Hochschule für Angewandte Wissenschaften Hamburg
Hamburg University of Applied Sciences

USAGE OF 'JAR' AS A SUPPLEMENT TO PREDICT CONSUMER ACCEPTANCE BASED ON DESCRIPTIVE SENSORY

- DIPLOMARBEIT -

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Usage of 'JAR' as a Supplement to Predict Consumer Acceptance Based on Descriptive Sensory

- Diplomarbeit -

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ABSTRACT

Over the last 20 years it has become increasingly popular for the consumer goods companies to add just-about-right (JAR) questions in consumer acceptance tests. These questions are used to help researchers to understand the basis of hedonic responses to products. However, the use and utility of these JAR questions raise a great deal of controversy amongst sensory professionals. This study was designed to determine if JAR questions alone are an appropriate tool to explore product acceptance. Furthermore, it was examined whether it is possible to obtain reliable and sufficient information about possible directions of how to change product attributes, or whether it is necessary to have additional descriptive sensory data. A total number of 932 consumers, who rated on overall liking as well as on six pre-selected just-about-right questions, participated in this particular consumers' product test. Afterwards, these JAR data set was analyzed by means of variance analysis and of the two-tailed binomial test, which were conducted on the frequencies and on the distributions of the JAR responses. In parallel, a Quantitative Descriptive Analysis (QDA®) was employed using a descriptive panel of 13 trained panellists, who once evaluated 59 descriptive sensory product attributes.

Based on the six pre-selected JAR questions, which were included in the consumer questionnaire, important drivers of product acceptance could be identified. In addition, it was possible to identify target products and to reach clear conclusions regarding possible changes for product attributes which were not 'just right' to the consumers' opinion. The results gained from the analysis of the JAR responses were in line with the results and recommendations based on descriptive sensory. Yet, it has to be mentioned that the information that has been received through the JAR questions are less detailed and, therefore, less precise than the descriptive sensory terms.

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1. INTRODUCTION

Consumer tests are an important part of the research process and one of the key activities of consumer goods companies. They are conducted to support product development by providing information about the consumers' affective responses and reaction to products. The level of acceptance is accessed by asking the consumer how much they like the product. For this a nine point hedonic category scale is usually used.

It has become increasingly common to add so-called "attribute diagnostic questions" to the questionnaire ballot. These questions should help the researchers understand why consumers like or dislike a product, and how product attributes might be changed to increase acceptability. The most "famous" diagnostic question is the "just-about-right (JAR) question". Despite the ubiquity of JAR questions in consumer testing, the use and utility of these JAR scales have been criticized on several grounds and still raises a great deal of controversy amongst sensory professionals. One of the major critic points is that these scales rely too heavily on the consumers' ability to judge the characteristics of sensory products. Furthermore, the analysis of JAR responses can pose some problems.

This study was conducted in order to evaluate the usage of JAR scales as a supplement to predict and explain consumer acceptance in multiple product tests based on descriptive sensory. A central location test (CLT) was conducted in three different countries in order to explore the consumer acceptance of a wide range of milk chocolates. In addition to some hedonic questions, the consumer questionnaire contained six JAR questions about pre-selected appearance, flavour and texture product attributes. The aim was to analyze whether JAR scales are an appropriate tool to explore product acceptance and if JAR scales can deliver sufficient and reliable information about the direction of change. In addition, the results of the JAR analysis were compared with the results received through descriptive sensory data in order to determine if JAR scales can provide additional information that cannot be obtained by descriptive sensory.

Before starting with the experiment, we must explore the general issues about sensory evaluation and consumer research. Section one describes some important aspects of sensory evaluation as a distinctive scientific discipline, including its historical development, methodology and areas of application. Secondly, the significance of consumer testing for product development will be explained. Types of consumer test methods, general requirements as well as special characteristics and potential risks will be presented. In this context, the particularity of JAR scales as well as their advantages and disadvantages will be explained. In addition, the need and importance of relating affective and descriptive testing will be examined.

Section two shall present the object and scope of the study, materials and methods, followed by the description of the results. At the end, the findings of the analysis will be discussed and conclusions and recommendations on the use of JAR scales will be given.

2. GENERAL ISSUES ABOUT SENSORY EVALUATION AND CONSUMER SENSORY TESTING

2.1. Basics of Sensory Evaluation

This chapter describes general knowledge and the current status of sensory evaluation as a scientific discipline as well as its most important objectives, test methods, and areas of application.

2.1.1. Historical Development

Test methods to evaluate the quality of products are as old as mankind. At every time in history people tried to find characteristics and criteria for assessing the quality of food, water, clothes, weapons and other products they used in their daily life. MEILGAARD et al. see the early origins of sensory tests to be linked closely with the beginning of the trade. The rising demand for trade brought with it the need for the development of more formal sensory testing schemes based on which the merchants and trading partners could set their prices.

During the first decades of the 20th century so called "professional tasters" consulted consumer goods industries. They were conducting "organoleptic[1] tests" to provide objective measurements of the sensory product characteristics. These professional tasters were however mainly experts with a fundamental scientific knowledge and background; the applied methods were simple and easy in execution. Thus the measurement methods as well as the interpretation were, in reality, strongly influenced by subjective opinions and preconceived expectations of these professionals [MEILGAARD et al., 1988, p. 2].

The birth of sensory evaluation as a scientific discipline is not easy to date. The past fifty years brought many significant developments in research into both the physiology of human perception and the psychological influences on the evaluation process. Based on this knowledge, amazing progress has been made on

[1] organoleptic: (Gr. root of lambanein to seize) affecting a bodily organ or sense. [The Chambers Dictionary, 1993]

principles and practices of sensory measurement techniques. These studies led to important and valuable insights that contributed to the growing popularity and activities in this science [Schutz, 1998].

A strong impetus for research and development on sensory evaluation techniques came from the United States during the Second World War.
In the 1940s the U.S. government initiated several nutritional programs to supply the population and the army forces with food drawn upon adequate nutritional values and guidelines. However, all of these efforts failed because the population rejected the food they were offered. Therefore, the US Army Quartermaster Food and Container Institute began to determine the reasons and key factors for food acceptance and preference [Benz, 2002, chapter IV (1), p. 3].

The consumer goods industry soon began to understand the value of the information and the opportunities for product development and thus, was one of the first to provide support for this emerging science [Stone, 1999, p. 124]. Although its importance was recognized, the organization and operation of sensory evaluation as a distinct function within a company still remained unclear [Stone; Sidel, 2004, p.7]. One drawback was the fact that in the beginning only experts evaluated the products. To overcome the dependence of the sensory tests on one or a few experts, and further, to make results more reliable, new principles and measurement methods of sensory evaluation were developed. One of the first descriptive methods – the Flavour Profile Method – was introduced by the Arthur D. Little company in 1957. Several discrimination test procedures were used by Boggs and Hansens in the mid 1940s and 1950s. The first triangle tests were conducted in the mid 1940s in the Carlsberg breweries and in the Seagrams distilleries [Rummel, chapter 2 (2.1), 2004a, p. 3]. Additionally, other measurement techniques were used trying to access consumer product acceptance.

Today, sensory evaluation is widely recognized and accepted by professionals as a distinct scientific discipline and is seen as linkage between marketing activities on the one hand side and research and development activities on the other hand side [Muñoz, 2003a, p. 10].

2.1.2. Definition and Methodology

Many definitions and explanations are available to describe the area and tasks of sensory evaluation. One is quoted here:

> *"Sensory evaluation is a scientific discipline used to evoke, analyze and interpret reactions to those characteristics of foods and materials as they are perceived by the senses of sight, smell, taste, touch and hearing."*
>
> [STONE; SIDEL, 2004, p. 13]

Sensory test methods comprise a broad range of different measurement techniques in order to answers one of the three major questions about products.

1. *"What is the product in terms of its perceived characteristics?"*
2. *"Is the product different from another product?"*
3. *"How acceptable is the product (or is it preferred to some other product)?"*

[CHAMBERS; BAKER WOLF, 1996, p. 1]

According to the project objective, its target and research questions the scientist has to chose the proper and most suitable test method. An overview of the three main classes of sensory methods is given by the following figure.

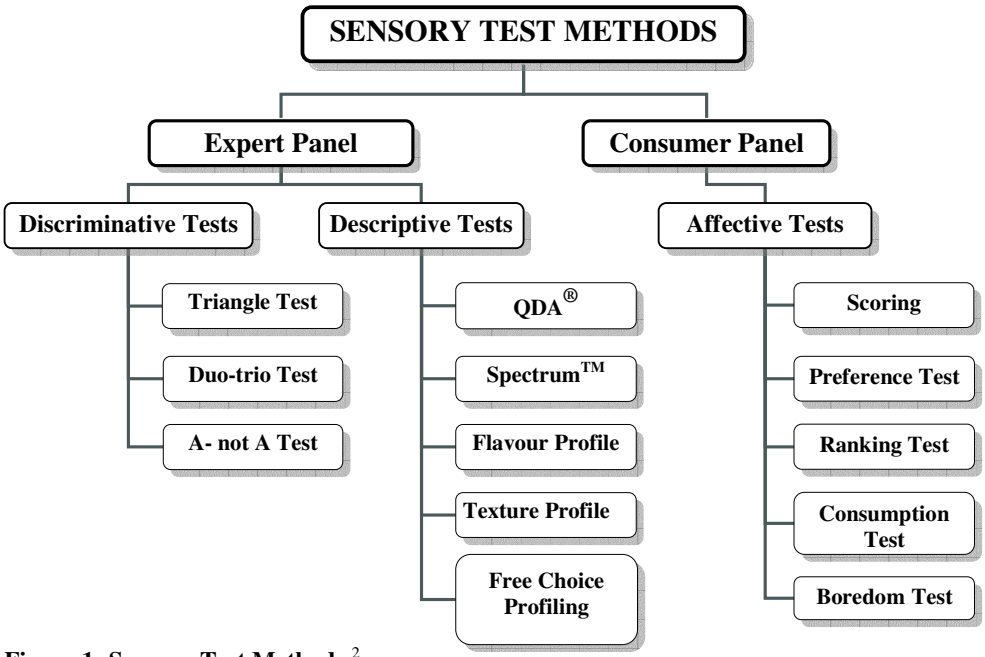

Figure 1: Sensory Test Methods [2]

[2] Chart made according to the explanation of CHAMBERS; BAKER WOLF, 1996 and LAWLESS; HEYMANN, 1999

2.1.2.1. Discrimination Tests

Discrimination tests are conducted to determine whether there is a perceptible difference between two samples when the objective is that a new product should match the old standard product. Therefore their main area of application is to support cost reduction projects like reformulations, substitution of product ingredients or process changing [Chambers; Baker Wolf, 1996, p. 25]. The participants in these tests should show a high acuity in discriminating differences between the products tested [Lawless, 2001]. "The analysis is based on statistics of frequencies and proportions (counting the right/ wrong answers)" [Lawless; Heymann, 1998, p.7]. Traditional discrimination tests are not designed to measure sameness; that means "a rejection of difference is not a measurement of similarity" [Chambers; Baker Wolf, 1996, p. 25].

2.1.2.2. Descriptive Analysis

Descriptive methods represent the most comprehensive and informative sensory evaluation tools. They are used to first describe a product in terms of its characteristics and secondly to quantify the perceived intensities. Thanks to descriptive analysis it is possible to build up a detailed sensory product profile which allows the researcher to draw comparisons among a variety of products to determine differences and similarities [Chambers; Baker Wolf, 1996, pp. 58].

"The information can be related to consumer acceptance information and to instrumental measures by means of statistical techniques such as regression and correlation" [Lawless; Heymann, 1998, p. 10]. Descriptive analysis is used for shelf-life testing, and frequently used in product development to measure how close a new introduction is to the target or to access suitability of prototype products. For quality assurance it can be invaluable when a problem must be defined [Chambers; Baker Wolf, 1996, pp. 58].

The participants in descriptive tests are highly trained panellists who have been screened for a positive attitude to the product category and a good faculty of judgment and articulation as well as for team spirit and the willingness to cooperate with other group members [Busch-Stockfisch, 2002a, chapter I (2.1), pp. 3].

2.1.2.3. Affective Testing

The third major class of sensory evaluation tools contains hedonic or affective test methods. They are used to quantify the degree of like or dislike for a product and to determine whether a product is preferred over another product [CHAMBERS; BAKER WOLF, 1996, p. 73]. It is important to obtain a representative sample of target consumers for the test. Therefore a large number of participants are usually needed [LAWLESS, 2001]. The information gleaned from these tests is very valuable. Combined with additional product information out of descriptive sensory analysis and analytical measurements it delivers useful information about the "optimal design of food products" [LAWLESS; HEYMANN, 1998, p.431].

2.1.2.4. Panel Characteristics

As already mentioned above, the different methodology approaches require, according to their objectives, a different amount and population of respondents in terms of sensory acuity, experienced trainings and background knowledge. The following table summarizes on what criteria the respondents for the three classes are selected.

Class	*Type of Test*	*Aims/ Objectives*	*Panellist Characteristics*
Discrimination Tests	"Analytical"	Determination whether there are perceptible sensory differences among very similar products	Screened for sensory acuity, Oriented to test method, Sometimes trained, (10–20 responses) * 2
Descriptive Tests	"Analytical"	Neutral and unaffected description of the sensory product characteristics	Screened for sensory acuity and motivation, Trained or highly trained, (10–12 responses) *3
Affective Tests	"Hedonic"	Determination of the product acceptability and/ or preference	Screened for product use, Untrained, 120–300 responses

Table 1: Objectives and Panel Characteristics of the Different Sensory Test Classes[3]

[3] Table modified in accordance with LAWLESS; HEYMANN, 1998, p. 7 and DLG, 2000

2.1.3. Application Areas of Sensory Evaluation

With growing understanding of the relationship between a product's sensory characteristics, consumer acceptance, and market success sensory evaluation became more and more important and appreciated by consumer products companies, especially in the food, beverage and personal care sector. Today, sensory evaluation has a valuable and important contribution to product development and the decision-making process.
It has established itself as an essential tool in the following areas listed below:

- **Product Development**.
  - new product development
  - quality improvement
  - cost reduction
  - supplement of ingredients; change of recipe or processing

- **Quality Control and Assurance**.
  - setting quality standards for products to obey the quality requirements within production, processing and sales of the products
  - control of quality maintenance through shelf-life testing

- **Market Research**.
  - exploration of the market structure and the positioning of the products
  - product comparison between the own products and competitors
  - determination of consumers preferences and key factors for liking and acceptance

[Liptay-Reuter; Ptach, 1998, pp. 12
and
Fliedner; Wilhelmi, 1993, pp. 18]

2.1.4. Sensory Physiology

Through the five senses of sight, hearing, smell, taste and touch the human body gets information about the world around him. The receptor cells of the sensory organs detect external stimuli and convert these stimuli into nervous irritations. However, every single receptor cell responds only to one type of stimulus. This means, an olfactory receptor cell is not able to detect any vibrations or colour reflections [FRICKER, 1984, p. 6].

NEUMANN and MOLNÁR describe the process of sensory perception in a simplified way as follows [NEUMANN; MOLNÁR, 1991, p. 26]:

- Food ingredients irritate the human sensory organs.
- The receptor cells of the sensory organs translate these stimuli into nervous irritations.
- The nervous irritations are then transmitted to the central nervous system via the nerves.
- In the central nervous system a sensory impression is formed out of theses irritations, which the human being notices as perception.

The following table shows which receptor cell or sensory organ responds to what kind of stimulus and further its meaning for the evaluation of food products:

Sensory Organ	Extern Stimuli	Sensory Evaluation of Food Products
Eyes – Sense of Sight/ Vision	Colour reflections, shape	Appearance, colour, structure, shape
Ears – Sense of Hearing/ Audition	Vibrations, sound	Consistency, product characteristics such as crispy or crusty
Nose – Sense of Smell/ Olfaction	Aromatic substances	Aroma, odour
Tongue – Sense of Taste/ Gustation	Flavour: sweet, sour, bitter, salty and umami	Flavour, texture
Skin – Sense of Touch/ Somatosensation	Pressure, hit, heat, cold, shape	Consistency, texture

Table 2: Human Sensory Perception[4]

[4] Table made in accordance with BUSCH-STOCKFISCH,2002b chapter I (1..2.) and CHUDLER, 1996-2005

Using human subjects as measuring instruments to describe product characteristics such as appearance, texture, aroma and flavour is the most important access to evaluate food products. In contrast to chemical and physical measurements human senses are highly sensitive and quickly available at the same time [FLIEDNER; WILHELMI, 1993, p. 35]. Furthermore, sensory evaluation allows the description of the integrated perception of all product components and their interactions whereas the analytical techniques only can measure each single component alone [ZACH, 2005]. That is the reason why physical and chemical techniques only can complete, but never replace measurements perceived through human sensory organs.

2.2. Basics of Consumer Sensory Testing

This chapter explains how consumer sensory tests are integrated into the product development process. Furthermore, some considerations for conducting quantitative affective tests are examined.

2.2.1. Importance of Consumer Sensory Testing

It is essential for every consumer goods company to develop quality products that are well liked and satisfy specific consumer needs. Each company tries to make its own products superior to competitive products. Furthermore, the companies want to make consumers dependent to their own products and build brand loyalty long after "the initial rush of interest from advertising claims and promotions that surround a new product" [LAWLESS; HEYMANN, 1998, p.480].

The competition and complexities of the marketplace requires a comprehensive approach of all available resources to support the product development process. Apart from precise and analytical information about the sensory product profile the company need information and feedback from the persons for whom the product is intended – the consumers [STONE, 1984, pp.283]. Through consumer testing the companies determine the consumers' opinion of products or concepts. They can further determine product preference or acceptance and how consumers perceive the sensory characteristics of the products [MUÑOZ, 1997, pp.2].

Today, consumer research is one of the key activities of consumer goods companies and each year, consumer tests are used more and more. Consumer testing has proven highly effective as a principal tool in designing products and established itself as an essential element in the overall decision-making process with regard to the likelihood for product success [STONE, 1984, pp.287]. "The companies that prosper are seen to excel in consumer testing know-how and consequently in knowledge about their consumers" [MEILGAARD et al., 1988, p. 202].

2.2.2. Types of Consumer Sensory Testing

Within the wide range of affective test methods the scientist differentiate between two major classifications, the qualitative and the quantitative affective test methods, each of which contains several subclasses as modification.

2.2.2.1. Qualitative Affective Methods

Qualitative methods measure subjective responses and spontaneous behaviour of the consumer towards the presented products and their sensory properties. These tests permit consumers to discuss product attributes openly in their own words. In an interactive process either in a one-on-one interview or in small groups they develop their own language to describe the sensory attributes of a product. In this way, information received through qualitative methods is very valuable for the researcher. Here, the researcher gets the opportunity to learn and understand the consumer terminology to describe the sensory attributes of products. Due to the high level of interaction between the interviewer / moderator and the consumers, qualitative methods require a highly trained interviewer / moderator who is able to lead the discussion without influencing the direction of the dialogue.

Qualitative test methods are for example:

- **Focus Groups/ Focus Panels**.
  A small group of 10 to 12 pre-selected consumers meet for one or two hours with a moderator to discuss the presented products or concepts.

- **One-on-One Interviews**.
  The consumer is individually interviewed in a one-on-one setting about the product.

[MEILGAARD et al., 1988, pp. 209]

2.2.2.2. Quantitative Affective Methods

Through quantitative affective testing the researcher determines the "overall preference or liking for a product or products by a sample of consumers who represent the population for whom the product is intended" [MEILGAARD et al., 1988, p. 211]. In addition, the researcher wants to determine the preference or acceptance for specific product characteristics like particular aroma, flavour, appearance or texture attributes. Studying these product characteristics can provide significant insights regarding the factors that affect overall preference or acceptance. In contrast to qualitative methods that focus on small consumer groups, quantitative test methods call on a large amount of consumer responses (a minimum of 50 up to 400 and more consumers) per test session.

On the basis of the primary task of the test, quantitative methods can be classified into two main categories:

- **Preference Tests**.
  The consumer is forced to choose between two or more samples the preferred product. The preference test does not measure the acceptance and gives no indication whether any of the products are liked or disliked.

- **Acceptance Tests**.
  The consumer has to rate on a balanced hedonic scale how well he likes the tested products. From relative acceptance scores the scientist can infer preferences among the products; the sample with the higher score is preferred.

Additionally, the test design often asks secondary questions about the reasons for the expressed preference or acceptance. These questions can be intensity, attribute hedonic and/ or just-about-right questions as well as open ended question where the consumer has to name the product attributes he likes and dislikes.

[MEILGAARD et al., 1988, pp. 210]

2.2.3. Purpose and Applications

The primary intention of consumer tests is to collect individual responses like opinions, preferences or acceptance data by "current or potential consumers of a product, a product idea, or specific product characteristics" [MEILGAARD et al., 1988, p. 202]. Consumer testing is conducted to support important areas and projects of product development.

Product Maintenance

Product maintenance is a key issue in quality control and quality assurance projects. Consumer tests are conducted to determine if the consumer perceive potential product changes over time, condition, storing and so on. Product maintenance can further mean research in cost reduction projects without affecting the consumer acceptance.

Product Improvement and/or Optimization

Companies permanently seek to improve and optimize products, so that they deliver what the consumer is looking for.

Development of New Products

During the typical new product development cycle, consumer tests are needed at several critical junctures. Focus groups, for example, are conducted at early stages to evaluate a new concept or a prototype. Consumer field studies are used towards the end of the product development cycle to confirm that the product characteristics do confer the expected advantages over competitive products.

