractors) attributes than the ones they ate at breakfast. The results show that in most cases, the exception being fatness and sweetness, people remembered the targets significantly better than by chance guessing, but that their memory for certain aspects (crispiness and bitter) was much better than for others and that it also depended on the product in which the attribute was varied. Furthermore, it became clear that, especially with regard to texture, males remembered some aspects differently than females. For taste no such gender differences were found. The gender differences found might indicate that what people remember and the way in which they remember it, may depend on the meaning it has to them. Is this possible influence of meaning on memory also found in perception?

7. The situational fallacy

The situational fallacy is based on the implicit assumption that perceptual situations are exclusively defined by objective criteria and not by the subjects' conscious and subconscious intentions.

Taking the reality of the objective physical world seriously, is something we learn in school, and later in university, it forms the basis of our "scientific" attitude and our strong believe in the inter-subjectivity of our experiences. Even perceptual psychology, with its strong roots in vision, where inborn laws govern the relationship between the physical world and the perception of it, has almost completely forgotten that in everyday life we live in a world of meanings, rather than in one of objective facts. When J.J. Gibson, one of the most original and influential authors in the field of perception, devoted the last three chapters of his famous book "Perception of the Visual World" (Gibson, 1952) to meaning, learning and to a motor theory of perception in which he explained how spatial behaviour is intimately connected with spatial perception ("the floor looks capable of being walked on, the walls do not"), most of his followers were more enticed by his mechanistic explanations of the inborn laws of vision, than by these chapters. After all such ideas might attack the principle of inter-subjectivity on which experimental psychology was built and might make room for personal interpretation. Gibson's ideas about visible meaning and about the motor theory of perception and visual kinaesthesia are very similar to phenomenological psychology. Based on Edmund Husserl's ideas about consciousness and memory (see Merleau-Ponty, 1945; Sartre, 1940), phenomenological psychology saw consciousness not as a receptive box that is filled with images from the outside world, but as an active principle that is always directed outwards at its object and that in doing so, by its "intentionality", provides "meaning" to the objects it is directed at. This intentionality is an intrinsic and in itself unconscious act, in which memory plays an important role, because it gives the object as it were the possibility to show all that we know about it and what we have experienced with it. What it will show depends on what we want to do with it or from what mental perspective we look at it. Somewhere (the author cannot find the citation anymore and therefore gives a free version) Jean Paul Sartre gives the following example:

Suppose you enter a room with a picture and a nail, because you want to hang it on the wall, but you have forgotten to bring a hammer. Now all of a sudden all the things around you show themselves in their capacity to serve as a hammer. The glass shows its breakability, the books show their vulnerable weak covers, etc. Finally, you take off your shoe and use the heel of it. When the job is done

and you look around, all things have lost their hammer- or no hammer-look. Books now refer to their contents or to the author whom you once met at a literary evening or to the holiday place where you read them for the first time and the glass shows you the thirst that doing the hammering job has given you.

This means that with your intention the situation has changed and that the things around you show different meanings which are closely related to your previous experience with or your (implicit) knowledge about them. For the perceiver, things are never without meaning and for phenomenological psychology (just like for Gibson) in everyday behaviour there are no "pure" sensations, that exist independent of meaningful perception. Although Gibson does not use the word intentionality, he illustrates the same principles, when in his later book (Gibson, 1968) he speaks about the active role of perception and discusses for instance the strong differences in tactile perception between touching and being touched. From all this, it follows that the same things are not always perceived in the same way and may not have the same meaning for the observer. But if this is true, does that mean that there is no inter-subjectivity and that we all perceive the world differently? It does not, as another simple example may show. When as a student, the present author asked this question to his former professor (Hans Linschoten, who died much too young), he got the following answer:

What do you do, when you find something in the street and you do not know what it is? (I remained silent) Well, you go to someone else and you ask him whether he knows what it is, because you are absolutely sure that he sees the same shape of the object as you. That is inter-subjectivity, but at the same time, he may recognise it as a carpenter's measuring instrument and notice that the user has made a little scratch on it, because he used a certain measure very often. The fact that he notices something that you have overlooked although you can clearly see it when it is pointed out to you, is because he also sees meaning.