Category Review

Through a category review the researcher wants to study a product category in order to understand the position of the companies' brands within the competitor products and to identify areas and niche markets where opportunities for new products may exist. With additional tests regarding the descriptive sensory analysis, the researcher can further understand how products and attributes cluster within the product/attribute space and which attributes best define which products [MEILGAARD et al., 1988, pp. 202].

2.2.4. The Requirements of Quantitative Consumer Tests

From the perspective of sensory evaluation, acceptance and preference tests receive a specific meaning concerning the purpose for the test, how it will be done and who will participate. These differences to analytical sensory tests require a different approach and procedure for these test methods.

- The participants in preference or acceptance tests should be naïve and untrained consumers.
- The consumers should represent the target group in age and gender as well as in product usage.
- Judgments about products should be given without any previous knowledge about the product itself, its ingredients or the manufacturing process. Therefore the samples are coded with a three digit number and served in neutral cups or on neutral plates.
- Consumers should only response to hedonic not analytical questions about the products.
- The type of task the consumer is required to perform should be simple and easy to understand.
- The questionnaire should be clearly constructed; the amount of questions and presented samples should not demand too much of the consumer.

[RUMMEL, chapter 2 (2.2.4.), 2004b, p. 13]

2.2.5. Special Considerations for Conducting a Quantitative Consumer Test

In contrast to qualitative consumer tests, where the consumers have the opportunity to discuss the presented products in their own language, in quantitative studies the consumers merely answer questions about pre-selected product attributes. Therefore, the structure of the questionnaire as well as the type of question and the product attributes to be asked are important and critical issues in quantitative consumer tests. The researcher has to be very careful when designing and organizing such types of tests.

2.2.5.1. The Design of Consumer Questionnaires

"The primary rule for questionnaire flow is to go from the general to the specific. With food and consumer product testing, this requires asking about the person's overall opinion of the product first. An overall opinion question is recommended using the 9-point balanced hedonic scale" [LAWLESS; HEYMANN, 1998, p.500].

10 Guidelines for Questionnaire Construction:

- *Be brief.*
- *Use plain language.*
- *Don't ask what they don't know.*
- *Be specific.*
- *Multiple-choice questions should be mutually exclusive and exhaustive.*
- *Do not lead the respondent.*
- *Avoid ambiguity.*
- *Beware of effects of wording.*
- *Beware of halos and horns.*
- *Pretesting is usually necessary.*

[LAWLESS; HEYMANN, 1998, p.503]

2.2.5.2. Attributes in Consumer Questionnaires

The second major emphasis is put on the type of questions and the selection of attributes to be included in the questionnaire design. Sensory scientists have different opinions about the consumer's capability to rate attribute questions. In general, there are three different philosophies among sensory scientists which will be explained in the following.

1. Posing Only Questions of Overall Liking.

Some scientists believe that the consumer can and should only be asked overall liking questions about the product. They want to keep the questionnaire as simple as possible. Sometimes other general liking questions such as 'overall liking of appearance', 'overall liking of texture' or 'overall liking of flavour' are added to the questionnaire. These professionals are of the opinion that the consumer as a naïve subject was not capable of providing any attribute liking and intensity information because the consumer did not understand the meaning of such attributes. Furthermore it is also believed that the inclusion of any attribute question to the ballot biased the consumer's responses. These researchers rely exclusively on descriptive analysis results to provide any kind of attribute information about the products.

2. Posing Questions of Overall and Attribute Liking.

Other sensory scientists do not believe that the inclusion of attribute questions affected the overall liking ratings of the products. Therefore, in addition to questions of overall liking, they ask other liking questions relating to specific product attributes, such as 'liking of the strawberry flavour' or 'liking of the melting mouthfeel'. However, they pose no questions of attribute intensity. They deny that the consumer was able to provide intensity information about product attributes because, as an untrained subject, the consumers did not have any frame of reference for using an intensity scale. These professionals also use descriptive data to obtain information on the intensity levels that consumers like or dislike.

3. Posing Questions of Overall and Attribute Liking and Diagnostic Questions.

The third class of scientists uses overall, general and liking questions on specific product attributes as well as so-called diagnostic questions. Diagnostic questions are attribute intensity questions and just-about-right (JAR) questions. This group of sensory professionals believes that the consumer was able to understand properly selected and well and thoroughly named product attribute terms and was further able to use a scale. Furthermore, they are of the opinion that most consumers were very determined about their likes and dislikes, so that the inclusions of special product attributes did not bias their overall liking decision. Only when the consumers answered all of these types of questions the most complete information was obtained. Any misleading consumer information from attribute questions could be unveiled through additional product information from a descriptive analysis which should be conducted in parallel.

The majority of sensory professionals shares this latter presented opinion, and asks overall and attribute liking, and diagnostic questions in consumer tests [Muñoz, 2003b, pp.184].

3. LINKAGE BETWEEN DESCRIPTIVE AND AFFECTIVE TESTING

3.1. Descriptive Panels versus Consumers

"Experts or descriptive panels versus consumers" has been a central issue in sensory science for over forty years and still remains a contentious topic. Most sensory professionals like STONE and SIDEL, MUÑOZ or CHAMBERS regard the tasks of each population as clearly different. They are of the opinion that the consumers were not able to deliver reliable results on descriptive sensory product terms. The consumers' responses were affected by psychological errors. Therefore, it was necessary to have both populations. On the contrary, MOSKOWITZ and others declare that consumers were able to do the descriptive sensory themselves. They relate this topic to the question of sensitivity and claim that there was a misconception that a trained panellists' sensitivity was higher than the sensitivity of the average consumer. Others like MUÑOZ see the core of the issue rather focussed on the type of information and say that descriptive data was more actionable for product development [MUÑOZ, 2003c, p.112].

Many studies dealt with the question what the consumer is able to do and to perform but no generalized results could be obtained. GACULA believes that the results were product-dependent. "Products that have been on the market for a long time would likely produce similar results using (…) (trained panellists) and consumers, because the sensory properties of the product (…) (had) been fully defined by both panels as a result of continued product use." Products with complex sensory properties, however, might lead to completely different responses "likely due to the lack of uniform understanding of the sensory attributes of the product" [GACULA, 2003a, p.122].

3.2. Attribute Diagnostic Questions in Quantitative Consumer Tests

Since the 1980s just about right (JAR) scales became more and more popular in the industry. Today, this scale type is omnipresent in quantitative consumer testing and frequently used in conjunction with acceptability and preference measurements. Favoured as a diagnostic tool JAR scales are brought in to help understanding the reasons for hedonic responses to products and to provide directional information for further product development such as product reformulation and / or optimization [ASTM, 2003 and LAWLESS; HEYMANN, 1998, pp.457].

3.2.1 Particularity of Just-About-Right Scales

Due to their unique scale construction JAR scales combine acceptability and attribute intensity measures in one single question. "(..)(T)he just right category located in the middle of the scale denotes an acceptance rating for a sensory attribute, whereas above and below the scale denotes intensity ratings" [GACULA, JR., 2003b, p.169].

Answering to the JAR scale the respondent need to do three tasks at the same time:

- "*evaluate the product"*
- "*compare the product to an internal 'ideal' product"*
- "*report what characteristics are out of kilter*"

[MOSKOWITZ, 2003a, p. 147]

As hedonic scales JAR scales ask for affective responses to the product attribute. The particularity of the JAR scales, however, lies in the implication that there is an ideal product [POPPER ET AL., 2004, p.857]. Furthermore, the ideal product that serves as reference point during the evaluation process is internal to the respondent and further not assessable via any measurement techniques [GACULA, JR., 2003b, p.169].

3.2.2. Construction of Just-About-Right Scales

JAR scales are either bipolar category or continuous line scales with a middle anchor labelled as "just right" or "just about right". These scales always show a balanced construction. That means, in case of a category scale, the number of category anchors on either side of the midpoint "just right" is equal. When using a line scale the two endpoints have the same distance from the middle point.

The most frequently employed form of the JAR scale is a five point category scale. According to a survey conducted by the ASTM[5] in 1999 about 52% of the sensory scientists exclusively use this type of JAR scales. The line scale is less popular in research testing [ASTM, 2003].

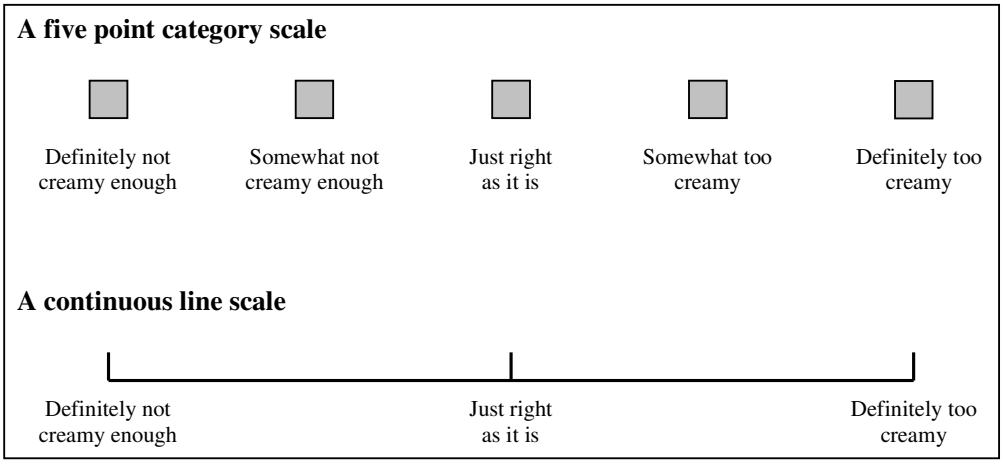

Figure 2: Examples of JAR Scales for the Product Attribute 'Creaminess'

The researcher has carefully to select the labelling of each category and endpoint anchor. While some scientists use opposite terms for the two sides of the scale like "dark/ light" or "soggy/ crispy", other researchers rather prefer to use the same term for each endpoint anchor. Figure 2 shows an example how to construct the JAR scale with one single term. Both methods are accepted by scientists. However, if using different words one has to be aware that these terms truly represent opposite meanings. Inappropriate and incorrect word terms like "too soft/ too crispy" or "too sour/ too sweet" may lead to subjective assumptions about the relationship between those attributes and thus may cause biases in the responses [MUÑOZ, 2003d, p.158 and ASTM, 2003].

[5] American Society for Testing and Materials, West Conshohocken, Pennsylvania, USA

3.2.3. Advantages and Drawbacks of Just-About-Right Scales

The use and the utility of JAR scales arouse a lot of discussion and controversy amongst sensory scientists. Whilst some researchers believe in the reliability of the results obtained from JAR scales, other scientists claim that the usage of JAR scales was an indication "of limited resources or limited knowledge about sensory descriptive methods, or both" [STONE and SIDEL, 2004, p.92]. Therefore a lot of scientists do not recommend this type of scale for consumer sensory tests.

Pros and contras of the JAR scales are summarized in the following figure.

Advantages of JAR Scales	*Disadvantages of JAR Scales*
▪ Consumers can easily use the JAR scales. ▪ Since the acceptance and the intensity question are combined in a single JAR scale the questionnaire can be shortened. ▪ JAR scales are easily understood by researcher and management. ▪ JAR scales deliver directional information for product reformulation or optimization. ▪ JAR scales can identify possible problems with products.	▪ JAR scales are limited to a few simple and commonly understood consumer terms. ▪ Only product attributes with positive connotations can be asked to the consumer. ▪ Even if the consumer does not understand the attribute an answer is still obtained. ▪ The middle anchor may be a venue for uncommitted consumers to choose the just right category more frequently. ▪ JAR questions may alter and bias the hedonic responses to products.[6]

Figure 3: Advantages and Disadvantages of JAR Scales

[MOSKOWITZ, 2003a, pp.147; MUÑOZ, 2003d, pp.157; ASTM, 2003]

[6] there are some studies that prove the impact of JAR an overall acceptance ratings (EARTHY et al.,1997 and POPPER et al., 2004)

3.2.4. Risks Unique to Just-About-Right Scales

The Results Obtained out of the JAR Analysis Are Quite Often "Experiment-Specific."

Since the reference point of the consumer that the samples are compared with is internal, the JAR scale is very sensitive to context and range effects [Gacula, 2003b, p169]. Several studies proved this hypothesis as true. Johnson and Vickers observed conflicting just right ratings in 'sweetness' for the same lemonade when presenting the lemonade within different samples ranges. While it was considered as 'too sweet' when presented in a group of products with a rather low sweetness level, the lemonade was rated as 'not sweet enough' when shown together with products with a moderate sweetness [Johnson and Vickers, 1987, p.289]. Furthermore, the evaluation depends on the moment of consumption and the consumed amount of the product. "An attribute may be 'just right' when consuming a small amount of the product, but may prove to be 'too strong' when consuming a full serving or with continued exposure" [ASTM, 2003].

Answers Given to JAR Scales May Be Affected by Preconceived Opinions of the Respondent.

Product attributes with negative imagery, e.g. attributes which carries negative health connotations like 'salty' or 'sweet' are typically rated as 'too much' on JAR scales. These responses often reflect the consumer's belief that sweet and salty products are unhealthy. Thus, the consumer may feel forced to evaluate the products as 'too much' in such attributes even if he, in reality, prefers the sweet and salty samples [ASTM, 2003]. Bower and Boyd detected an effect of health concerns on JAR ratings in that the predicted optimum level for 'sweetness' was lower compared to the calculated optimum level when only a hedonic scale was used [Bower and Boyd, 2003, p.235]. Furthermore, there are some attributes that are hardly ever rated as just right. Especially product attributes that are characterizing for the product such 'cheesy' for cheese products or 'chocolaty' for chocolates as well as "inclusions like nuts in (…) bars or ice cream" and "toppings like pepperoni on a pizza" [ASTM, 2003] are typically rated as rather 'not enough' on JAR scales.

Answers Given to JAR Scales May Be Affected by Assumptions that Rise Due to the Special Scale Construction.

The JAR scales imply that there is still room to improve the products [Popper et al., 2004, p.857]. However, the consumer may assume that at least one of the tested products is just right. Moreover, he may think that he if he likes a sample very much, he has to rate this product as 'just about right' on all asked attributes [ASTM, 2003].

A JAR Result Is Often Not Specific and Actionable Enough for Product Development.

The JAR scales only produce relative information about the product attributes of the samples tested. This means the ratings are relative to an internal reference of the individual respondent. The researcher does not know if the reference of one respondent is strong or weak relative to another respondent's reference point. Besides, the scientist has to be aware of the fact that human subjects are "no machines that produce the same reference point every time" but that there are "some variation from moment to moment" [Ennis, 2003].

Furthermore, it is impossible to draw conclusions about the level of adjustment from the distance of the attribute from 'just right'. "A developer may incorrectly assume that a large number of 'too much' responses suggests a larger decrease in an ingredient than a smaller number of 'too much' responses" [ASTM, 2003]. Even more importantly, it is not always desirable to obtain or create a product that is just right in all questioned product attributes. Moskowitz, for example, ascertained in several studies through product modelling that optimizing the overall liking did not lead to an optimal just right profile. On the other hand, optimizing the just right profile did not lead to the best accepted, although quite well accepted, product [Moskowitz 2001; Moskowitz 2003b]. For the researcher it is necessary that he understands the interdependence of the product attributes and their influence on attribute ratings. Without a thorough understanding of the flavour system, the scientist should not give recommendations based on the JAR results. An awareness of these risks can enable an experienced researcher to minimize these dangers and limitations through a judicious ballot construction and a careful data analysis and interpretation [ASTM, 2003].

3.3. Relating Consumer and Descriptive Data

Despite the recognition of the need for affective data, the researcher is often unsure about what the consumer means when asked about actual sensory perceptions [MEILGAARD et al, 1988, pp. 220]. The dangers associated with relying exclusively on consumer data as well as some suitable solutions and suggestions to put things right will be explained in the following section.

3.3.1. Potential Risks of the Exclusive Use of Consumer Data

Firstly, consumer data may be not specific enough for product guidance. An example of the lack of specificity of the consumer terms are the so-called integrated consumer terms. Results expressed in consumer-integrated terms are not actionable enough since they encompass several attributes. 'Creaminess', for example, is a very common expression used in consumer testing that is well understood by the consumers. However the consumer 'creaminess' may integrate apart from 'creaminess' other appearance, flavour and texture attributes. This means for the researcher that many product attributes could be changed to impact the 'creaminess' perception [MUÑOZ, 1997, pp.5].

Secondly, consumer responses are often affected by psychological factors such as the halo effect and stimulus errors (e.g. the effect of colour). The connotation of certain attributes may also influence the consumer's rating. Consumers tend to rate very positive or negative product attributes based on their beliefs of or attitudes towards that attribute, but not on their real perception. Therefore, the obtained results may not be representing the true consumer response [MUÑOZ, 2003c, pp.367]. Thirdly, consumers evaluate all attributes, no matter if they understand the asked product attribute or not. Misleading direction may be obtained for several attributes if their terms are complex or too technical since consumer may not understand such terms or may give them a different interpretation [MUÑOZ, 1997, pp.5].

3.3.2. The Importance of Consumer - Descriptive Data Relationships

It is undisputed that only consumers can judge validly whether products are liked or disliked. Furthermore, they are able to rate product attributes and provide reliable information, as long as the used attributes are simple word terms, easy to understand and not ambiguous. However, as explained above, there may be some limitations with attribute diagnostic information obtained from consumers.

Descriptive data on the other hand, provides technical data and more precise qualitative and quantitative sensory information about the products. As the descriptive panellists are highly trained they are able to evaluate products in an unbiased way, unaffected by context and physiological factors. However, because of their training they should not be asked to provide liking or preference information. [MUÑOZ, 2003b, pp.364]

The availability of both types of information and relating these data to each other enables the scientist to obtain a more complete understanding of the results. The most important applications of consumer-descriptive relationships results are [MUÑOZ, 1997, p.4]:

- "*provide more specific product guidance through consumer-descriptive relationships*"
- "*achieve a more thorough interpretation and understanding of consumer responses*"
- "*enable the prediction of consumer responses based on internal data (e.g. descriptive, instrumental, 'employee consumer')*"
- "*to study different consumer segments*"

3.3.3. Requirements with Consumer - Descriptive Data Relationships

In order to build consumer-descriptive data relationships that provide valid information about the relationship the researcher has to ensure that he uses the most suitable elements and sources. This entails:

1. Enough and sufficiently different products are needed that span the product category and the variables to be tested and studied. The researcher has to understand that conclusions can only be drawn within this sensory space and its given boundaries.
2. Sound consumer data about the products and/or category of interest is needed. Furthermore the consumer subjects should represent the target group for the products.
3. Sound descriptive data obtained through a very well trained and experienced descriptive panel is needed.
4. Adequate statistical support is required to build valid models and study data relationships.

[Muñoz, 2003b, pp. 368]

4. OBJECT OF THE INVESTIGATION

4.1. Scope and Aim of this Project

Over the last years, just-about-right (JAR) scales have increasingly gained in importance in consumer product tests of food and beverages. Favoured as "diagnostic tools" they are often used in conjunction with preference and acceptance measures to help understanding the basis for hedonic responses and to identify problems or weaknesses of the products.

The objective of the current study was to analyze the usage of JAR scales in multiple products tests to predict and explore product acceptance. A central location test was conducted in three different countries. A cluster analysis was used in advance. Three different preference groups among the respondents were detected. The cluster analysis will not be illustrated but is the starting point on which the JAR analysis is based.

The aim was to check if JAR scales are an appropriate tool to explore product acceptance and to identify products that show ideal attribute intensities for each preference group. Furthermore it was determined if JAR scales can deliver sufficient and reliable information about the direction of attribute changing which can be used as guidance for product development.

The results were presented for each of the three preference groups.

Firstly, a correlation analysis was employed to see which of the JAR attributes were related to overall acceptance and to understand how the JAR attributes were correlated with one another. For each of the six JAR attributes the frequency and distribution of the just right responses were analyzed. Analysis of variance and Duncan's multiple range test were used to determine if some samples were more 'JAR' than others and to determine which samples differ significantly in their JAR percentage values. Furthermore, the distribution of the consumer responses who did not rate the samples as just right were analyzed in order to check if

significantly more assessors fell on one side of JAR than the other, and thus if a direction how to change the product attribute is visible.
A second analysis approach of JAR was applied referring to the JAR mean values and the derivation to the ideal point to determine which samples differ significantly from the ideal intensity. For this, analysis of variance and Duncan's Multiple Range Test were conducted.
For each preference group the results are summarized and particular findings were discussed.

In parallel to the consumer test a quantitative descriptive analysis was conducted to obtain a precise descriptive sensory profile of each of the tested products. Through regression analysis on quantitative descriptive sensory data, analytical data, and overall acceptance data one model was identified for each preference group showing the key attributes that were important for product acceptance and target products could be identified. The results of the JAR analysis were compared with the results based on descriptive sensory. The aim was to check if both analysis approaches lead to similar results and to determine if JAR scales may provide additional information which cannot be obtained by descriptive sensory.

Since this study is especially focused on the utility of JAR scales, only the results of the JAR analysis will be described in detail. The procedure of the regression analysis will not be explained but only the results presented and compared with the JAR results in chapter 6.

4.2. Material

In the current study, 24 milk chocolate tablets were tested. The selection of the chocolate tablets was based on marketing and sensory reasons and represented a wide sensory characteristic range. The product set included Kraft products as well as competitive products. All products were purchased from retail and have been remoulded at R & D Munich pilot plant in 100g tablets.

4.3. Sensory Methods

A multi-product central location test (CLT) was conducted in the three different countries in order to explore the consumer acceptance of a wide range of milk chocolates. In parallel, a quantitative descriptive analysis (QDA®) was carried out at R&D Munich to obtain a descriptive sensory profile of each of the tested products.

The methodology of both tests is described in the following section.

4.3.1. Central Location Test (CLT)

Subjects

A total of 932 respondents were recruited within the three target countries. The respondents were screened in advanced according to the target group. Only heavy consumers of chocolate tablets were invited to participate in the test. The gender ratio of male to female respondents as well as the age classes was comparable in each test location.

	Test Country A	*Test Country B*	*Test Country C*
Respondents (N)	250	250	432
Test Locations	City D1	City D2	City D3

Table 3: Distribution of Respondents within Each Country

Questionnaire

Apart from overall liking/ overall acceptance the respondents had to evaluate six acceptance questions and six just-about-right (JAR) questions for selected descriptive attributes. The overall acceptance question was the first question on the ballot. The acceptance question was in each case placed in advance the corresponding JAR question.

Acceptance Questions (Nine Point Scale)	*JAR Questions (Five Point Scale)*
1. Overall Acceptance	
2. Colour Appearance	3. Colour Appearance
4. Melting Mouthfeel	5. Melting Mouthfeel
6. Creamy Mouthfeel	7. Creamy Mouthfeel
8. Sweetness	9. Sweetness
10. Cocoa Flavour	11. Cocoa Flavour
12. Milk Flavour	13. Milk Flavour

Table 4: Consumer Questionnaire - Question Order

For each question a category scale was employed. Table 5 displays the scales and the labelling of the single categories. For the hedonic questions a nine point category scale was chosen, while the JAR questions composed five categories.

Hedonic Liking (Nine Point Scale)	*JAR (Five Point Scale)*
How do you like the …	**What is your opinion, the product should be…**
9 Like Extremely	**5** Definitely more…
8	**4** Somewhat more…
7	**3** Just as it is now
6	**2** Somewhat less…
5	**1** Definitely less…
4	
3	
2	
1 Dislike Extremely	

Table 5: Scales Used for Liking and JAR Questions

Procedure

Each respondent evaluated all 24 chocolate milk tablets. The samples were served sequentially, monadically according to a balanced test design. The products were remoulded in advance the consumer test. Thus, they did not differ in the shape of the single pieces. They were further coded with a 3-digit number and served on a plastic plate. Each consumer obtained one raw of each sample to evaluate the sensory characteristics

4.3.2. Quantitative Descriptive Analysis (QDA®)

The QDA® method was used to provide descriptive data using a trained chocolate panel of 13 persons located at R&D in Munich.

The QDA® method was developed in 1974 by Stone et al. from the Tragon Company [STONE et al., 1974, pp. 24-34]. It delivers product descriptions in terms of the products' characteristics and their perceived intensities based on a small group of qualified subjects who do not rate on acceptance. The training phase as well as that of the data collection is conducted accordingly to the instructions and norms of Tragon Inc. [www.tragon.com, June 2005].

Before the data was collected, a training session took place in which the panel developed a scorecard with 59 descriptive attributes covering the six generic categories appearance, aroma (smell), flavour (taste), mouthfeel and aftertaste/ aftersensation. For each attribute a definition was defined by the panel during the training.

Based on this scorecard the panellists evaluated the samples during the data collection phase. The data collection was carried out computer based using "Compusense® five software [Compusense Inc., Guelph, Canada]. The panellists scored the perceived attribute intensities on a graphical unstructured line scale from 0-60.

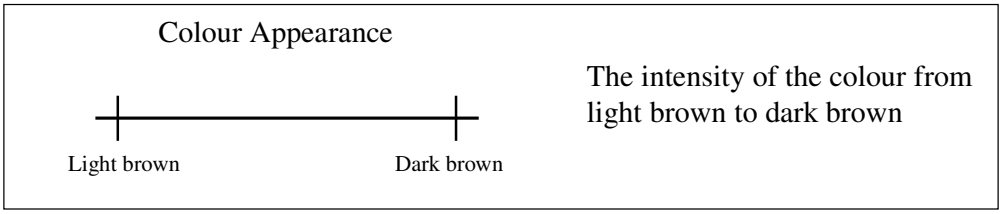

Figure 4: Example of the Line Scale with the Definition of the Attribute

The samples were coded by a 3-digit number and served sequentially, monadically (i.e. one at a time), according to a balanced test design. All samples were evaluated three times by each judge.
Additionally to the samples the panellists received water and crispbread for neutralization. The room temperature in the sensory booths was about 20°C.

4.4. Statistical Analysis

4.4.1. Software

The data analysis of the CLT test was done using the SAS vs. 6.0 software [SAS Institute Inc., Cary, NC, USA]. The data out of the QDA® was analyzed using Statistica 6.1 software [StatSoft, Inc., Tulsa, OK, USA].
The results were illustrated with Microsoft Excel, XP Professional.

4.4.2. Analysis of Variance (ANOVA) and Duncan's Multiple Range Test

Analysis of variance is the most used statistical method in sensory science. The purpose of the ANOVA is to test for significant differences between means (for groups or variables) [O'MAHONY, 1986, p.135].

"This is accomplished by analyzing the variance, that is, by partitioning the total variance into the component that is due to random error (i.e., within- group SS) and the components that are due to differences between means. These latter variance components are then tested for statistical significance, and, if significant, we reject the null hypothesis of no differences between means, and accept the alternative hypothesis that the means (…) are different from each other" [STATSOFT, INC., 1984-2003].

For descriptive sensory the ANOVA can say whether the tested samples are significant different in a special attribute or not. For consumer tests the ANOVA can be used to test if products differ significantly in their overall liking ratings. However, it cannot be said which of the tested products is significantly different to which. Therefore, the Duncan's multiple range test is applied for multiple mean comparison at a significance level of $\alpha = 0.05$. The Duncan tests the means of the

products against the error, while taken into consideration the interactions between the product means and the means of the single panellist / consumer.

Example of Result of Duncan's Multiple Range Test:

Product	Mean Overall Liking	Duncan Groups
Product 1	7.4	A
Product 2	6.94	AB
Product 3	6.76	B
Product 4	6.73	B
Product 5	6.65	B

Table 6: Example- Results of the ANOVA

Products that share the same letter are not significant different at a significance level of $\alpha = 0.05$. In this example product 1 was significantly better liked than product 3, product 4 and product 5. No significant difference could be detected between product 2, product 3, product 4 and product 5 as they belong to the same Duncan group (bracket).

4.4.3. Binomial –based Tests on Proportions

Parametric statistics such as the analysis of variance work well for situations in which the data are graded or nearly continuous as in rating scales. In other situations, however, the performance is categorized into groups. [LAWLESS; HEYMANN, 1998, p. 679]. E.g. in the case of JAR scales people can be categorized into the group who evaluated the product as 'too much of something' and the group who evaluated the product as 'not enough of something'.

"In these situations, the (…) (researcher) want(s) to use a specific kind of distribution for statistical testing, one that is based on discrete, categorical data. This is called the binomial distribution (…). The binomial distribution is useful for tests based on proportions, where (…) (the researcher) (…) (has) counted people in different categories or choices." [LAWLESS; HEYMANN, 1998, p.679]

"The binomial test is an exact probability test, based on rules of probability, and is used to examine the distribution of a single dichotomy. It tests the difference between a sample proportion and a given proportion." [WEB, without author]

Computation of $p(r)_{binomial}$:

"In a binomial test we determine the probability of (…) (obtaining) r observations in one category of a dichotomy and (n-r) observations in the other category, given sample size n. Let p= the probability of getting the first category and let q = 1–p = the probability of getting the other. ${}_nC_r$ is the number of combinations of things taken r at a time." The binomial formula is:

$$P(r)_{binomial} = {}_nC_r * p^r * q^{n-1} = (np^r q^{n-r})/(r\ (n-r))$$

[WEB, without author]

4.4.4. Correlations

When two variables are related, a change in one is usually accompanied by a change in the other [LAWLESS; HEYMANN, 1998, p.741]. The determination of the correlation coefficient, r, allows assessments of the degree of linearity of the relationship of two or more variables. The value of the correlation coefficient can be in between -1.00 and +1.00. A value of -1.00 means a perfect negative correlation, whereas a value of +1.00 means a perfect positive correlation. A value of 0 or around zero indicates that the variables are not related to each other [STATSOFT, INC., 1984 - 2003].

4.5. Steps of JAR Analysis

ANOVA and Duncan's Multiple Range Test were carried out to assess differences in overall acceptance of the chocolate tablets at a significance level of $\alpha = 0.05$.

The first step of the JAR analysis involved the correlation analysis (the Pearson correlation coefficient 'r') of the JAR mean values to overall acceptance rating in order to determine the strength of linear relationship to the overall acceptance.

The JAR data set itself was analyzed from two angles.

- **The Percentage of Answers and the Distribution of the Consumer Groups Who Rated the Products As "Just Right", "Too Much/ Should Be Weaker" and "Not Enough/ Should Be Stronger"**

  - Two-Way ANOVA and Duncan's Multiple Range Test conducted on JAR/ not JAR percentage ratings to determine if and which samples differ significantly in their JAR percentage values. Therefore the JAR data was converted to the binary form as follows:
    1 = if the sample was rated as just right and
    2 = if the sample was rated as not just right

  - Two tailed binomial test conducted on "too much"/ "not enough" percentage groups to decide whether significantly more assessors fall on one side of JAR than the other. The p-value of the test was calculated in an Excel spreadsheet with the following formula:
    = 2*BINOMDIST(MIN(TM, NE), TM +NE, O.5, TRUE),
    where
    TM = percentage of the consumers who evaluated the products as "too much" and
    NE = percentage of consumers who evaluated the products as "not enough" [LESNIAUSKAS, CARR, 2004, pp. 895]

- **The Deviation to a Generated Ideal Point of ‘3**

  - ANOVA and Duncan’s Multiple Range Test conducted on the differences to the ideal score in order to determine if the product is significantly to strong or too weak on the considered attribute.

[SCHLICH, 2004, p. 892]

Both elements were considered in the JAR analysis in is to identify the optimum product, which does not differ significantly to ideal and, at the same time, has a high percentage of “just right” responses.

In the second part, the results of the JAR analysis will be compared with the results out of the regression analysis conducted on QDA®, analytical data, and overall acceptance.

5. RESULTS

5.1. Preference Group 1

5.1.1. Overall Liking Ratings of the Products

Overall Liking Means	Product	N = 309									
7.92	**100**	A									
7.57	**863**		B								
7.51	**141**		B	C							
7.36	**594**		B	C	D						
7.34	**520**		B	C	D						
7.27	**875**			C	D	E					
7.27	**787**			C	D	E					
7.26	**896**			C	D	E					
7.22	**889**				D	E	F				
7.21	**922**				D	E	F				
7.21	**920**				D	E	F				
7.18	**386**				D	E	F				
7.15	**226**				D	E	F				
7.04	**981**					E	F	G			
7.00	**833**					E	F	G			
6.95	**811**						F	G	H		
6.87	**170**							G	H	I	
6.87	**273**							G	H	I	
6.70	**262**								H	I	
6.70	**101**								H	I	
6.65	**753**									I	
6.64	**260**									I	
6.15	**990**										J
6.03	**577**										J

Table 7: Cluster 1 – Overall Liking of the Products (Sign. level α=0.05)

309 consumers comprised the first identified preference group.

The consumers had to rate the overall liking on a nine point hedonic scale from '1= dislike' extremely to '9= like extremely'. The best liked product received an average score of 7.92, the least accepted product was yet relatively well liked with an average score of 6.

Products that share the same letter do not differ significantly in their overall liking. Product #100 was significantly best accepted than all other tested products by the consumers of the first cluster. Products #863, #141, #594 and #520 also reached very high overall acceptance scorings. Furthermore, no significant differences in overall liking could be detected between these four products since they belonged to the same Duncan group. Products #990 and #577 performed the worst in overall liking.

5.1.2. Correlation between JAR and Overall Liking Ratings[7]

	Colour Appearance	Melting Mouthfeel	Creamy Mouthfeel	Sweetness	Cocoa Flavour	Milk Flavour
Correlation to Overall Liking	**0,64**	0,55	0,49	-0,33	**0,83**	-0,08

Table 8: Cluster 1 - Correlation between JAR Attributes and Overall Liking

The overall liking rating was highly positively correlated with JAR cocoa flavour and JAR colour. JAR melting mouthfeel and JAR creamy mouthfeel were also slightly positively correlated with overall acceptance, whereas JAR sweetness and JAR milk flavour showed a slightly negative relationship to overall acceptance. JAR colour appearance and JAR cocoa flavour showed a positive linear relationship to overall acceptance.

[7] Correlation analysis was conducted on the mean values of JAR and their difference to ideal point '3'

Correlation	Colour Appearance	Melting Mouthfeel	Creamy Mouthfeel	Sweetness	Cocoa Flavour	Milk Flavour
Colour Appearance	1,00	-0,05	-0,18	0,37	**0,82**	**-0,72**
Melting Mouthfeel	-0,05	1,00	**0,90**	-0,35	0,29	0,49
Creamy Mouthfeel	-0,18	**0,90**	1,00	-0,48	0,24	**0,70**
Sweetness	0,37	-0,35	-0,48	1,00	0,19	-0,59
Cocoa Flavour	**0,82**	0,29	0,24	0,19	1,00	-0,30
Milk Flavour	**-0,72**	0,49	**0,70**	-0,59	-0,30	1,00

Table 9: Cluster 1 - Correlation of JAR Attributes among Each Other

The correlation analysis among the JAR attributes unveiled that JAR colour appearance was highly correlated with JAR cocoa flavour and negatively correlated with JAR milk flavour. JAR melting mouthfeel was highly positively correlated with JAR creamy mouthfeel and further with JAR milk flavour.
JAR sweetness did not show a strong relation to the other five JAR attributes.

5.1.3. Frequencies and Distributions of JAR Responses

A bar chart was chosen to present the frequencies and distribution of the just right responses for each JAR attribute. The yellow part of the bars show the amount of respondents (in percentage) who evaluated the products as just right in the referring JAR attribute. The orange and red parts above represent the amount of people who wanted the products to be 'more**…**', whereas the green parts of the bars represent the amount of people who wanted the products to be 'less**…**'.
The products were listed according to their performance in overall liking (OL). The overall liking mean score of each product is written on the top of each bar. So, the reader additionally knows how the products scored in overall acceptance.

In order to analyze the frequencies and the distributions of the JAR responses we used a Variance Analysis and the Duncan's Multiple Range Test as well as the Two-Tailed Binomial Test (for description see chapter 4.4. and chapter 4.5.). These results gained from tests allow statements about the distribution of the different groups of respondents at a statistically significance level of α=0.05.
The Duncan tables as well as the p-value calculations out of the binomial test of the JAR attributes are displayed in the appendix 2.

- **Colour Appearance**

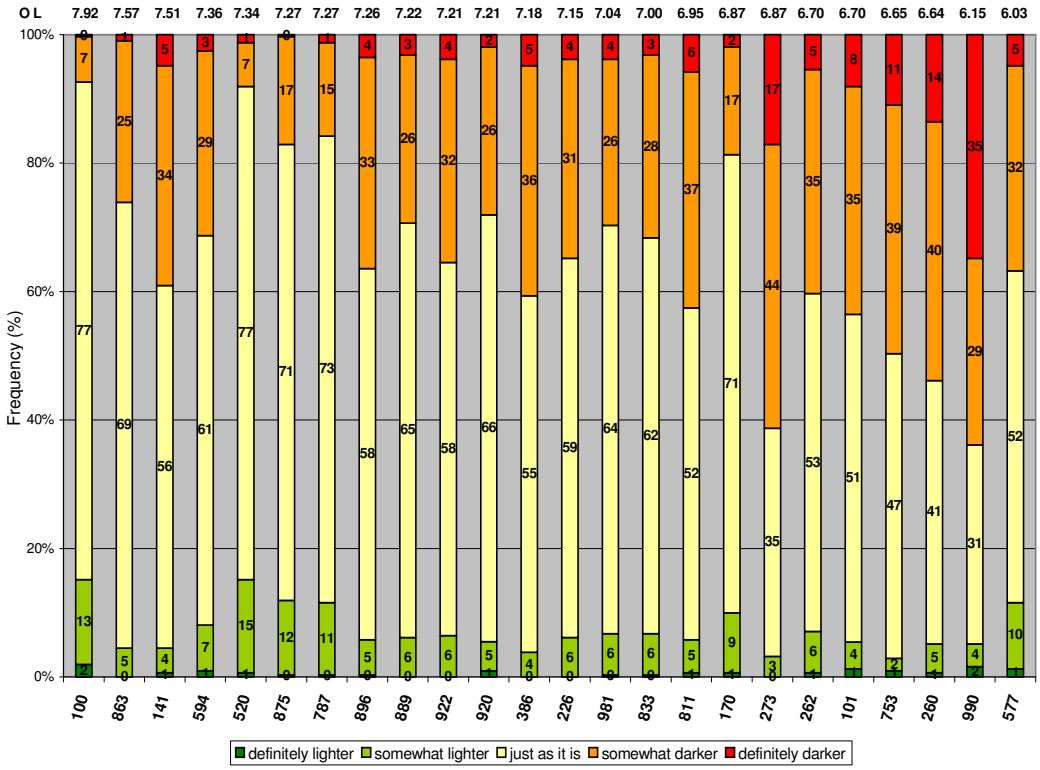

Chart 1: Cluster 1 – JAR Colour Appearance

Well accepted products tended to obtain the most just right responses. The less the products were liked in overall acceptance, the lower was the obtained JAR percentage. An exception was product #170 whose colour appearance was rated as just about right by 71% of the consumers although it performed rather lower in overall acceptance.

The analysis of variance showed that the products #100, #520, #787, #170 and #875 were in the top group of JAR percentage (the table is displayed in appendix 2). That means these five products obtained significantly more just right answers than the other tested products. However, about 15% of the respondents stated that products #100 and #520 should be somewhat or definitely lighter. The other three products of the top group, products #787, #170 and #875, on the other hand, should already be slightly darker according to the consumers' mind.

A binomial test was conducted to determine if significantly more assessors fall on one side of the just-right category (see appendix 2). For none of the five products of the top group of JAR percentage significantly more respondents fell on one of the two side of the just-right category. However, for all other tested products significantly more consumers said that the products should be darker.

Since products #100, #520, #787, #170 and #875 were rated as just right in colour appearance by more than 70%, one might assume that these products are ideal in colour intensity and need not to be changed.

- **Melting Mouthfeel**

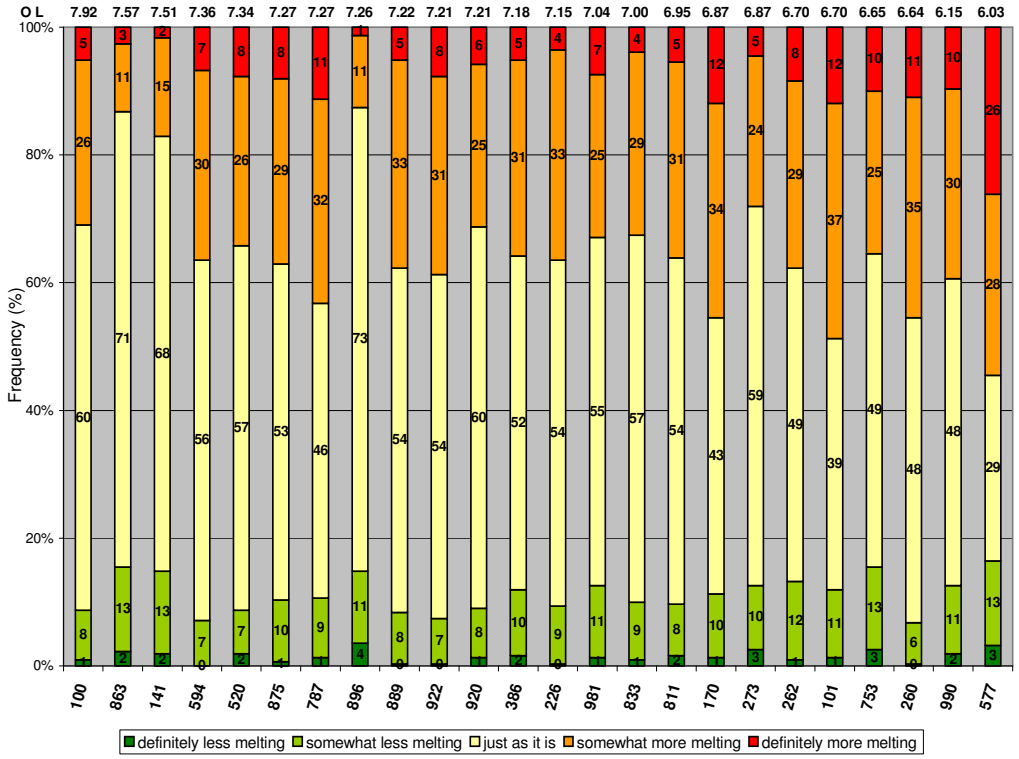

Chart 2: Cluster 1 – JAR Melting Mouthfeel

JAR melting mouthfeel did not exhibit a high degree of correlation with overall acceptance ratings. According to the consumers, both the products that were well accepted as well as products that were less liked should be slightly more melting in mouthfeel. Products #896, #863 and #141 received the highest amount of just right answers in melting mouthfeel. Analysis of variance detected that significantly more respondents evaluated these products as just right than all other tested products

A comparison of the distribution of respondents who did not judge the products as just right detected that for all tested samples except the three products of the top group of JAR percentage significantly more assessors wanted the products to be more melting.