That meaning is more or less forgotten in visual perception research is understandable, because understanding the mechanisms underlying the inborn rules is such a fascinating problem that it focuses all attention, but that it is also little considered in other areas of sensory research, where no such inborn mechanisms exist and where memory and personal experience play an important role, is incomprehensible. Nevertheless sensory research is full of examples. Once in our laboratory, we asked people to rate their liking for 12 different types of cooked carrots presented under red light to

mask colour differences at nine o'clock in the morning. Their data together with those of a trained panel made such a wonderful external preference map that even the question whether this measurement was meaningful did not occur to us. Apart from the bizarre situation in which we placed the subjects, we neglected the fact that carrots are almost never eaten alone and that they might serve very different functions in combination with other meal components.

Other subjects have been blindfolded and asked to recognise mashed vegetables that were put in their mouth with a spoon by the investigator, who afterwards drew conclusions about food flavour recognition.

Such experiments, of which there are many, are scornfully denounced as “meaningless” by “true” consumer scientists who want to know, what deeper values are at the basis of people’s food choice. In order to find this out, their subjects are faced with endless sequences of “why” questions until, in their despair, they answer something like “because it is good for the happiness of my family”, which is then accepted and interpreted as the highest “value” involved in eating brown bread or drinking skimmed milk. And of course, since by rationalising, well over 70% of the people have found only this way out of the ordeal, instead of just answering “I don’t know” to the first “why” question, the investigators consider it to be such a significant conclusion, that they never ask themselves whether the same “value” might have been obtained by asking why the subject likes brick houses or grand pianos. As was pointed out earlier, the worst of it all is, that in most cases the influence of such “values” on actual choice behaviour is not checked and that, when this is done, the results of these checks are usually negative. True meaning is based on very intricate and often hidden motives which, if they can be brought to consciousness at all, are difficult to express verbally. Thus, meaning cannot be measured by asking such blunt questions. More indirect and less verbal methods will be needed to catch it. At the same time, the earlier mentioned objections of the consumer scientists against “meaningless” laboratory measurements are completely legitimate and methods will have to be found to measure hedonic responses in a more meaningful context. Before turning to such methods, one other misunderstanding should be mentioned, which often occurs in research about the influence of context on the perception and appreciation of food.

Meiselman (1996), in his excellent review of this topic, comes to the conclusion that contextual variables can have profound effects on eating behaviour. He mentions three broad areas of context that interact in an eating event:

1. The food context: combinations with other foods, culinary tradition and culture, food packaging, naming and labelling.

2. The eating situation: the social and physical environment in which the food is eaten.
3. The individual: food preferences and aversions, variety seeking tendencies, neophobic–neophilic attitudes, restrained eating tendencies and food expectations of the individual consumer.

In his summary, he comes to the conclusion that dealing with the complex interaction of these different classes of variables (and perhaps other ones), “just as the individual does when eating”, is a research challenge for the future. The problem with this view lies in the underlined part of the sentence and it is threefold. In the first place, it may suggest that many of these variables (other foods, packaging, naming, labelling information, physical environment) are objective properties of the context that can be measured independently of the meaning they have for the individual subject. Simple experiments, for instance about what different people, even within the same cultural group, see on a package or in a physical environment or what they remember of a food or a food labelling text, will immediately show that the differences in meaning are so large, that it is doubtful whether such context elements can be varied in a general way and can reasonably be used as a “variable”. In the second place, it is doubtful whether the individual typologies obtained with questionnaires (e.g. variety seeking, neophilic/neophobic tendencies), which usually have only moderate external validity and might even be artefacts created by the questions, are not too gross and generalising to serve as variables on an individual level. After all at breakfast many high variety seekers eat the same things every morning and at dinner even the lowest variety seekers almost never eat the same things every day. So what did they have in mind when they answered the variety seeking questionnaire? In the third place, and this is the most fundamental problem with the underlined part of the sentence, it is very questionable whether the individual really deals with the complex interaction between all these (partly construed) variables. And if he or she does, it is certain that he/she not do so consciously and we can therefore not verify what he/she does by asking direct questions about it. Furthermore, it is questionable whether different individuals do so consistently and in the same way. In view of what has been discussed above this seems very unlikely. Who then is “the individual” mentioned in the quoted sentence? In view of all these difficulties it seems rather doubtful that the problem can be solved by recombining separately measured variables, even in the unlikely event that we could measure them all at once in the same group of people without upsetting their normal behaviour. Different ways of attacking the problem without disturbing the natural perception of the subject should therefore be looked at. As one way to solve it, a situation-oriented approach instead of a consumer-oriented