- **Creamy Mouthfeel**

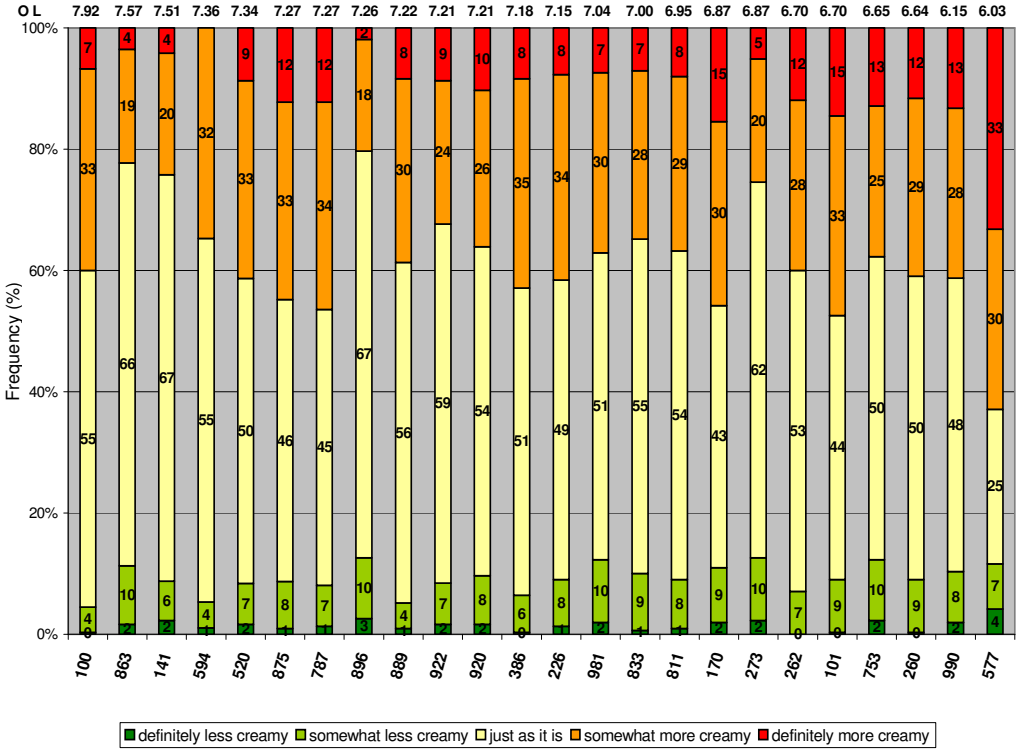

Chart 3: Cluster 1 – JAR Creamy Mouthfeel

For the product attribute creamy mouthfeel, all products obtained rather a low amount of just right answers.

However, products #896, #141, #863 and #273 comprised the top group of JAR percentage. All of these four products received more than 60% just right answers.

Comparing the distribution of the consumers who did not rate the products as just right, significantly more assessors fell on the side of the just right category that wanted the products to be creamier in mouthfeel. The only exceptions were products #863 and #896. Here, the opinion of the consumers who did not agree with the creaminess of the products was polarizing and no clear recommendation can be given.

- **Sweetness**

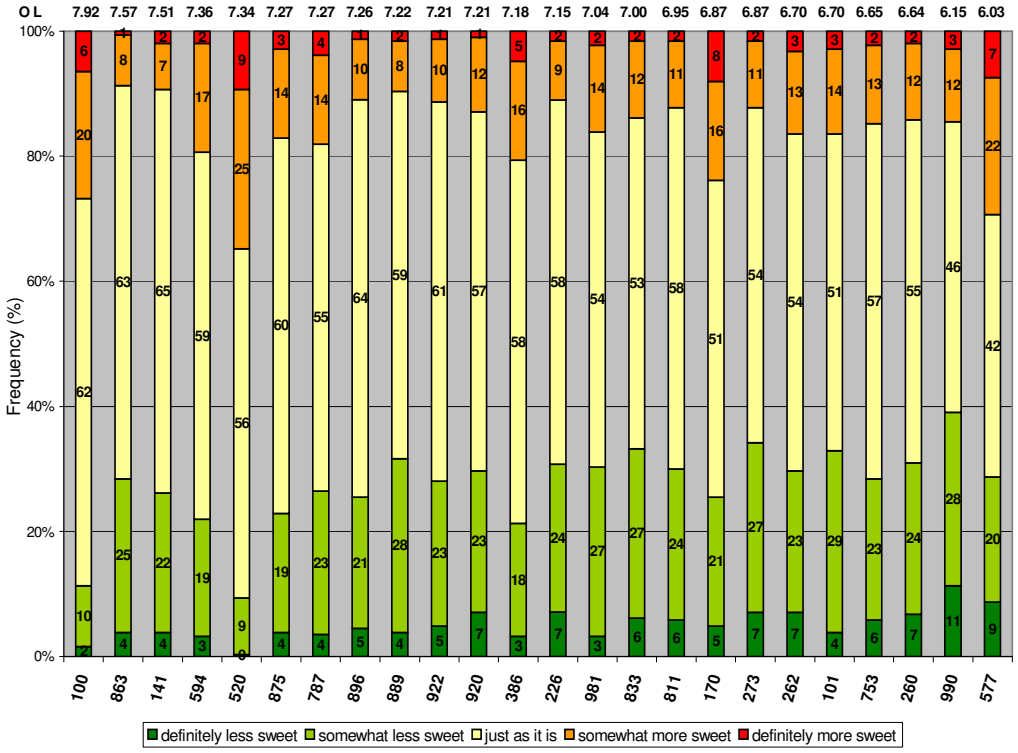

Chart 4: Cluster 1 – JAR Sweetness

As with the evaluation of melting and creamy mouthfeel the products obtained a low amount of just right answers in sweetness. Analysis of variance could not identify clearly separate Duncan brackets among the products. Nevertheless, products #141, #896, #863, #100, #922 and #875 obtained more or at least 60% just right responses in sweetness.

In the view of the consumers most of the tested products tended to be slightly too sweet. This becomes apparent in the JAR mean values and the high percentage of respondents who wanted the products to be less sweet in flavour. Exceptions were products #100 and #520. The binomial test conducted on the distribution of the 'not just-right responses' showed that significantly more consumers wanted these two products to be more sweet. For products #594, #875, #386, #981, #170, #262 and #577 the distribution of the consumers for either one of the two sides of the just right category was not significantly different. This means that no clear conclusions can be reached regarding the possible changes in the sweetness level of these products.

- **Cocoa Flavour**

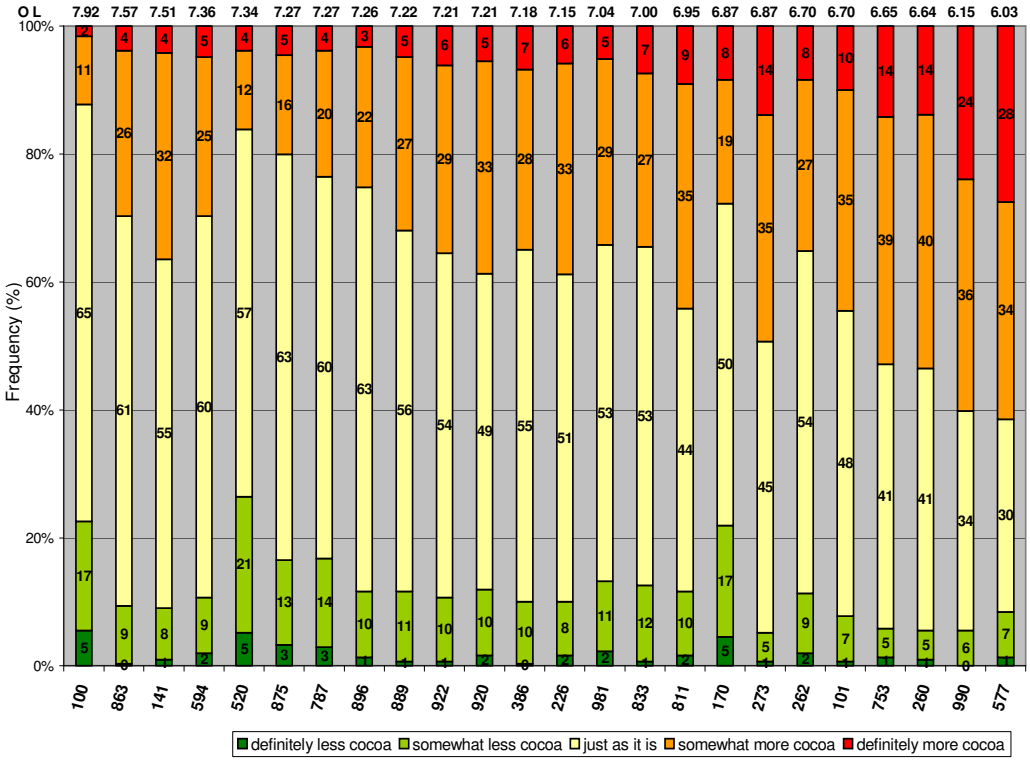

Chart 5: Cluster 1 – JAR Cocoa Flavour

The JAR rating of cocoa flavour was highly linked to overall acceptance ratings. Products that obtained the most just right answers were well liked in overall acceptance. The less the products were accepted the more increased the amount of consumers who wanted these products to be stronger in cocoa flavour. Exceptions were products #863, #141, #594. Although well liked these products should be somewhat more intense in cocoa flavour.

Products #100, #875, #896 and #863 were in the top group of JAR percentage. More than 60% of the respondents evaluated these products as just right. The best liked product #100 as well as product #520 was already rated as slightly too strong in cocoa flavour by more than 20% of the consumers. Yet, analysis of the two-tailed binomial test did not find significant differences between the distributions of respondents who did not agree with the cocoa intensity of these two products.

- **Milk Flavour**

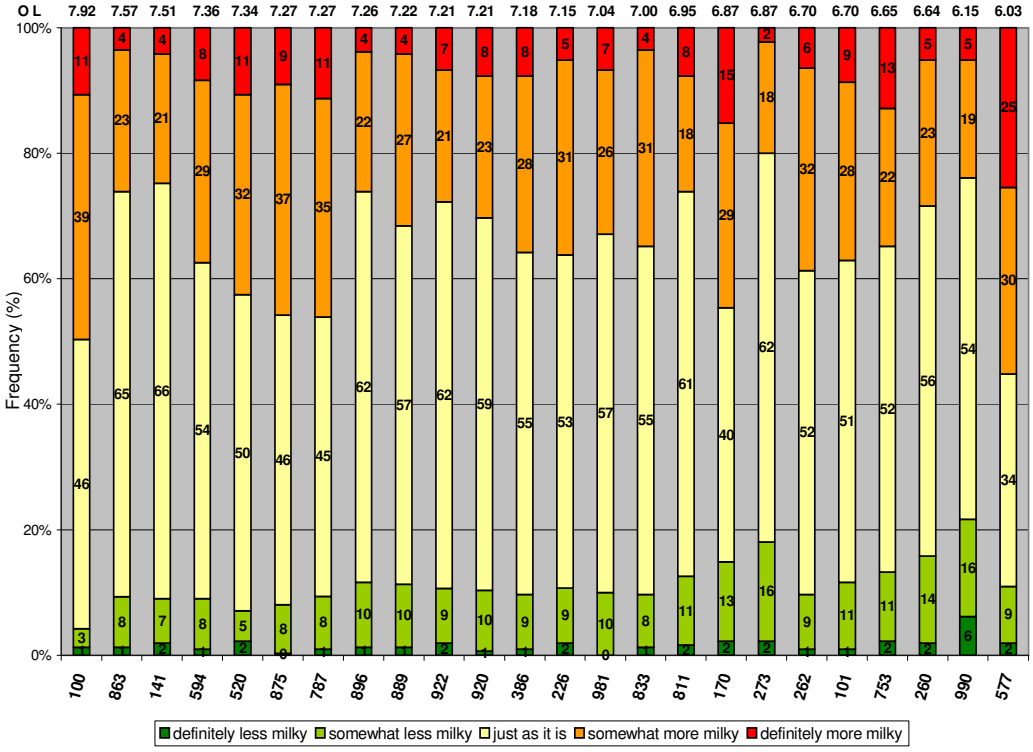

Chart 6: Cluster 1 – JAR Milk Flavour

No strong relationship between JAR ratings in milk flavour and overall acceptance ratings can be detected. Regarding the distribution of the response categories as well as the JAR mean values the consumers wanted the products milkier in flavour.

Product #141 and #863, however, received the highest amount of JAR percentage among the tested products. Still, both products were not milky enough in flavour. Significantly more assessors fell on the side of just right who wanted these products to be milkier in flavour.

5.1.4. Analysis of the Product Differences in Comparison with the Ideal Point

Analysis of Variance and Duncan's Multiple Range Test were conducted on the product differences to the ideal point of '3' in order to determine if the products differ significantly in their JAR attributes from a virtual ideal point. Furthermore, this analysis allows statements about the direction of difference, e.g. if the product is significantly too strong or too weak in the product attribute compared to the ideal point.

OL	Product	Colour Appearance	Melting Mouthfeel	Creamy Mouthfeel	Sweetness	Cocoa Flavour	Milk Flavour
7,92	**100**	0,09	-0,26	-0,42	-0,20	0,14	-0,55
7,57	**863**	-0,23	***0,02***	-0,13	0,23	-0,24	-0,19
7,51	**141**	-0,39	***-0,02***	-0,17	0,19	-0,31	-0,18
7,36	**594**	-0,25	-0,36	-0,44	***0,04***	-0,22	-0,36
7,34	**520**	***0,06***	-0,31	-0,40	-0,35	0,12	-0,44
7,27	**875**	***-0,05***	-0,34	-0,47	***0,07***	***-0,05***	-0,46
7,27	**787**	***-0,05***	-0,43	-0,49	***0,08***	***-0,08***	-0,47
7,26	**896**	-0,34	***0,05***	***-0,07***	0,18	-0,15	-0,17
7,22	**889**	-0,26	-0,34	-0,41	0,24	-0,25	-0,23
7,21	**922**	-0,33	-0,39	-0,31	0,20	-0,30	-0,22
7,21	**920**	-0,24	-0,27	-0,35	0,23	-0,31	-0,27
7,18	**386**	-0,42	-0,27	-0,45	***-0,01***	-0,31	-0,33
7,15	**226**	-0,33	-0,30	-0,39	0,25	-0,33	-0,29
7,04	**981**	-0,26	-0,26	-0,30	0,15	-0,24	-0,30
7	**833**	-0,28	-0,25	-0,31	0,24	-0,29	-0,27
6,95	**811**	-0,42	-0,30	-0,35	0,22	-0,40	-0,20
6,87	**170**	-0,10	-0,45	-0,48	***-0,02***	***-0,10***	-0,43
6,87	**273**	-0,75	-0,17	-0,16	0,27	-0,57	***-0,02***
6,7	**262**	-0,38	-0,32	-0,45	0,17	-0,30	-0,35
6,7	**101**	-0,45	-0,47	-0,53	0,17	-0,46	-0,33
6,65	**753**	-0,57	-0,27	-0,36	0,17	-0,60	-0,32
6,64	**260**	-0,62	-0,49	-0,43	0,22	-0,61	-0,16
6,15	**990**	-0,92	-0,35	-0,42	0,33	-0,79	***-0,01***
6,03	**577**	-0,29	-0,61	-0,80	***0,01***	-0,79	-0,68

Table 10: Cluster 1 – Analysis of the JAR Differences to the Ideal Point '3'
(Sign. level α= 0.05)

Table 10 displays the differences to the ideal score. Product #100 differed in its mean value from the ideal point by 0.09 in colour appearance, thus its average score was 2.91. (The mean values of all JAR attributes are displayed in appendix 3.) The products were then sorted according to their performance in overall acceptance (OL = overall liking), starting with the best liked product. The deviation that is not significantly different from the ideal point (at a sign. level of $\alpha = 0.05$) is written in bold italics and coloured in orange. All other distances differ significantly from the ideal point. Positive (+) numbers mean that the product is significantly too strong in the product attribute, negative (-) numbers mean that the product is significantly too weak in the product attribute compared to the ideal point.
Product #100, for example, obtained a JAR mean value of 3.55 in milk flavour (see appendix 3). Its difference from the ideal point was -0.55. This derivation to zero (as optimal product) was significantly different to the ideal. Therefore, we can draw the conclusions that product #100 was significantly too low in milk flavour.

Best liked product #100 showed significant differences to the ideal point in each of the JAR attributes. While it was evaluated as significantly too strong in colour appearance and in cocoa flavour, it was definitely not melting and creamy enough in mouthfeel and further too low in sweetness and in milk flavour. Products #863 and #141 were ideal in melting mouthfeel. However, both products had a too light colour and were further not creamy enough in mouthfeel and too low in cocoa and milk flavour. On the other hand, both products were already too sweet compared to the ideal point. Product #594 was only ideal in sweetness. Products #875 and #787 did not differ significantly from the ideal point in colour appearance, sweetness and cocoa flavour. Product #896 was just right in melting and creamy mouthfeel.

In milk flavour none of the better liked products in overall acceptance were close to the ideal point. However, products #273 and #990 showed no significant differences to the ideal value.

5.1.5. Summary and Discussion

The correlation analysis and further the frequency charts of the JAR attributes identified two main drivers for overall acceptance. Colour appearance and cocoa flavour were positively related to overall liking ratings, whereas the consumers were not so concerned about other JAR attributes.
The most liked product #100 performed pretty well in terms of colour appearance and in cocoa flavour, whereas in the other JAR attributes the consumer still saw room for improvement. It should definitely be made more melting and creamy as well as sweeter and milkier in flavour. As the colour and cocoa flavour were negatively correlated with melting and creamy mouthfeel it is only logical that the consumers did not agree with the intensity level of these characteristics of product #100. However, regarding the analysis of variance conducted on the deviation to the ideal point product #100 showed significant differences from ideal in all JAR attributes. In colour appearance and cocoa flavour it was even significantly too strong compared to the ideal level. This result can be explained by the range effect that quite often occurs in consumer testing. Due to the fact that most of the tested samples were very sweet and milky chocolate tablets with a rather light brown colour the consumer might tend to evaluate products that differ clearly from the other chocolates as already slightly too strong in the considered attributes, even then when he, in reality, prefers and like the attribute's intensity just as it is.

In JAR melting mouthfeel the three products #863, #141 and #896 obtained the most just right responses (about 70%). Furthermore, analysis of variance conducted on the deviation to the ideal point detected that these products did not differ significantly from the ideal level. Thus these products could be considered as just right in melting mouthfeel. All other products were significantly not melting enough in mouthfeel. The JAR results of creamy mouthfeel are comparable to the results of melting mouthfeel and milk flavour. The consumers wanted all products to be creamier in mouthfeel and milkier in flavour.

Sweetness was a product attribute that was difficult to interpret. The Analysis of the deviation of the JAR mean values to the ideal point led to some products that showed no significant differences to the ideal level. However, regarding the percentage of just right responses none of the tested products could be clearly identified as just right in sweetness. Only a few products obtained about 60% just right answers. In the consumers' opinion the sweetness should be slightly decreased in most of the chocolate samples. Products #100 and #520, on the contrary, should be somewhat sweeter in the mind of the consumer.

It can be summarized that it was possible to explain the product acceptance of the consumers of this preference group based on the six JAR attributes. It was further possible to identify for each JAR attribute products that were just right or close to just right in this product characteristic. Besides, directions for product changing or improvement became apparent.

5.2. Preference Group 2

5.2.1. Overall Liking Ratings of the Products

Overall Liking Means	Product	N = 337													
8.13	**273**	A													
7.84	**990**		B												
7.59	**141**		B	C											
7.37	**811**			C	D										
7.35	**260**			C	D	E									
7.28	**833**				D	E	F								
7.28	**896**				D	E	F								
7.18	**863**				D	E	F	G							
7.10	**920**				D	E	F	G	H						
7.07	**981**					E	F	G	H						
7.06	**922**						F	G	H						
7.03	**101**							G	H						
6.97	**889**							G	H						
6.89	**753**							G	H						
6.84	**262**								H	I					
6.83	**226**								H	I					
6.57	**386**									I	J				
6.53	**594**										J				
5.91	**875**											K			
5.54	**577**												L		
5.28	**787**												L	M	
5.18	**170**													M	
4.50	**100**														N
4.50	**520**														N

Table 11: Cluster 2 – Overall Liking of the Products (Sign. level α=0.05)

The second preference group was made up of 337 consumers.

Product #273 was significantly best accepted than all other tested products by the consumers of the second cluster, followed by products #990 and #141. Products #100 and #520 which performed very well liked in the first preference group were least liked by the consumers of the second preference group.

In contrast to the first preference group, the gap between the best and the worst liked products was relatively wide. While product #273 with a mean overall liking score of 8.13 was very well accepted, products #100 and #520 performed with only 4.50 very poorly.

5.2.2. Correlation between JAR and Overall Liking Ratings [8]

	Colour Appearance	Melting Mouthfeel	Creamy Mouthfeel	Sweetness	Cocoa Flavour	Milk Flavour
Correlation to Overall Liking	**-0,93**	0,69	**0,91**	**0,91**	**-0,78**	**0,97**

Table 12: Cluster 2 - Correlation between JAR Attributes and Overall Liking

Except for melting mouthfeel, all JAR attributes were highly correlated with overall acceptance ratings. JAR colour appearance and JAR cocoa flavour were highly negatively correlated with overall liking, whereas JAR creamy mouthfeel, JAR sweetness and JAR milk flavour were highly positively linked to overall acceptance ratings.

Correlation	Colour Appearance	Melting Mouthfeel	Creamy Mouthfeel	Sweetness	Cocoa Flavour	Milk Flavour
Colour Appearance	**1,00**	-0,59	**-0,79**	**-0,84**	**0,87**	**-0,96**
Melting Mouthfeel	-0,59	**1,00**	**0,86**	0,53	-0,36	0,64
Creamy Mouthfeel	**-0,79**	**0,86**	**1,00**	**0,76**	-0,53	**0,86**
Sweetness	**-0,84**	0,53	**0,76**	**1,00**	**-0,81**	**0,89**
Cocoa Flavour	**0,87**	-0,36	-0,53	**-0,81**	**1,00**	**-0,84**
Milk Flavour	**-0,96**	0,64	**0,86**	**0,89**	**-0,84**	**1,00**

Table 13: Cluster 2 - Correlation of JAR Attributes among Each Other

JAR colour appearance and JAR cocoa flavour were positively linked to each other, but negatively correlated with JAR creamy mouthfeel, JAR sweetness and JAR milk flavour. JAR melting mouthfeel and JAR creamy mouthfeel were positively linked to each other. Besides, JAR creamy mouthfeel was further positively correlated with JAR sweetness and JAR milk flavour ratings.

[8] Correlation analysis was conducted on the mean values of JAR and their difference to ideal point '3'

5.2.3. Frequencies and Distributions of JAR Responses

- **Colour Appearance**

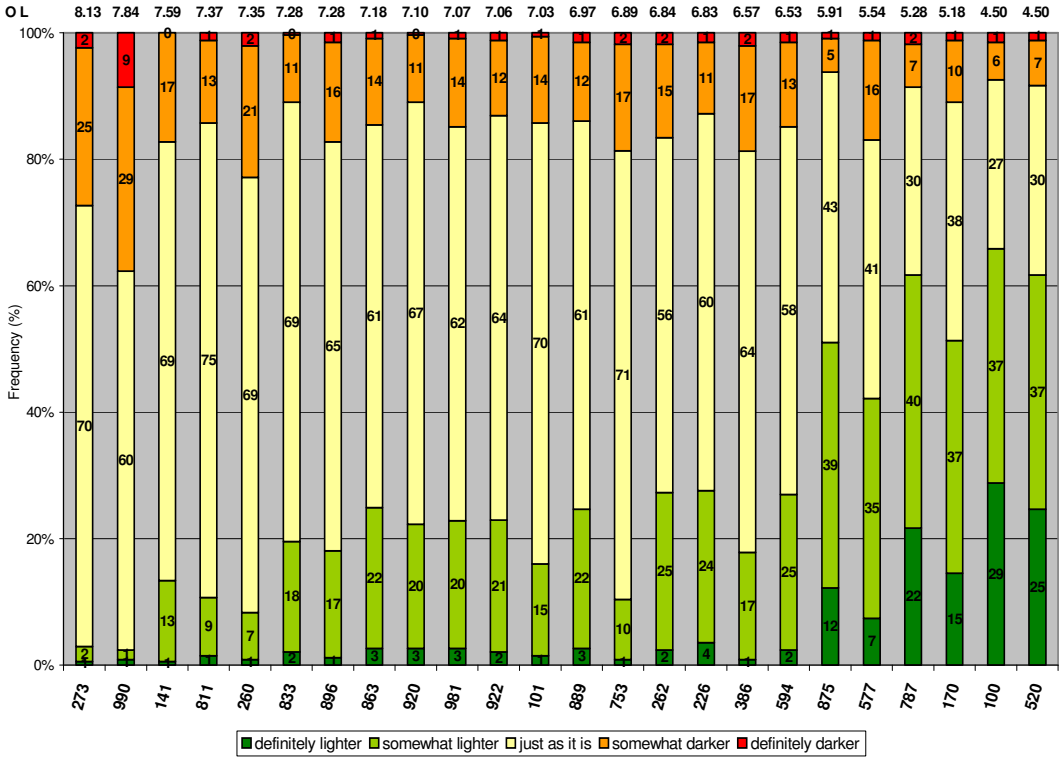

Chart 7: Cluster 2 – JAR Colour Appearance

The bar chart illustrates a strong correlation between the evaluation of colour appearance and the overall acceptance ratings. The two best liked products should be darker in colour appearance. Significantly more assessors found these products as too light in colour than the consumers who found the products as too dark.

Products that performed low in overall acceptance should be definitely lighter in colour to the mind of the consumers. Here, the distribution of the consumers to one of the two sides from the just right category was significantly different.

Products #811 and #753 were rated by more than 70% of the respondents as just right in colour. Furthermore, the two-tailed binomial test did not show that significantly more assessors fell on one side of the just right category. Therefore it can be assumed that their colour intensity is well accepted and need no further change or improvement in any direction.

- **Melting Mouthfeel**

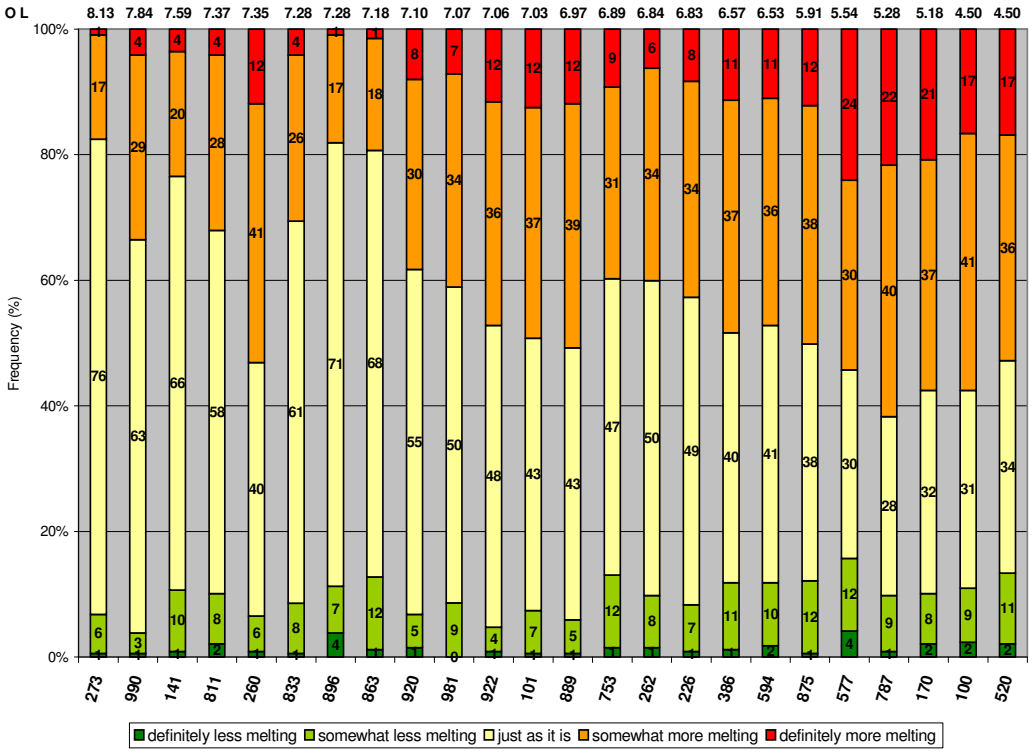

Chart 8: Cluster 2 – JAR Melting Mouthfeel

Products #273 and #896 were in the top group of JAR percentage. More than 70% of the respondents evaluated these products as just right in melting mouthfeel. Best liked product #273 obtained the most just right responses of all tested products.

Analysis of the two-tailed binomial test conducted on the consumer distribution who did not evaluate the products as just right, detected that for all products, except for products #896 and #863, significantly more assessors fell on the side of just right that wanted the products to be more melting.

- **Creamy Mouthfeel**

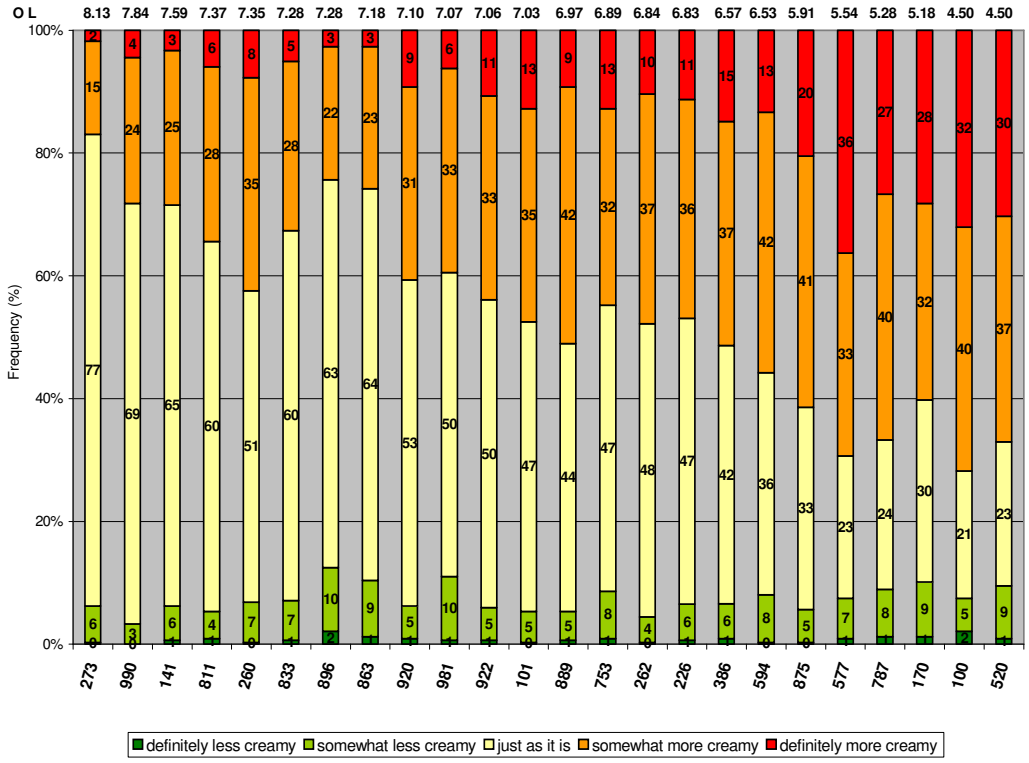

Chart 9: Cluster 2 – JAR Creamy Mouthfeel

Creamy mouthfeel was highly linked with overall acceptance ratings. The best liked products were just right in creamy mouthfeel. They perceived a high percentage of just right answers. The less the products were liked in overall acceptance, the less just right responses obtained the products. Products that were less accepted in overall liking were definitely not creamy enough in the consumers' opinion. The binomial test detected that of all consumers who did not evaluate the products as just right, significantly more assessors said that the products should be creamier in mouthfeel. Product #896 was the only sample for which no clear direction could be identified trough the binomial test.

- **Sweet Flavour**

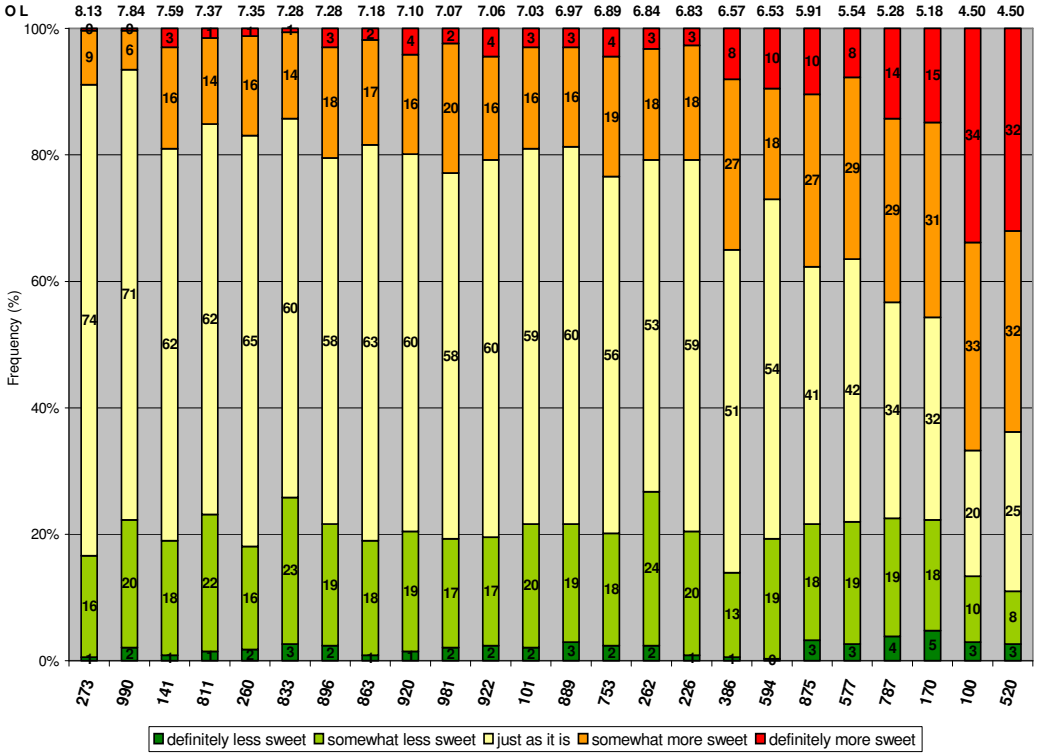

Chart 10: Cluster 2 – JAR Sweetness

Well liked products in overall acceptance performed also well in JAR percentage ratings. Yet, the evaluation of sweetness was polarizing. Based on the distribution of the consumer who did not agree with the level of sweetness no clear direction for improving the sweetness intensity can be concluded. The percentage of consumers who evaluated the products as already too sweet and the percentage of consumers who evaluated the products as not sweet enough, was equally distributed around the just right category for most of the products.

The best liked products in overall acceptance, product #273 and product #990, were in the top group of JAR percentage. Each product was evaluated as just right in sweetness by more than 70% of the consumers. Nevertheless, according to the consumers, product #990 should already be slightly less sweet. Regarding the percentage of just right answers and the distribution of the consumer groups and the JAR mean values, products #273, #896 and #863 were closest to just right in sweet flavour.

- **Cocoa Flavour**

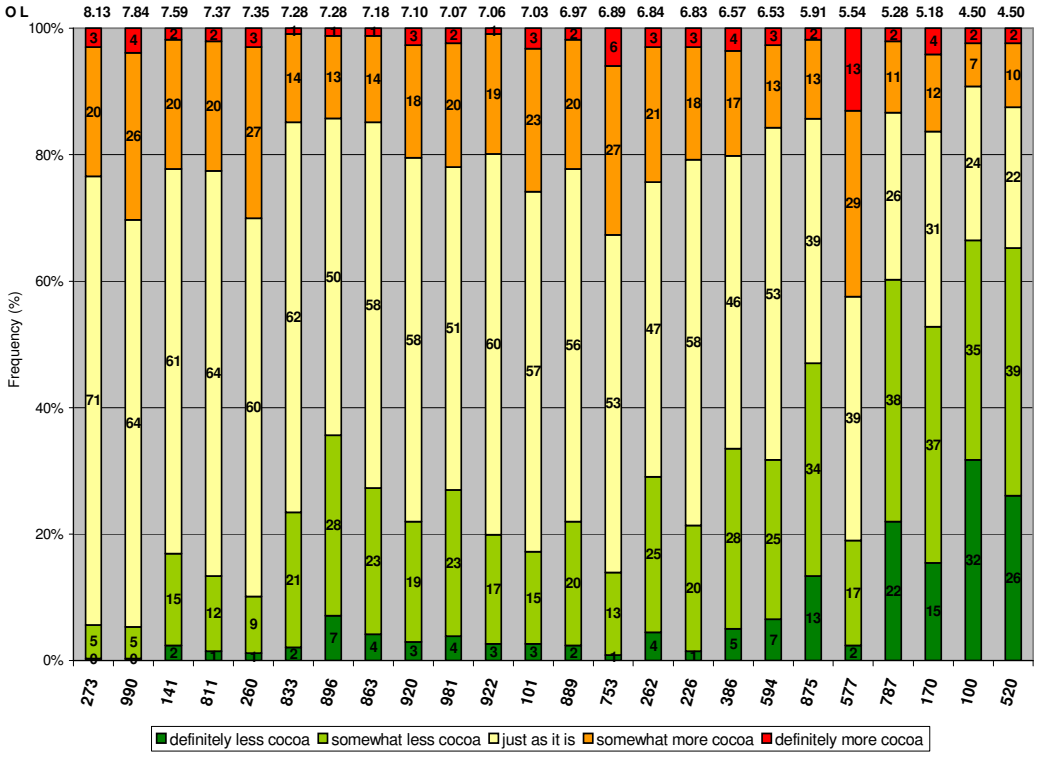

Chart 11: Cluster 2 – JAR Cocoa Flavour

Cocoa flavour was negative linked to overall acceptance. The more the intensity of the cocoa flavour increased the less the products were accepted by the consumers. Nevertheless, best liked products should already be slightly stronger in cocoa flavour. Product #577 was the only product which was low accepted in overall liking and, at the same time, obtained a high amount of consumer responses that wanted this product to be more intense in cocoa flavour.

Product #273 received the most just right answers, followed by product #990 on second and product #811 on third position. However, products #273 and #990 were already evaluated as lacking intensity in cocoa flavour. Of the consumers who did not found the cocoa intensity of these products just right significantly more assessors said that the products should be stronger in cocoa flavour. For product #811, on the other side, no clear direction in which way to change the intensity of cocoa flavour can be given.

- **Milk Flavour**

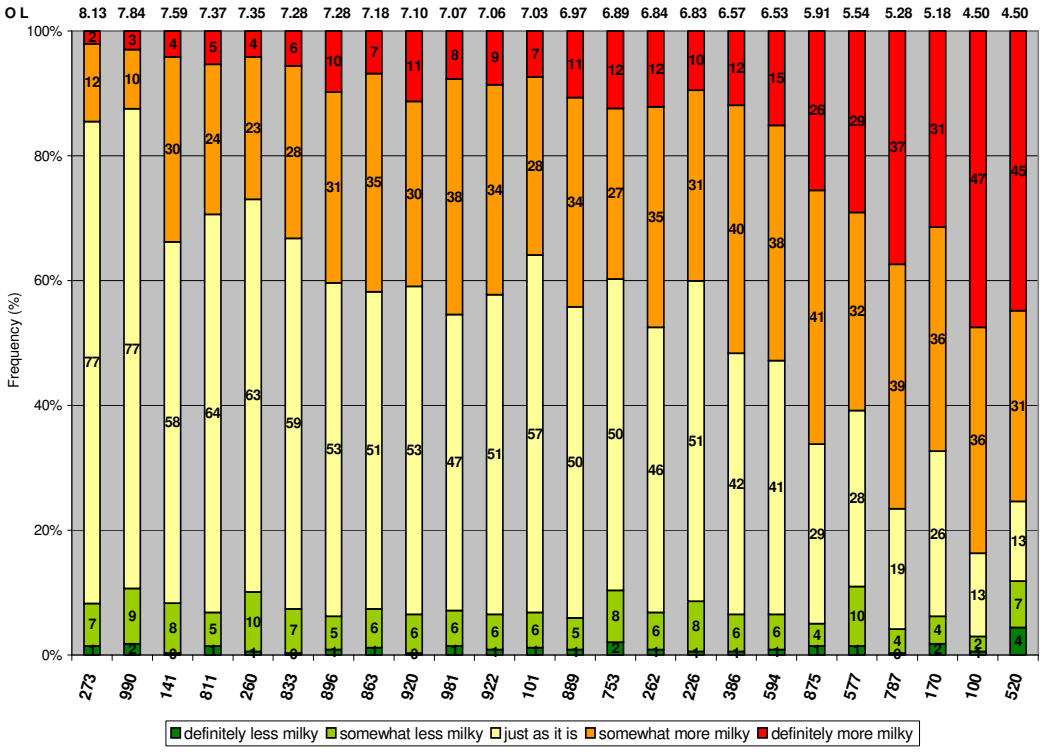

Chart 12: Cluster 2 – JAR Milk Flavour

The evaluation of milk flavour was highly correlated with overall acceptance ratings. The best liked products were just right in milk flavour, whereas the least liked products performed poorly in JAR percentage. These products should definitely become stronger in milk flavour. The less the products were accepted the more the JAR mean values rose. Furthermore, the two-tailed binomial test proved that for all tested products, except for products #273 and #990 significantly more consumers wanted the products to be stronger in milk flavour than the consumers who wanted the products less milky.

5.2.4. Analysis of the Product Differences in Comparison with the Ideal Point

The differences between the JAR mean values and the ideal point of '3' are illustrated in the following table. The products are sorted according to their performance in overall acceptance (OL = overall liking), starting with the best liked product. The deviation that is not significantly different from the ideal point (at a sign. level of α= 0.05) is written in bold italics and coloured in orange.