approach has been suggested (Köster, 1996). In this approach the consumer is not seen as a fixed individual with constant characteristics, but as someone who plays many roles in life and who has different intentions and wishes in each of these roles. These variable intentions and wishes become apparent, even to himself, in “situations”. Thus, a situation is an event in the life of an individual in which his personal history is organised in his perception of and expectations about the things around him. In fact, every moment of one’s life is a situation, but in the context of this paper, attention is paid only to situations in which eating is involved. A family dinner is a situation, where one takes a certain role according to one’s position in the family and one expects a certain type of conversation and also a certain type of food. A dinner with friends in a restaurant is a different situation and the expectations about the food are different also. Hunger shows “eatables”, but hunger when one is sitting alone in front of the TV shows other “eatables” than at a dinner with friends at home or with a group of business relations at a restaurant. A globally accepted and otherwise highly appreciated product, like a chocolate covered ice-cream on a stick, would fit the first situation very well and might, if the friends had dropped in unexpectedly, perhaps be acceptable in the second one, but would certainly look ridiculous and be unacceptable in the third situation. Thus, the same product may fit one situation and not another. The idea of situation-oriented research and product development is based on measuring this fittingness, which reflects the already combined variables of Meiselman which the subject brings along to the situation. Thus, the risk of distortions of the real behaviour by the separate measurement of perhaps closely interwoven variables and by their later recombination on merely statistical grounds, could be avoided.

How could such situation-oriented research be carried out and what are the difficulties encountered in setting it up?

The principle is simple. One evokes situations with the help of auditory and/or visual means, one gives the consumer a food or a variation of the same food to eat or drink and one asks him/her only to rate how well this food would be appreciated in the situation and how often he/she would like to eat it in such a situation. One repeats this with a number of situations and a number of foods. One can also repeat a given combination of situation and food several times in different sessions.

Of course, it is not necessary to show all situations to everyone. In fact, one makes a selection, based on the personal circumstances of the person, (married, living together, children, parents still alive, etc) and shows the selected situations to the person before the experiment, asking him to rate the frequency of occurrence of these situations in his life. This also serves to familiarise the person with evoking his personal images of the situation.

One can also select the situations on other grounds. Certain foods are only eaten at certain occasions, while other foods will be adequate for a very large number of situations.

What would one win if such a method were used?

First of all one would be much nearer to the real wishes of the consumer, who has different expectations in different situations. Secondly, one would have a better insight in the frequency with which people would be tempted to consider a food as adequate. Thirdly, one would have an idea which variation of a food performed better and which was less liked. Normal descriptive analysis can then be used to profile these foods and to show the differences in sensory properties that are linked to differences in acceptability or fittingness ratings. After all, the situation-oriented approach should be only a better method of assessing the hedonic value and meaning of a food. The rest is a matter of good sensory analysis. Such methods are also better than the traditional home use methods, because in the home use test, the family, who knows that they are asked to evaluate the product, devote much more special attention to it than they would normally do. This means that the situation in which the product is consumed is not normal at all. Furthermore, in many home use tests people have the feeling that they have to consume the product, whereas in situational measurement they make a choice between products and express their preference between different products in this choice.

What are the difficulties in applying a situational method?

Of course situations as defined here, are highly individual. Everybody has his/her own personal history and it seems as if meeting the expectations about food of the consumer would demand an enormous variety of products, but it should be realised that people may have much more in common in the way they experience situations than it seems at first sight. After all, much of one’s personal history is influenced strongly by cultural traditions, by the school system and by the common values and beliefs of one’s own generation. If situations were really completely individual and private, communication of feelings would be impossible. Literary books would not be published and the film industry would not exist.

Finding the situations and evoking them in the laboratory may be another problem.