OL	Product	Colour Appearance	Melting Mouthfeel	Creamy Mouthfeel	Sweetness	Cocoa Flavour	Milk Flavour
8,13	**273**	-0,26	***-0,11***	-0,12	***0,08***	-0,20	***-0,07***
7,84	**990**	-0,43	-0,33	-0,29	0,18	-0,28	***-0,03***
7,59	**141**	***-0,03***	-0,15	-0,25	***-0,02***	***-0,05***	-0,29
7,37	**811**	***-0,03***	-0,24	-0,34	***0,08***	***-0,10***	-0,26
7,35	**260**	-0,16	-0,58	-0,43	***0,02***	-0,22	-0,20
7,28	**833**	0,10	-0,26	-0,30	0,14	***0,10***	-0,31
7,28	**896**	***0,01***	***-0,04***	-0,12	***0,01***	0,27	-0,43
7,18	**863**	0,12	***-0,07***	-0,17	***0,00***	0,15	-0,40
7,1	**920**	0,14	-0,38	-0,43	***-0,02***	***0,02***	-0,45
7,07	**981**	***0,10***	-0,40	-0,34	***-0,04***	***0,07***	-0,45
7,06	**922**	0,11	-0,53	-0,48	***-0,03***	***0,02***	-0,43
7,03	**101**	***0,03***	-0,54	-0,55	***0,02***	***-0,09***	-0,35
6,97	**889**	0,12	-0,56	-0,54	***0,03***	***0,00***	-0,48
6,89	**753**	***-0,09***	-0,34	-0,48	***-0,05***	-0,24	-0,40
6,84	**262**	0,11	-0,35	-0,53	***0,05***	***0,06***	-0,52
6,83	**226**	0,17	-0,42	-0,51	***-0,02***	***-0,01***	-0,40
6,57	**386**	***-0,02***	-0,47	-0,59	-0,28	0,15	-0,56
6,53	**594**	0,13	-0,45	-0,61	-0,17	0,20	-0,61
5,91	**875**	0,56	-0,50	-0,76	-0,23	0,44	-0,85
5,54	**577**	0,31	-0,58	-0,97	-0,20	-0,34	-0,77
5,28	**787**	0,73	-0,73	-0,83	-0,31	0,67	-1,09
5,18	**170**	0,54	-0,66	-0,77	-0,34	0,48	-0,91
4,5	**100**	0,86	-0,61	-0,94	-0,84	0,87	-1,28
4,5	**520**	0,77	-0,54	-0,87	-0,82	0,77	-1,04

Table 14: Cluster 2 – Analysis of the JAR Differences to the Ideal Point '3' (Sign. level α= 0.05)

Analysis of variance which was conducted on the difference to a virtual ideal point showed that best liked product #273 was rated fairly close to ideal in melting mouthfeel, sweetness and milk flavour. In colour appearance, cocoa flavour as well as in creamy mouthfeel it was significantly not strong enough.

Product #990 which was scored on second position in overall liking was only just right in milk flavour. It was significantly too sweet in flavour, whereas its intensity in colour appearance, melting and creamy mouthfeel and cocoa flavour was significantly too weak. Products #141 and #811 were ideal in colour appearance and cocoa flavour.

None of the products was judged as just right in creaminess. However, in sweetness as well as in cocoa flavour many of the better accepted products were ideal. Furthermore, it could be detected that none of the lower accepted products that obtained a mean value below 6.0 in overall liking was ideal in any of the asked JAR attributes.

5.2.5. Summary and Discussion

Based on the previous analysis of JAR it became apparent that the preferences of the consumers of the second cluster could be identified and described by the selected JAR attributes pretty well. Five out of six JAR attributes were highly correlated with overall acceptance ratings. Creamy mouthfeel, sweetness and milk flavour were highly positively related to overall acceptance, whereas colour appearance and coca flavour were negatively linked with overall liking. Products that were evaluated as too intense in colour appearance and too strong in cocoa flavour were lower accepted by the consumers. Products #100 and #520 which performed very well in the first preference group were least accepted by the consumer of the second cluster. Thus, it can be assumed that colour appearance and cocoa flavour were strong negative drivers of product acceptance.

The most popular product #273 in terms of overall acceptance obtained the most just right responses in melting mouthfeel, creamy mouthfeel, sweetness, cocoa flavour and milk flavour. In each of these attributes more than 70% of the consumers evaluated the product as just right. Furthermore, the analysis of variance conducted on the deviation to the ideal point was in line with the results of the frequency and distribution analysis. Product #273 showed no significant differences from the ideal level in melting mouthfeel, sweetness and milk flavour. Thus, product #273 can be considered as just right in these product attributes.

In JAR colour appearance the top liked products should be slightly darker. Product #811 was just right in colour appearance. It obtained the most just right answers and was further close to ideal point in its mean value. Least liked products in overall acceptance performed poorly in colour appearance. Consumers wanted these products to be definitely lighter.

In JAR creamy mouthfeel, JAR melting mouthfeel and JAR milk flavour most of the products reached a rather low amount of just right answers. The products were definitely not creamy and melting enough and were too weak in their milk flavour. This became apparent through the distribution of the just right answers as well as through the analysis of deviation to the ideal.

Again, the results of JAR sweetness were difficult to interpret. The two best liked products performed best in sweetness. Other well products obtained a lower percentage of just right answers. However, the distribution of the consumer responses that did not evaluate the products as just right could not provide a clear direction how to change the intensity level of sweetness. On the other hand, products that scored low in overall liking should be definitely sweeter to the consumers' opinion.

It can be stated that the consumers of the second preference group liked very creamy and melting products with a high content of milk flavour. The content of cocoa flavour should rather be lower. Furthermore, a strong colour intensity was rejected by the consumer.

5.3. Preference Group 3

5.2.1. Overall Liking Ratings of the Products

Overall Liking Means	Product	N = 285													
7.74	**863**	A													
7.68	**141**	A	B												
7.62	**833**	A	B												
7.55	**896**	A	B	C											
7.38	**922**		B	C	D										
7.27	**981**			C	D	E									
7.20	**273**				D	E									
7.12	**386**				D	E									
7.07	**811**				D	E	F								
7.06	**889**				D	E	F								
6.95	**594**					E	F								
6.79	**226**						F	G							
6.55	**920**							G	H						
6.48	**101**								H						
6.31	**260**								H	I					
6.05	**262**									I	J				
6.00	**100**										J				
5.96	**875**										J	K			
5.93	**787**										J	K			
5.67	**990**											K			
5.22	**753**												L		
5.19	**520**												L		
4.84	**170**													M	
3.99	**577**														N

Table 15: Cluster 3 – Overall Liking of the Products (Sign. level α=0.05)

The third identified preference group comprised 285 consumers.

Products #863, #141, #833 and #896 tended to be best accepted than all other tested products by the consumers of the third cluster, followed by products #922 and #981. Products #170 and #577 were least liked by the consumers of the third preference group.

As in the second preference group the gap between the top liked product and the least accepted product was very wide. Product #577 was disliked by the consumers since it received a very low mean score in overall liking.

5.3.2. Correlation between JAR and Overall Liking Ratings [9]

	Colour Appearance	Melting Mouthfeel	Creamy Mouthfeel	Sweetness	Cocoa Flavour	Milk Flavour
Correlation to Overall Liking	-0,23	**0,77**	**0,91**	0,42	0,06	**0,74**

Table 16: Cluster 3 - Correlation between JAR Attributes and Overall Liking

Overall acceptance rating was highly positive correlated with JAR creamy mouthfeel, JAR melting mouthfeel and JAR milk flavour. JAR coca flavour showed no linear relationship to the overall acceptance rating. Further, JAR colour appearance was slightly negatively correlated to overall acceptance.

Correlation	Colour Appearance	Melting Mouthfeel	Creamy Mouthfeel	Sweetness	Cocoa Flavour	Milk Flavour
Colour Appearance	**1,00**	-0,20	-0,29	-0,70	**0,87**	**-0,77**
Melting Mouthfeel	-0,20	**1,00**	**0,90**	0,23	0,08	0,61
Creamy Mouthfeel	-0,29	**0,90**	**1,00**	0,37	0,05	**0,78**
Sweetness	-0,70	0,23	0,37	**1,00**	-0,68	0,73
Cocoa Flavour	**0,87**	0,08	0,05	-0,68	**1,00**	-0,48
Milk Flavour	**-0,77**	0,61	**0,78**	0,73	-0,48	**1,00**

Table 17: Cluster 3 - Correlation of JAR Attributes among Each Other

The correlation among the JAR attributes further showed that JAR creamy mouthfeel was highly positively linked to JAR melting mouthfeel and JAR milk flavour. Besides, JAR milk flavour was highly positively correlated to JAR sweetness, whereas it was negatively correlated with JAR colour appearance.

For the consumers in the third preference group the product attributes creamy mouthfeel, melting mouthfeel and milk flavour were important drivers of product acceptance.

[9] Correlation analysis was conducted on the mean values of JAR and their difference to ideal point '3'

5.3.3. Frequencies and Distributions of JAR Responses

- **Colour Appearance**

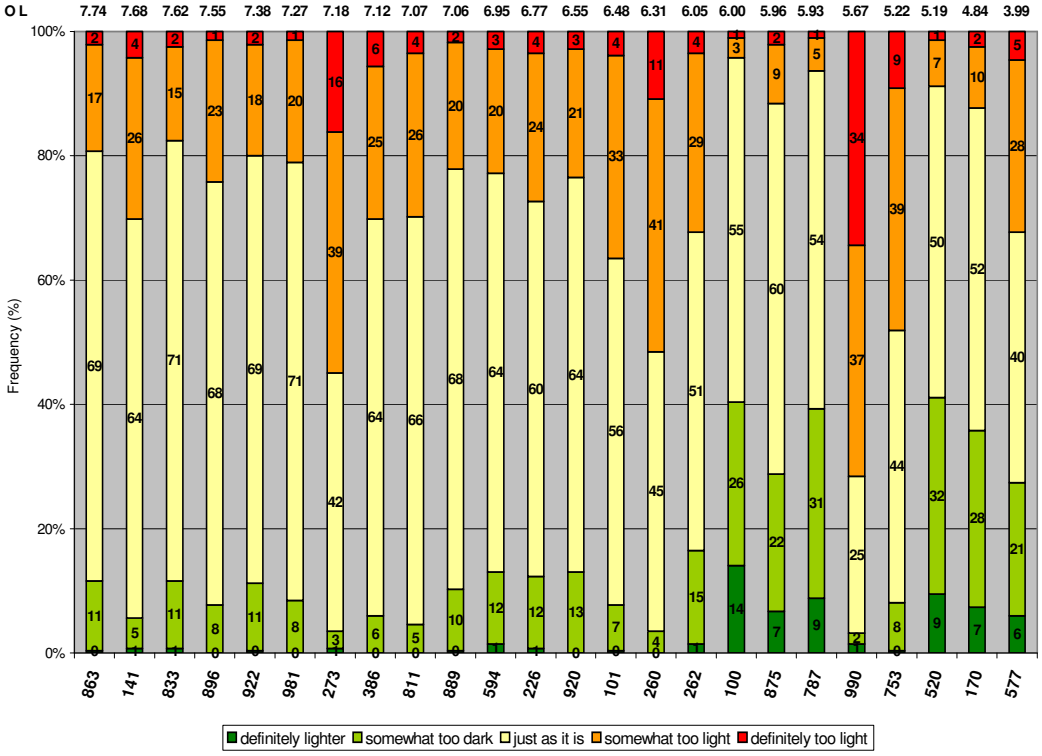

Chart 13: Cluster 3 – JAR Colour Appearance

The slightly negative relationship between the overall acceptance and the JAR colour ratings, which was identified by the correlation analysis above, can be also detected in the graphical illustration of chart 13. Products that were well liked were rated close to just right or should be slightly darker, whereas products that scored low in overall acceptance were already too dark in the consumers mind. Exceptions were products #990, #260 and #753 that were low scored in overall acceptance and rated as definitely too light in colour appearance. Product #273 was also found as somewhat too light, although it was also well liked.

In colour appearance, products #833, #981, #863, #922 and #896 were in the top group of JAR percentage. About 70% of the consumers evaluated these products as just right in colour appearance.
Regarding the results of the two-tailed binomial test conducted on the distribution of the consumers who did not judged the colour intensity of these products as right, products #981 and #896 were evaluated as too light. Significantly more assessors fell to the side of the just right category that demanded a slightly stronger colour. For products #833, #922 and #863 the distribution of the consumers who did not evaluate the products as just right was not significantly different. Furthermore, the mean value of JAR colour appearance was close to just right (close to the optimum level of '3') for these three products.

Taking all this into consideration, products #833, #922 and #863 were ideal in colour intensity for the consumers of the third cluster.

- **Melting Mouthfeel**

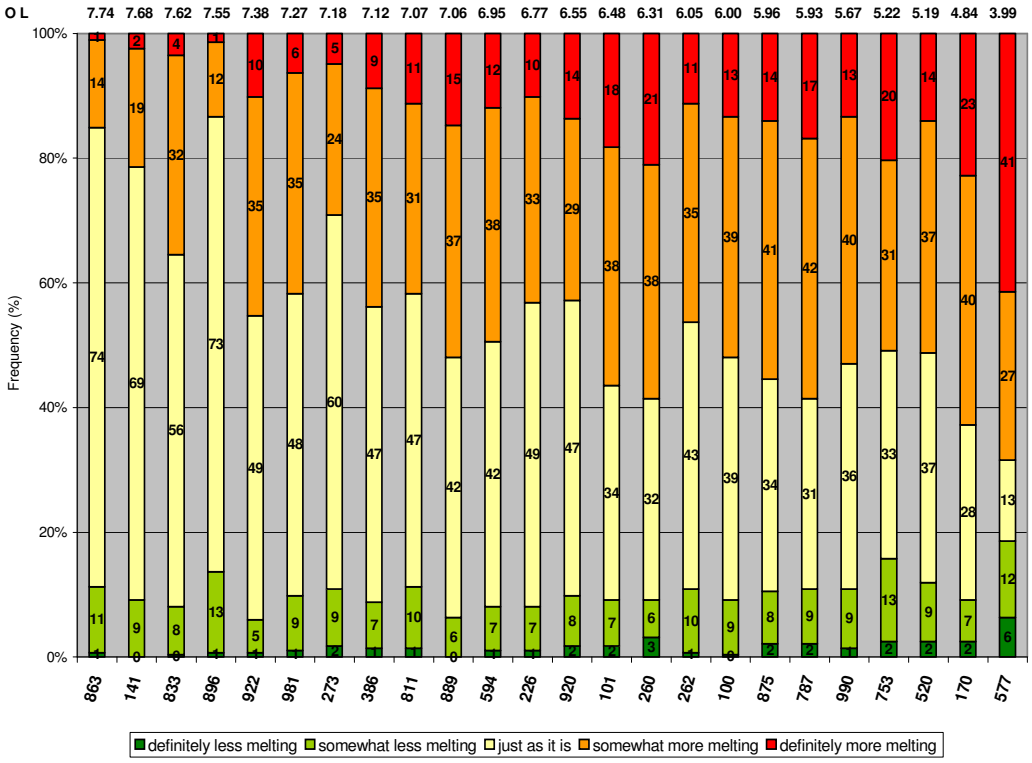

Chart 14: Cluster 3 – JAR Melting Mouthfeel

The bar chart shows that products that were very well liked in overall acceptance reached the most just right answers. With decreasing liking scores the percentage of consumers who evaluated the products as just right dropped significantly; the JAR mean value rose the less the products were liked.

In melting mouthfeel, products #863, #896 and #141 were in the top group of JAR percentage. About 70% of the respondents evaluated each of these three products as just right. The consumers who did not judged these products as just right were equally distributed around the just right category. For all other tested products significantly more consumers fell on the side that wanted the products to be more melting in mouthfeel. Based on the amount of just right answers and the distribution of the single consumer groups, the melting intensity of products #863, #896 and #141 can be considered as ideal/ just right for the consumers in the third cluster.

- **Creamy Mouthfeel**

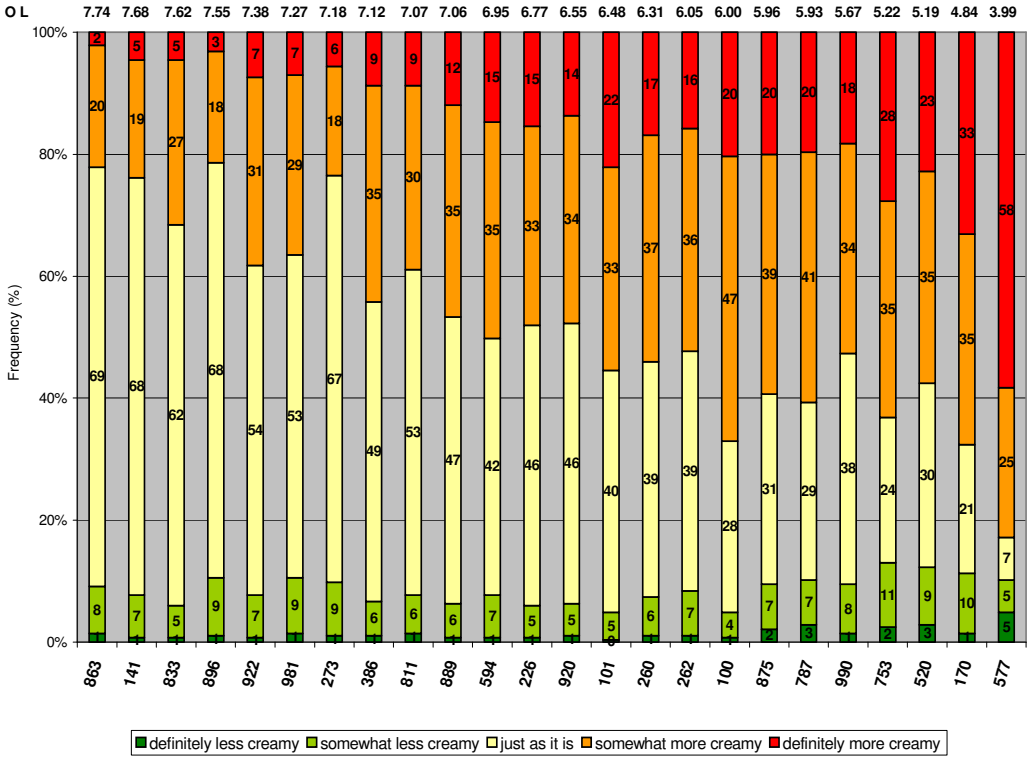

Chart 15: Cluster 3 – JAR Creamy Mouthfeel

As for melting mouthfeel, the strong linear relationship between overall acceptance and the just right evaluation for creaminess becomes apparent in chart 15. In the category creamy mouthfeel, products #863, #141, #896, #273 and #833 were in the top group of JAR percentage. However, products #863, #141, #273 and #833 were still evaluated as slightly too weak in creaminess. Of the respondents who did not judged these products as just right significantly more assessors found that these products should be somewhat creamier. The only exception was product #896 where no significantly different distribution of the consumer responses around the just right category could be detected.

- **Sweet Flavour**

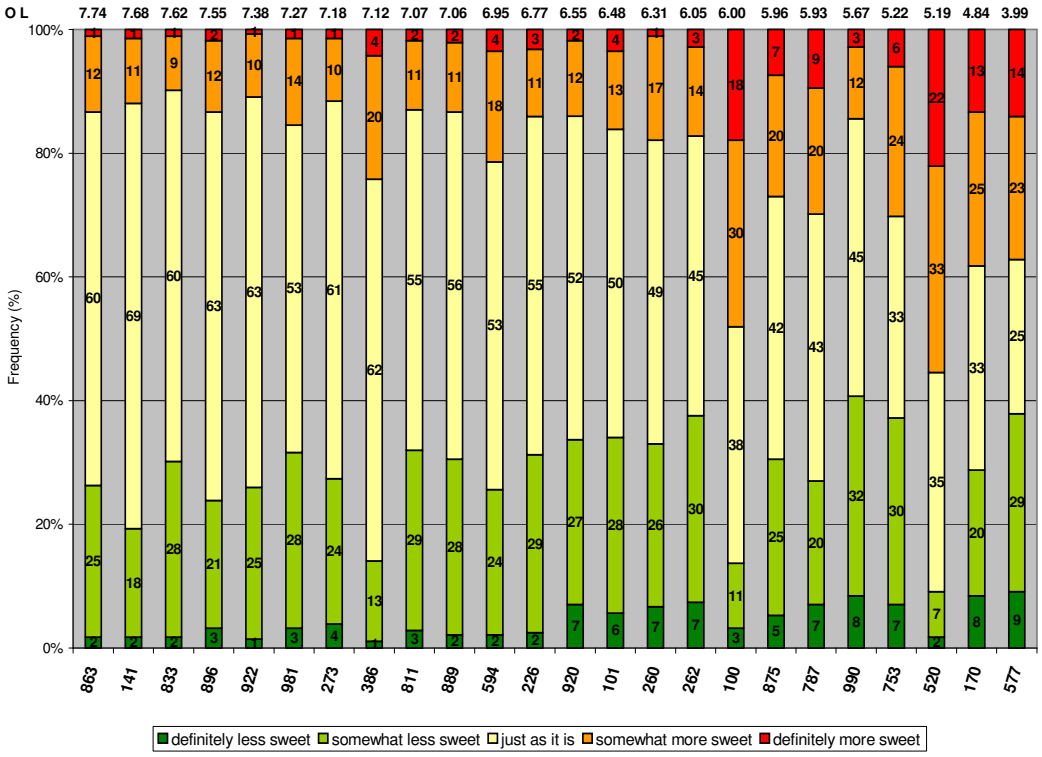

Chart 16: Cluster 3 – JAR Sweetness

The evaluation of sweetness was polarizing. However, all products should rather be less sweet according to the consumers mind. Exceptions were products #386, #100 and #520 which were definitely not sweet enough for the consumers.

About 69% of the consumers evaluated product #141 as just right in sweetness. Besides, products #922, #896, #386, #273, and #863 were also in the top group of JAR percentage. Of the products that performed best in JAR percentage product #922 as well as product #273 was already evaluated as slightly too sweet. On the other hand, the distribution of the consumers who did not evaluate products #141, #896, #386 and #863 as just right did not fell significantly to one of the two sides of the just right category.

- **Cocoa Flavour**

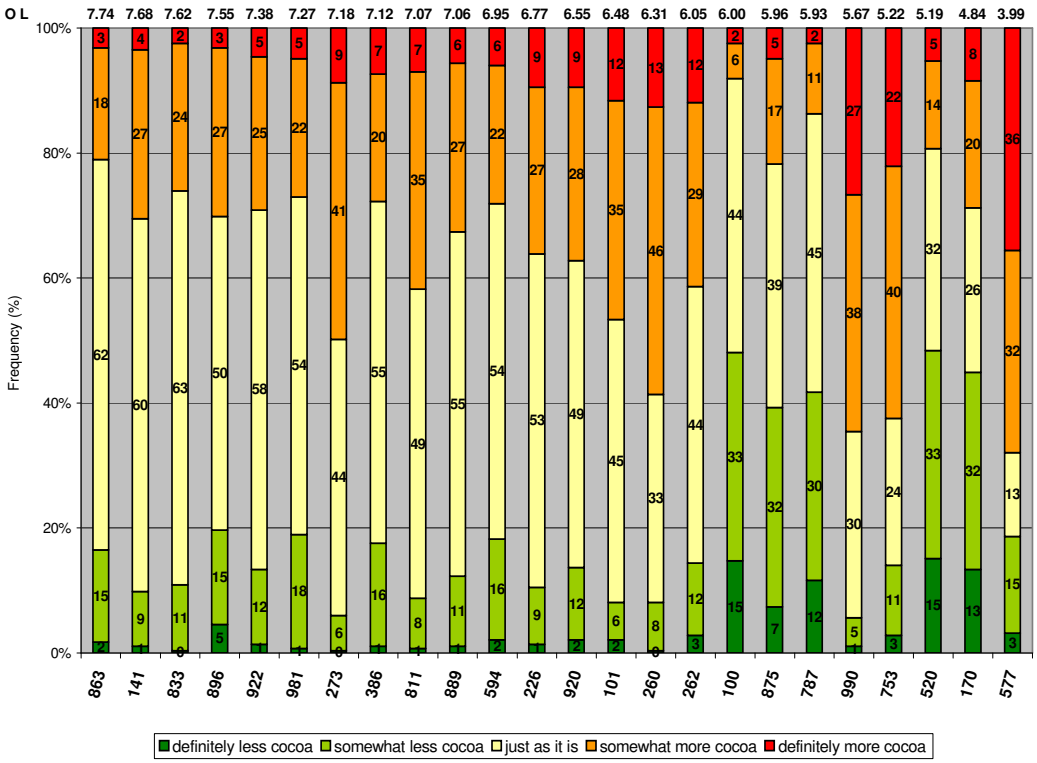

Chart 17: Cluster 3 – JAR Cocoa Flavour

The evaluation of cocoa flavour and the overall acceptance of the products were not strongly linked to each other. Except for products #100, #875, #787, #520 and #170, which should become definitely less intense in cocoa flavour, all other products were evaluated as rather not strong enough in cocoa flavour.

Products #833 and #863 were rated as just right in cocoa flavour by more than 60% of the respondents. However, product #833 was still not strong enough in cocoa flavour. For product #863, on the other side, the two-tailed binomial test could not determine a significant different distribution to one of the two sides of the just right category among the consumers who did not agree with the level of cocoa flavour.

- **Milk Flavour**

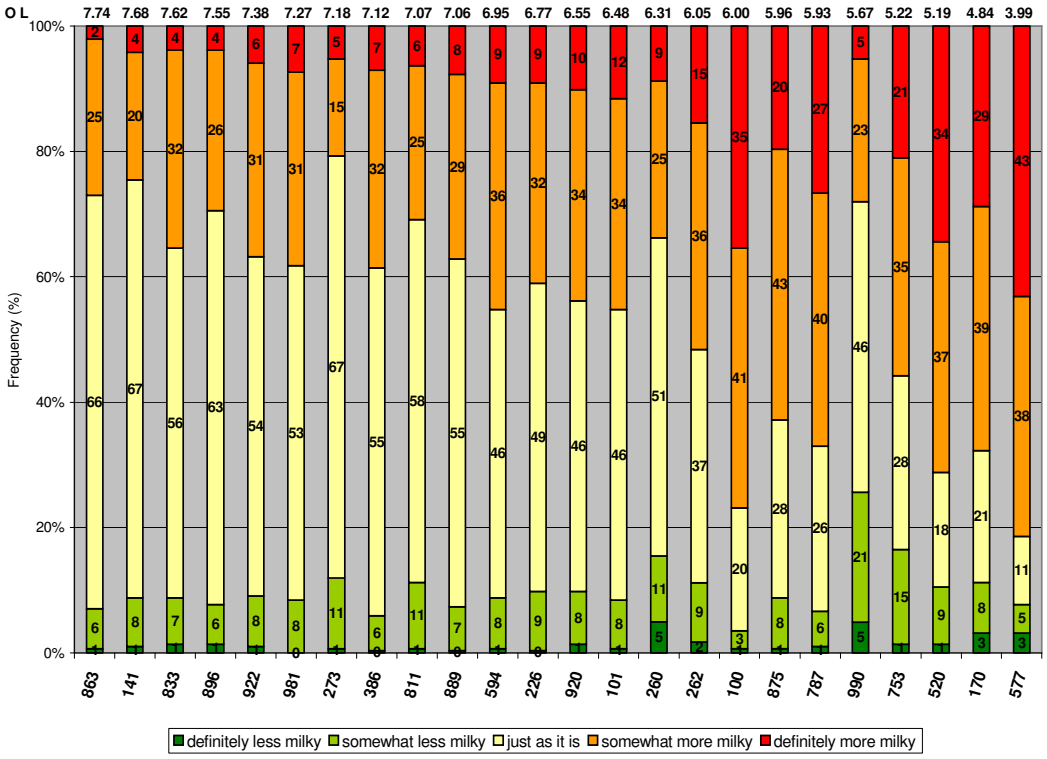

Chart 18: Cluster 3 – JAR Milk Flavour

The evaluation of milk flavour and the overall acceptance of the products were highly correlated to each other. Products that performed low in overall acceptance also scored low in JAR percentage. For the category of milk flavour, products #273, #141, #863 and #896 received the most just right responses. More than 60% of the consumers evaluated the milk flavour of each product as just right. The two-tailed binomial test did not detect a significant distribution of the respondents who did not agree with the level of milk flavour for product #273 to one of the two sides of the just right category. Products #141, #863 and #896, however, were evaluated as slightly not strong enough in milk flavour.

Based on the results above, product #273 was closest to ideal in milk flavour for the consumers of the third cluster.

5.3.4. Analysis of the Product Differences in Comparison with the Ideal Point

The differences between the JAR mean values and the ideal point of '3' are illustrated in the following table. The products are sorted according to their performance in overall acceptance (OL = overall liking), starting with the best liked product. Deviation that is not significantly different from the ideal point (at a sign. level of α= 0.05) is written in bold italics and coloured in orange.

OL	Product	Colour Appearance	Melting Mouthfeel	Creamy Mouthfeel	Sweetness	Cocoa Flavour	Milk Flavour
7,74	863	***-0,09***	***-0,04***	-0,14	***0,14***	***-0,06***	-0,21
7,68	141	-0,28	-0,15	-0,20	***0,08***	-0,23	-0,19
7,62	833	***-0,08***	-0,31	-0,29	0,21	-0,17	-0,29
7,55	896	-0,18	***0,00***	-0,13	***0,12***	***-0,09***	-0,24
7,38	922	***-0,11***	-0,49	-0,37	0,16	-0,19	-0,33
7,27	981	-0,14	-0,37	-0,32	0,18	***-0,12***	-0,37
7,20	273	-0,67	-0,21	-0,18	0,18	-0,52	-0,13
7,12	386	-0,30	-0,42	-0,45	-0,13	-0,16	-0,39
7,07	811	-0,29	-0,40	-0,39	0,20	-0,39	-0,25
7,06	889	-0,13	-0,60	-0,52	0,17	-0,25	-0,37
6,95	594	-0,11	-0,52	-0,56	***0,03***	-0,14	-0,45
6,79	226	-0,18	-0,44	-0,57	0,16	-0,34	-0,40
6,55	920	-0,13	-0,45	-0,54	0,25	-0,31	-0,43
6,48	101	-0,32	-0,64	-0,72	0,20	-0,48	-0,48
6,31	260	-0,59	-0,67	-0,62	0,21	-0,63	-0,22
6,05	262	-0,18	-0,46	-0,59	0,25	-0,36	-0,54
6,00	100	0,49	-0,56	-0,82	-0,49	0,52	-1,08
5,96	875	0,22	-0,57	-0,68	***0,01***	0,20	-0,73
5,93	787	0,41	-0,62	-0,67	***-0,05***	0,37	-0,86
5,67	990	-1,01	-0,54	-0,60	0,32	-0,85	***-0,03***
5,22	753	-0,49	-0,53	-0,75	***0,08***	-0,68	-0,59
5,19	520	0,40	-0,51	-0,65	-0,67	0,39	-0,94
4,84	170	0,28	-0,74	-0,88	-0,14	0,21	-0,82
3,99	577	***-0,04***	-0,85	-1,26	***-0,04***	-0,82	-1,14

Table 18: Cluster 3 – Analysis of the JAR Differences to the Ideal Point '3'
(Sign. level α= 0.05)

The analysis of variance, conducted on the differences to the ideal point of ‘3’, showed that the best liked product in overall acceptance, product #863, was ideal in colour appearance, melting mouthfeel, sweetness and cocoa flavour, whereas it was significantly not creamy enough and significantly too weak in milk flavour. Product #896 was ideal in melting mouthfeel, sweetness and cocoa flavour.

None of the tested products was close to ideal in creamy mouthfeel. On the contrary, all products were significantly not creamy enough in the opinion of the consumers. In milk flavour, only product #990 was ideal in its JAR mean value. All other products were significantly too weak in milk flavour.

In general, it can be stated that top liked products showed the most product attributes that were close or ideal in the JAR mean value. Furthermore, it is conspicuous that a lot of lower accepted products showed no significant difference to the ideal point in sweetness.

5.3.5. Summary and Discussion

Through correlation analysis and further based on the frequency charts of the JAR attributes three main drivers for overall acceptance in the third preference group could be identified. The JAR attributes creamy mouthfeel, melting mouthfeel and milk flavour were highly positive correlated with overall acceptance. The other JAR attributes were less important for liking; cocoa flavour was not correlated with overall acceptance at all.

In JAR melting mouthfeel the most popular product #863 as well as product #896 obtained the most just right responses. More than 70% of the consumers found these products as just right in melting mouthfeel. Furthermore, analysis of variance conducted on the deviation to the ideal point detected that these products did not differ significantly from the ideal level. Thus these products could be considered as just right in melting mouthfeel. All other products obtained rather a low amount of just right answers in melting mouthfeel. These products were significantly not melting enough in mouthfeel.

A similar result could be detected in JAR creamy mouthfeel. Again, products #863 and #896 tended to obtain significantly more just right responses than all other tested products. The other products performed very low in JAR percentage. Furthermore, analysis of variance conducted on the deviation to the ideal point detected that all products, even the samples that performed best in JAR percentage, showed significant differences to the ideal point. That means, that all products were significantly not creamy enough in mouthfeel.

The JAR results of milk flavour are comparable to the results of the texture attributes. The consumers wanted all products to be milkier in flavour.

For each of the three product attributes the JAR analysis could provide clear directions how to change the products.

On the other hand, the responses to JAR sweetness were polarizing. With the help of the JAR bar chart neither an optimal product nor any direction how to change the sweetness in the products could be identified.

The Analysis of the deviation of the JAR mean values to the ideal point led to some products that showed no significant differences to the ideal level. However, regarding the percentage of just right responses none of these products obtained a very high amount of just right answers. On the contrary, these products performed very poorly in both JAR percentage and overall acceptance. This is a very good example that it could be dangerous only to rely on the results of the JAR mean values since this data does not always represent the true average consumers' response.

Although colour appearance and cocoa flavour were not so important for product acceptance for the consumer of the third preference group the JAR results pointed in clear directions how to change these attributes in products that were not rated as just right.

Based on the analysis and evaluation of the JAR attributes it was possible to explain the product acceptance of the third preference group. Besides, the results make clear that the consumers saw a lot of room to improve the products and could further provide clear directions how to change specific product characteristics.

6. COMPARISON OF THE JAR RESULTS WITH THE RESULTS OF THE REGRESSION ANALYSIS ON QDA®/ ANALYTICAL AND ACCEPTANCE DATA

A regression analysis was conducted on descriptive, analytical and acceptance data to identify key attributes that are important and drive the liking. Furthermore, it is possible to determine the products that fulfill the demands and expectations of the consumers in each of the driving attributes.

The following tables display the results out of the regression analysis for each preference group. The attributes are listed according to the strength of their impact on overall acceptance. That means, the first attribute named had the strongest impact on overall acceptance and so on. The algebraic signs indicate whether the attribute was a positive (+) driver or a negative (-) for acceptance. The target products for each driving attribute are listed in the second column. The results are compared with the main findings out of the JAR analysis. Only JAR attributes that were highly correlated with overall acceptance are listed. The target products that were identified through regression analysis were compared to the products that performed best in JAR: the products that obtained a high amount of just right answers and were close to ideal point in their mean value at the same time.

Due to the need for confidentially only the product attributes that were also used in the consumer test are named. Identified key attributes out of the QDA® and the analytical data were coded.

- **Preference Group 1**

Product Attributes	*Target Product (QDA/ Analytic)*	*Products that Performed Best in JAR*
Analytical 16	**(+)** #100	**/**
Melting Mouthfeel	**(+)** **#863**	**(+)** **#863**/ #141/ #896
Mouthfeel 25	**(-)** #863	**/**
Cocoa Flavour	**(+)** **#100**/ #520	**(+)** **#100**/ #875/ #896
Brown Colour Appearance	**(+)** **#100/ #520/ #875**	**(+)** **#100/ #520/#875**
Sweet Flavour	**(-)** **#100**/ #875	**(-)** **#100**/ #141

Table 19: Cluster 1 – Comparison between QDA®/Acceptance Modelling and JAR Results

Through regression analysis it was possible to identify six key drivers for product liking for the first preference group. The driving attributes comprised one analytical data, two mouthfeel attributes, two flavour attributes and one appearance attribute. The analytical data had the strongest impact on overall acceptance. The higher the amount of the analytical component in the product the better the product was liked. The content of the analytical component in product #100 was ideal. Mouthfeel 25 as well as sweet flavour was negatively correlated to overall acceptance. Products that were strong in mouthfeel 25 and had an intense sweet flavour were less liked. Product #863 represented the target product for mouthfeel 25, while products #100 and #875 were optimal in sweet flavour. Melting mouthfeel, cocoa flavour and brown colour appearance were positively related to overall acceptance. Product #100 was one of the target products for cocoa flavour and brown colour appearance, whereas product #863 presents the target product for melting mouthfeel. Four of the identified key attributes were also included in the consumer test. Therefore it is possible to compare the JAR results of these four product attributes with the results of the QDA®/ acceptance modelling.

In general, the JAR analysis supported and confirmed the main findings out of the QDA®/ acceptance modelling.

JAR melting mouthfeel, JAR cocoa flavour and JAR colour appearance exhibited positive correlation with the overall acceptance ratings. JAR sweetness was slightly negatively related to overall liking. Furthermore, the products that performed best in JAR were identified as target products through the regression analysis.

To summarize the results, it can be noted that the results of the JAR analysis are in line with the results of the QDA®/ acceptance modelling. The researcher would have come to the same conclusions if he only would have based his recommendations on the consumer responses and the analysis of the six JAR attributes. However, the recommendations based only on the JAR analysis would have been less detailed. The QDA®/ acceptance modelling revealed additionally to the consumer attributes two more driving attributes, one analytical data and one technical terminology. Especially the information out of these two key attributes can be very valuable for the product developer, since these attributes are precise and very technical terms and thus highly actionable for product development steps.

- **Preference Group 2**

Product Attributes	*Target Product (QDA/ Analytic)*	*Products that Performed Best in JAR*
Brown Colour Appearance	**(-)** #990	**(-)** #811 / #753
Milk Flavour	**(+)** **#273**	**(+)** **#273** / #990
Sweet Aftertaste (Flavour)	**(+)** **#273**	**(+)** **#273** / #141
Aftertaste 45	**(+)** #141	**/**
Melting Mouthfeel	**(+)** **#273** / #811	**(+)** **#273** / #896

Table 20: Cluster 2 – Comparison between QDA®/Acceptance Modelling and JAR Results

The regression analysis identified five key drivers for overall acceptance, one appearance attribute, three flavour/aftertaste attributes and one mouthfeel attribute.

Brown colour appearance was a strong negative driver; all other attributes were positively linked to overall acceptance. For each of the key attributes at least one target product could be identified. Product #273 was optimal in milk flavour, in sweet aftertaste/ flavour and in melting mouthfeel, product #990 could be identified as target products for brown colour appearance and product #141 was ideal in aftertaste 45.

Four of the identified key attributes were also included in the consumer test. Therefore it is possible to draw comparisons between the JAR results of these four product attributes and the results of the QDA®/ acceptance modelling. As identified through regression modelling JAR colour appearance was negatively correlated to overall acceptance, whereas JAR milk flavour, JAR sweet flavour and JAR melting mouthfeel were positively related to overall liking ratings. Furthermore, the products that performed best in JAR milk flavour, JAR sweetness and JAR melting mouthfeel were identified as target products through regression analysis.

However, in brown colour appearance, the target product identified through QDA®/ acceptance modelling did not match with the target products ascertained

through the JAR analysis. Product #990, which was identified as target product in brown colour appearance based on the regression analysis, was not the product which performed best in JAR colour (see results in chapter 5.2.3.). Although about 60% of the consumers evaluated this product as just right in colour, more that 38% of the respondents wanted this product to be darker. Furthermore, the analysis of the product distances to the ideal point '3' detected that product #990 was significantly different to the ideal level; it was significantly too weak in colour appearance (see results in chapter 5.2.4.). On the contrary, products #811 and #753 were ideal in colour appearance according to the opinion of the consumers.

To summarize the results, it can be noted that the preferences and the liking pattern of the consumers of the second cluster could be explained by the six JAR attributes rather well. Four of the identified key attributes through the QDA®/ acceptance modelling belonged to the attributes that were included in the consumer questionnaire. Excepting colour appearance, the results and the target products identified through regression analysis were in line with the findings based on the JAR analysis and the products that performed best in JAR.

- **Preference Group 3**

Product Attributes	*Target Product (QDA/ Analytic)*	*Products that Performed Best in JAR*
Melting/Creamy Mouthfeel	(+) **#863**	(+) **#863**/ #896/ #141
Flavour 72	(-) #141	/
Aftertaste 13	(-) #922	/
Mouthfeel 29	(-) #863	/
Sweet Flavour	(+) **#141**/ #863/ #101	(+) **#141**
Milk Flavour	(+) **#273**/ #896	(+) **#273**
Flavour 34	(+) #896/ #833/ #141	/

Table 21: Cluster 3 – Comparison between QDA®/Acceptance Modelling and JAR Results

The regression analysis detected seven key drivers for overall acceptance, two mouthfeel attributes, four flavour attributes and one aftertaste attribute. Melting/ creamy mouthfeel, sweet flavour, milk flavour and flavour 34 were highly positively correlated to overall acceptance which can be confirmed by the analysis of the JAR attributes. The target product out of the regression analysis performed also best in JAR melting and creamy mouthfeel. All other identified key drivers were negatively correlated to overall liking.

Only three of the identified key drivers were product attributes that were also included in the consumer questionnaire. However, the products that performed best in these JAR attributes were also the products that were identified as target products through QDA®/acceptance modelling. Both results are in line and confirm each other.

It has to be noted that statements and explanations about the product preferences and acceptance that were only based on the results of the JAR responses would be less detailed and less precise than statements based on the results of the QDA®/acceptance modelling. Although three important positive key drivers for overall acceptance could be identified through the JAR analysis the QDA®/acceptance modelling additionally detected three product attributes that were strongly negatively linked to overall acceptance. Through this important

information the researcher gets closer and more detailed insights about the likes and dislikes of the consumers. Apart from knowing the product characteristics that the consumer likes it is always valuable to understand the product characteristics that lead to a rejection or lower product acceptance. In this case, the JAR attributes could only provide positive key drivers for product acceptance.

7. DISCUSSION

- **Approach of JAR Data Analysis**

A lot of different approaches for analyzing just right data are available in literature. According to the questions that want to be answered by just right data, some analysis stronger refer to the bipolar nature of the JAR scales while other methods cover the comparison to a generated ideal product [some are presented by POPPER et al., 2004, pp. 891-899]. Still, there is no "golden rule" how the just right data can be best analyzed. As the question about the benefit of JAR scale their analyzing methods also cause some controversies among researchers.

Whilst some scientists claim that it was "perfectly legitimate to report the JAR data in terms of the magnitude of the deviation from 'just right'" [MOSKOWITZ, 2003a, pp.145], other researchers recommend simply to display and report frequency distributions and apply non-parametric statistical tests [STONE and SIDEL, 1993, pp.93; LAWLESS and HEYMANN, 1998, pp.457]. MUÑOZ and other scientists are the opinion that these simple statistical tools were sufficient and more appropriate to unveil the "bi-modality" of JAR scales since the metric average alone did not necessarily represent the average population's response and could therefore mislead the interpretation of JAR data [MUÑOZ, 2003d, p.157].

In the current study both approaches have been conducted in order to obtain the most information out of the JAR data. Here, the danger of simply analyzing the mean values or deviation from the ideal point as stated by MUÑOZ also became apparent. Especially in the first and in the third preference group some of the products which were identified as close to just right in their mean values, performed very poorly in JAR percentage. In fact, products are always close to ideal, if the respondents who do not agree with the intensity level of the product attribute, are equally distributed on the two sides of the just right category, no matter, if 80% of the consumers judged the product as just right or only 30%.