Finding all situations in which people eat things will not be too difficult. One could use his own imagination and complement it with a simple questionnaire or even with focus group discussions. Representing the situations in such a form that all individuals can identify with them is much more difficult. Simply telling them that they should imagine themselves sitting at a family dinner or alone in the kitchen or eating in front of the TV, will certainly not be enough. People are lazy and

imagining such things takes quite an effort. Also, it would distract their attention from the food they have to taste. Therefore, more suggestive means such as projector slides or video clips might be needed. The latter could very well be shown on the same screen that is used for the response scales. The main problem is to make them in such a way that everybody can identify with them. Here auditory stimulation (telling stories, see later) might be better. People project their own situations very easily in a story as long as it does not describe the situation in detail. Visual stimulation has also the disadvantage that it will be necessary to adapt the set of situation evoking stimuli for different cultures with different eating habits [eating with hands (e.g. Pakistan), with fork only (e.g. US), with knife and fork (e.g. Europe), ways of sitting, etc.]. Nevertheless, visual stimulation may be very effective when quite general situations are to be evoked. In an industrial project, many years ago, we tried to find out which perfumes would be most suited in different countries to be used in certain household products. At first we asked the subjects simply to imagine how well a certain perfume would fit to a bar of soap, to a rimblock in a toilet, to a detergent, etc. The results were extremely poor. We then created a series of photographs of 20 situations in which the products could be encountered (a piece of soap on a wash basin, a rim block attached to a toilet pot, a scrubbed floor with a mop and a bucket, etc.) and presented each photograph in combination with each of 50 different perfumes to groups of 100 house-wives in 12 countries. Now the results were astonishingly clear and consistent. They showed large differences in the likes (and, perhaps more importantly, the dislikes!) for certain odour-application combinations in the different countries. Thus, it became clear that, unlike in northern European countries, citrus odours are not wanted in a Spanish toilet, but that heavy flowery odours are. More recently, Sylvie Henry (personal communication), in another industrial research project, compared three ways of evoking situations, auditorily by suggesting situations in little stories over a headphone, visually by showing compositions of pictures suggesting the same situations and by combining these two methods. One of her stories ran approximately as follows:

It is winter. You wake up in the morning and it is still dark. Outside it is wet with sleet and snow. The house is cold, but you have to get up to go to work. You take a shower and dress. You shiver when you enter the cold kitchen because you must eat something before you go. You open the fridge and find a (product x). Which of these four versions of the product would you like to find?

Both the auditory and the visual presentation methods separately, had a clear and similar influence on the

preference for different variations of a food, although it was stronger for the stories than for the visual stimulation, but the combination of the two methods had not. This is understandable, if one realises that the subjects in the case of the stories could imagine their own private situation, whereas with the visual stimulation the identification was less personal. Combining the two inputs brought them probably in conflict and disturbed the process.

In any case, both examples show that suggesting different situations can be effectively done and leads to clear differentiation in hedonic appreciation. Of course, situation-oriented research is still in a tentative stage and it is still to be proven that choices made in such imagined situations correlate highly with those made in actual situations. Combined laboratory and field experiments to this end are now under way. If they succeed in demonstrating a good relationship between simulation and reality, such situation-oriented research or “situational analysis” as the method has been called earlier, might well be preferable over many of the methods used up till now, because it more effectively avoids most of the fallacies mentioned in the earlier parts of this paper. It does not presume consumer uniformity and consistency, it avoids direct questions about products that may have variable meanings in different situations, but uses a frequency-based type of indirect questions that can easily be answered and it leaves the subject much more free to deal with the product in his own “meaningful” way.

8. Conclusion

Five types of fallacy that are often encountered in sensory and consumer research have been described in this paper and it has been tried to indicate ways of avoiding them. In describing these new ways, the author has undoubtedly succumbed to other fallacies without being aware of them. Therefore, the main conclusion of this paper is, that in research with an object that is as near to us as our own behaviour, we must be constantly aware of the fact that there may be a strong dissociation between what we think about ourselves (and others) and about what we do on the one hand, and what we really are and do at the other hand. Most of our acts and actions are irreflexive and implicit, but when we think about them, we have difficulty admitting that to ourselves. It should be a solace to those who come to sensory and consumer research from outside psychology, that even some 110 years after the discovery of this fact in psychology (the so-called psychologists’ fallacy, W. James, 1890), many psychologists, including the present author, fall into this trap.

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