On the other hand, some products that could be assumed to be just right according to their high amount of just right answers were on the contrary identified as too weak or too low in the product attribute considering only their JAR mean values. An example for this was also observed in the first preference group. The best liked product reached more than 70% in JAR percentage for 'colour appearance'; nevertheless, its mean value indicated that the attribute intensity was too strong and should be reduced. Besides according to the opinion of STONE and SIDEL, 70% just right answers were an agreed-on minimum of JAR percentage among scientists. When this minimum was achieved, the other responses could be ignored and the product be declared as just right in that particular product attribute [STONE and SIDEL, 1993, pp.93].

Although the mean value may provide the direction to which the developer has to change the product attribute, the results of this study made clear that reporting only the mean value leads to a loss of information. If this analysis is done it should only be used as additional tool but never reported without any consideration of the frequency of responses. Besides, through analysis of frequency distribution of the just right responses and the binomial test it is also possible to identify directions for product development.

- **Usefulness of the Information Gained from the JAR Data Analysis**

The analysis of JAR data could identify key attributes that were important for product liking and acceptance for each preference. While for the consumers of the first preference group the product characteristics colour appearance and cocoa flavour were most important and highly correlated with overall acceptance, the consumers of the second preference group focused their attention rather to the product attributes milk flavour and sweetness as well as to creamy/melting mouthfeel. Colour appearance and cocoa flavour were negatively related to overall acceptance. For the consumers of the third preference group especially the product attributes melting mouthfeel and creaminess were important drivers for acceptance. Milk flavour was also highly correlated with overall acceptance.

Based on only six selected consumer terms it was possible to describe and define the favourites of each preference group. Apart from identifying important product characteristics for overall acceptance it was further possible to define for each asked JAR attribute at least one product that were ideal in the mind of the consumer. These results make clear, that the selected consumer terms were very well chosen. The six attributes that were included in the questionnaire are important product characteristics of milk chocolate tablets. The consumer understood the meaning of these word terms and was able to rate the products on these attributes.

Furthermore, the JAR attributes could indicate directions for improvement for those products that were not just right to the consumers' opinion. In each preference group the analysis of JAR colour appearance, for example, could clearly point the direction how to change the products. JAR creamy mouthfeel and JAR melting mouthfeel were also product attributes for which clear recommendations could be given based on the analysis of the frequency distribution of the JAR responses.

JAR sweetness, on the other hand, was difficult to interpret. In all preference groups the products obtained a rather low amount of just right answers compared with the results of the other JAR attributes. However, the evaluation of the sweetness level of the products was polarizing. The amount of consumers who wanted the products to be sweeter and the amount of consumers who wanted the products to be less sweet was equally distributed around the just right category, so that no clear recommendation could be given.

The decision as to which product attributes the consumers should rate on a JAR scale is very important since it influences the usability of the obtained results. Several studies were conducted which dealt with this topic. "In general the JAR scales appear to work best when the attribute is truly descriptive, and does not have evaluative aspects. As an example, the attribute 'real chocolate' is probably evaluative even though it sounds very much like a sensory descriptive attribute. The attribute 'darkness' is virtually always a sensory descriptive attribute" [Moskowitz, 2003a, p.148].

Typically, texture and appearance attributes are rather descriptive terms. Attributes that are difficult to interpret and often do not work with JAR scales are product characteristics that have a judgmental or hedonic aspect attached to them. These are particularly attributes with emotional connotations such as 'sweetness' in the current study, 'fatty' or 'salty' [Moskowitz, 2003a, pp.148 and ASTM, 2003].

- **Comparison of the Results of the JAR Data Analysis with the Results through Regression Modelling Conducted on QDA®, Analytical Data and Overall Acceptance Ratings**

The regression analysis based on 59 descriptive sensory and six analytical data led to one theoretical model per preference group. It was possible to identify at least five key attributes for each preference group, which were important for product acceptance. Both positive as well as negative drivers were detected within each preference group and target products for every key attribute were defined.

The model of the first preference group contained three attributes which were also asked as JAR questions in the consumer test. In the second preference group even four of the five key attributes were also added to the questionnaire, whereas in the third preference group only three out of seven driving attributes belonged to the JAR attributes.

Apart from one exception (preference group 2, JAR colour appearance) the target products identified from the regression analysis performed very well in the relating JAR attributes. That means the analysis of JAR attributes led to the same results as obtained through regression modelling. The researcher might have come to the same conclusion even if his recommendations were only based on the results of the JAR attributes. The results of both analyses confirmed one another.
On the one hand however, it was proven that it is acceptable to rely on the recommendations of descriptive sensory alone but on the other hand, it could be shown that it is also legitimate to give recommendation only based on consumer data and JAR attributes. The consumer and the trained panellists understood the attributes in the same way. The preferences of the consumers of the second preference group could be described pretty well by the JAR attributes; four of the five key attributes identified through regression modelling were JAR attributes, whereas for the consumers of the third preference group the least information could be drawn out of the JAR attributes. Only three of the seven key attributes were also JAR attributes. In the third preference group all key attributes that were also JAR attributes were positively correlated with overall acceptance whereas the

regression modelling further identified product attributes that were negative drivers for liking.

Although, the liking and preference attitudes could also be described through JAR attributes, the descriptive sensory was able to deliver more detailed and specified information in two ways. Firstly, descriptive sensory provided more technical information that is more precise and actionable for product development. As the JAR attributes have to be simply named in consumer language it can not be excluded that the asked consumer term integrates several other attributes. Especially 'creamy mouthfeel' is a very common consumer term that is frequently used in consumer questionnaires. However, "depending on the type of product, consumer "creaminess" may integrate (other) appearance, flavour, and texture attributes" [Muñoz, 1997, p.5]. That means that the consumers do not only evaluate the creaminess of the product, but mix this attribute with his perception of milk and/ or sweet flavour.

Secondly, one would not asked negatively connoted attributes in consumer tests which, on the other hand, might be also very important drivers for consumer acceptance. The results of the third preference group are an example for this. Through JAR analysis three positive drivers for acceptance could be identified. But the regression analysis on descriptive sensory and analytical data unveiled additionally three product attributes that were highly negative correlated with overall acceptance.

Another drawback for the usefulness of JAR data is their dependence on the proper selection which again often depends on the experience of the researcher. In this study the JAR attributes were well selected. Important product characteristics were chosen which could provide useful information about the preferences of each consumer cluster. However, the results of the JAR data can only be as good as the JAR attributes have been defined in advance. If the JAR attributes do not fit to the product category or are not important to the consumers opinion results obtained from the JAR responses could not support the product development.

8. CONCLUSIONS

The analysis of the JAR attributes and the comparison of the JAR results with the results of the QDA®/ acceptance modelling led to the following main findings:

- Based on the six pre-selected JAR questions that were included in the consumer questionnaire it was possible to identify for each preference group important drivers of product acceptance.
- The results of the analysis of the JAR responses were in line with the results and recommendations based on descriptive sensory.
- The information received through just right questions was less detailed and precise compared to the descriptive sensory terms.

Since the information out of the JAR analysis could not provide additional findings to the regression analysis on descriptive / acceptance data and was for each preference group less detailed and precise, it can be claimed that it is not necessary to add so-called diagnostic questions to the consumer questionnaire. Descriptive sensory data obtained by a trained descriptive panel is sufficient to deliver useful information about the likes and dislikes of the consumers and to identify target products that fulfil the consumers' expectations and demands.

If the researcher is not sure whether to include JAR questions in the consumer questionnaire or not, he should make his decision based on the resources available, the task of the project, and the complexity of the study. In smaller consumer studies in which only a few prototypes are tested, JAR questions can deliver useful information to predict and explain consumer acceptance and can be used as a supplement for product optimization. In more complex studies, e.g. a category review with a large number of products and a large amount of test participants, the researcher should primarily interpret the results with the help of descriptive sensory. If it is possible to conduct a QDA® in parallel to the consumer test, JAR questions are not necessary. However, if there is no descriptive sensory data available based on which recommendations can be given, it is perfectly legitimate and useful to rely on the JAR data received by the consumers' opinion.

When JAR scales will be used in consumer tests, there are some important points the researcher should take into consideration.

The JAR attributes which are asked should be carefully selected and named according to the product category that will be explored. Therefore, it is necessary that the researcher is experienced and has a lot of knowledge about the product category and the referring consumer target group. Texture and appearance attributes work the best with JAR scales. Attributes that are naturally associated with acceptance (e.g. sweetness) are difficult to interpret. Furthermore, the chosen consumer term has to be simple and easy to understand.

If the JAR scales were used for product fine tuning and optimization recommendation only JAR attributes that are correlated to acceptance ratings should be used. In addition, the researcher should carefully pay attention to the interdependences and correlations among the JAR attributes. Lastly, it is recommended that the frequencies of the just right answer categories and their distribution to each other should be set prior to only analyzing and reporting the average score or the deviation from the ideal point.

In the current study only one consumer test was used to analyze the utility of JAR questions in multiple product tests. It would be important and interesting to know if the current findings can be confirmed by results out of other consumer tests with different products like salted snacks or dairy products. Therefore, further studies are recommended.

Another interesting point of research would be to determine whether one still receives reliable data from the JAR responses if the consumers were asked to rate on product attributes with mainly negative connoted imagery.

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APPENDIX 1

Relative and Absolute Frequencies of JAR Responses

- **Preference Group 1 (N=310)**

Product	Definitely lighter	Somewhat lighter	Just as it is	Somewhat darker	Definitely darker
100	6 N	41 N	240 N	22 N	1 N
	1,94%	13,23%	77,42%	7,10%	0,32%
863	0 N	14 N	215 N	78 N	3 N
	0%	4,52%	69,35%	25,16%	0,97%
141	2 N	12 N	175 N	106 N	15 N
	0,65%	3,87%	56,45%	34,19%	4,84%
594	3 N	22 N	188 N	89 N	8 N
	0,97%	7,10%	60,65%	28,71%	2,58%
520	2 N	45 N	238 N	21 N	4 N
	0,65%	14,52%	76,77%	6,77%	1,29%
875	1 N	36 N	220 N	52 N	1 N
	0,32%	11,61%	70,97%	16,77%	0,32%
787	1 N	35 N	225 N	45 N	4 N
	0,32%	11,29%	72,58%	14,52%	1,29%
896	1 N	17 N	179 N	102 N	11 N
	0,32%	5,48%	57,74%	32,90%	3,55%
889	0 N	19 N	200 N	81 N	10 N
	0%	6,13%	64,52%	26,13%	3,23%
922	0 N	20 N	180 N	98 N	12N
	0%	6,45%	58,06%	31,61%	3,87%
920	3 N	14 N	206 N	81 N	6 N
	0,97%	4,52%	66,45%	26,13%	1,94%
386	0 N	12 N	172 N	111 N	15 N
	0%	3,87%	55,48%	35,81%	4,84%
226	0 N	19 N	183 N	96 N	12 N
	0%	6,13%	59,03%	30,97%	3,87%
981	1 N	20 N	197 N	80 N	12 N
	0,32%	6,45%	63,55%	25,81%	3,87%
833	1 N	20 N	191 N	88 N	10 N
	0,32%	6,45%	61,61%	28,39%	3,23%
811	2 N	16 N	160 N	114 N	18 N
	0,65%	5,16%	51,61%	36,77%	5,81%
170	2 N	29 N	221 N	52 N	6 N
	0,65%	9,35%	71,29%	16,77%	1,94%
273	0 N	10 N	110 N	137 N	53 N
	0%	3,23%	35,48%	44,19%	17,10%
262	2 N	20 N	163 N	108 N	17 N
	0,65%	6,45%	52,58%	34,84%	5,48%
101	4 N	13 N	158 N	110 N	25 N
	1,29%	4,19%	50,97%	35,48%	8,06%
753	3 N	6 N	147 N	120 N	34 N
	0,97%	1,94%	47,42%	38,71%	10,97%
260	2 N	14 N	127 N	125 N	42 N
	0,65%	4,52%	40,97%	40,32%	13,55%
990	5 N	11 N	96 N	90 N	108 N
	1,61%	3,55%	30,97%	29,03%	34,84%
577	4 N	32 N	160 N	99 N	15 N
	1,29%	10,32%	51,61%	31,94%	4,84%

Table 22: Cluster 1 – Relative and Absolute Frequencies of JAR Colour Appearance

- **Preference Group 1 (N=310)**

Product	Definitely less melting	Somewhat less melting	Just as it is	Somewhat more melting	Definitely more melting
100	3 N	24 N	187 N	80 N	16 N
	0,97%	7,74%	60,32%	25,81%	5,16%
863	7 N	41 N	221 N	33 N	8 N
	2,26%	13,23%	71,29%	10,65%	2,58%
141	6 N	40 N	211 N	48 N	5 N
	1,94%	12,90%	68,06%	15,48%	1,61%
594	0 N	22 N	175 N	92 N	21 N
	0%	7,10%	56,45%	29,68%	6,77%
520	6 N	21 N	177 N	82 N	24 N
	1,94%	6,77%	57,10%	26,45%	7,74%
875	2 N	30 N	163 N	90 N	25 N
	0,65%	9,68%	52,58%	29,03%	8,06%
787	4 N	29 N	143 N	99 N	35 N
	1,29%	9,35%	46,13%	31,94%	11,29%
896	11 N	35 N	225 N	35 N	4 N
	3,55%	11,29%	72,58%	11,29%	1,29%
889	1 N	25 N	167 N	101 N	16 N
	0,32%	8,06%	53,87%	32,58%	5,16%
922	1 N	22 N	167 N	96 N	24 N
	0,32%	7,10%	53,87%	30,97%	7,74%
920	4 N	24 N	185 N	79 N	18 N
	1,29%	7,74%	59,68%	25,48%	5,81%
386	5 N	32 N	162 N	95 N	16 N
	1,61%	10,32%	52,26%	30,65%	5,16%
226	1 N	28 N	168 N	102 N	11 N
	0,32%	9,03%	54,19%	32,90%	3,55%
981	4 N	35 N	169 N	79 N	23 N
	1,29%	11,29%	54,52%	25,48%	7,42%
833	3 N	28 N	178 N	89 N	12 N
	0,97%	9,03%	57,42%	28,71%	3,87%
811	5 N	25 N	168 N	95 N	17 N
	1,61%	8,06%	54,19%	30,65%	5,48%
170	4 N	31 N	134 N	104 N	37 N
	1,29%	10%	43,23%	33,55%	11,94%
273	8 N	31 N	184 N	73 N	14 N
	2,58%	10%	59,35%	23,55%	4,52%
262	3 N	38 N	152 N	91 N	26 N
	0,97%	12,26%	49,03%	29,35%	8,39%
101	4 N	33 N	122 N	114 N	37 N
	1,29%	10,65%	39,35%	36,77%	11,94%
753	8 N	40 N	152 N	79 N	31 N
	2,58%	12,90%	49,03%	25,48%	10%
260	1 N	20 N	148 N	107 N	34 N
	0,32%	6,45%	47,74%	34,52%	10,97%
990	6 N	33 N	149 N	92 N	30 N
	1,94%	10,65%	48,06%	29,68%	9,68%
577	10 N	41 N	90 N	88 N	81 N
	3,23%	13,23%	29,03%	28,39%	26,12%

Table 23: Cluster 1 – Relative and Absolute Frequencies of JAR Melting Mouthfeel

- **Preference Group 1 (N=310)**

Product	Definitely less creamy	Somewhat less creamy	Just as it is	Somewhat more creamy	Definitely more creamy
100	1 N	13 N	172 N	103 N	21 N
	0,32%	4,19%	55,48%	33,23%	6,77%
863	5 N	30 N	206 N	58 N	11 N
	1,61%	9,68%	66,45%	18,71%	3,55%
141	7 N	20 N	208 N	62 N	13 N
	2,27%	6,47%	66,99%	20,06%	4,21%
594	3 N	12 N	169 N	98 N	28 N
	0,97%	3,87%	54,52%	31,61%	9,03%
520	5 N	21 N	156 N	101 N	27 N
	1,61%	6,77%	50,32%	32,58%	8,71%
875	3 N	24 N	144 N	101 N	38 N
	0,97%	7,74%	46,45%	32,58%	12,26%
787	4 N	21 N	141 N	106 N	38 N
	1,29%	6,77%	45,48%	34,19%	12,26%
896	8 N	31 N	208 N	57 N	6 N
	2,58%	10%	67,10%	18,39%	1,94%
889	3 N	13 N	174 N	94 N	26 N
	0,97%	4,19%	56,13%	30,32%	8,39%
922	5 N	21 N	184 N	73 N	27 N
	1,62%	6,80%	59,22%	23,62%	8,74%
920	5 N	25 N	168 N	80 N	32 N
	1,61%	8,06%	54,19%	25,81%	10,32%
386	1 N	19 N	157 N	107 N	26 N
	0,32%	6,13%	50,65%	34,52%	8,39%
226	4 N	24 N	153 N	105 N	24 N
	1,29%	7,74%	49,35%	33,87%	7,74%
981	6 N	32 N	157 N	92 N	23 N
	1,94%	10,32%	50,65%	29,68%	7,42%
833	2 N	29 N	171 N	86 N	22 N
	0,65%	9,35%	55,16%	27,74%	7,10%
811	3 N	25 N	168 N	89 N	25 N
	0,97%	8,06%	54,19%	28,71%	8,06%
170	6 N	28 N	134 N	94 N	48 N
	1,94%	9,03%	43,23%	30,32%	15,48%
273	7 N	32 N	192 N	63 N	16 N
	2,26%	10,32%	61,94%	20,32%	5,16%
262	0 N	22 N	164 N	87 N	37 N
	0%	7,10%	52,90%	28,06%	11,94%
101	1 N	27 N	135 N	102 N	45 N
	0,32%	8,71%	43,55%	32,90%	14,52%
753	7 N	31 N	155 N	77 N	40 N
	2,26%	10%	50%	24,84%	12,90%
260	1 N	27 N	155 N	91 N	36 N
	0,32%	8,71%	50%	29,35%	11,61%
990	6 N	26 N	150 N	87 N	41 N
	1,94%	8,39%	48,39%	28,06%	13,23%
577	13 N	23 N	79 N	92 N	103 N
	4,19%	7,42%	25,48%	29,68%	33,23%

Table 24: Relative and Absolute Frequencies of JAR Creamy Mouthfeel

- **Preference Group 1 (N=310)**

Product	Definitely less sweet	Somewhat less sweet	Just as it is	Somewhat more sweet	Definitely more sweet
100	5 N	30 N	192 N	63 N	20 N
	1,61%	9,68%	61,94%	20,32%	6,45%
863	12 N	76 N	195 N	25 N	2 N
	3,87%	24,52%	62,90%	8,06%	0,65%
141	12 N	69 N	200 N	23 N	6 N
	3,87%	22,26%	64,52%	7,42%	1,94%
594	10 N	58 N	182 N	54 N	6 N
	3,23%	18,71%	58,71%	17,42%	1,94%
520	1 N	28 N	173 N	79 N	29 N
	0,32%	9,03%	55,81%	25,48%	9,35%
875	12 N	59 N	186 N	44 N	9 N
	3,87%	19,03%	60%	14,19%	2,90%
787	11 N	71 N	172 N	44 N	12 N
	3,55%	22,90%	55,48%	14,19%	3,87%
896	14 N	65 N	197 N	30 N	4 N
	4,52%	20,97%	63,55%	9,68%	1,29%
889	12 N	86 N	182 N	25 N	5 N
	3,87%	27,74%	58,71%	8,06%	1,61%
922	15 N	72 N	188 N	31 N	4 N
	4,84%	23,23%	60,65%	10%	1,29%
920	22 N	70 N	178 N	37 N	3 N
	7,10%	22,58%	57,42%	11,94%	0,97%
386	10 N	56 N	180 N	49 N	15 N
	3,23%	18,06%	58,06%	15,81%	4,84%
226	22 N	73 N	181 N	29 N	5 N
	7,12%	23,62%	58,25%	9,39%	1,62%
981	10 N	84 N	166 N	43 N	7 N
	3,23%	27,10%	53,55%	13,87%	2,26%
833	19 N	84 N	164 N	38 N	5 N
	6,13%	27,10%	52,90%	12,26%	1,61%
811	18 N	75 N	179 N	33 N	5 N
	5,81%	24,19%	57,74%	10,65%	1,61%
170	15 N	64 N	157 N	49 N	25 N
	4,84%	20,65%	50,65%	15,81%	8,06%
273	22 N	84 N	166 N	33 N	5 N
	7,10%	27,10%	53,55%	10,65%	1,61%
262	22 N	70 N	167 N	41 N	10 N
	7,10%	22,58%	53,87%	13,23%	3,23%
101	12 N	90 N	157 N	42 N	9 N
	3,87%	29,03%	50,65%	13,55%	2,90%
753	18 N	70 N	176 N	39 N	7 N
	5,81%	22,58%	56,77%	12,58%	2,26%
260	21 N	75 N	170 N	38 N	6 N
	6,77%	24,19%	54,84%	12,26%	1,94%
990	35 N	86 N	144 N	36 N	9 N
	11,29%	27,74%	46,45%	11,61%	2,90%
577	27 N	62 N	130 N	68 N	23 N
	8,71%	20%	41,94%	21,94%	7,42%

Table 25: Cluster 1 – Relative and Absolute Frequencies of JAR Sweetness

- **Preference Group 1 (N=310)**

Product	Definitely less cocoa	Somewhat less cocoa	Just as it is	Somewhat more cocoa	Definitely more cocoa
100	17 N	53 N	202 N	33 N	5 N
	5,48%	17,10%	65,16%	10,65%	1,61%
863	1 N	28 N	189 N	80 N	12 N
	0,32%	9,03%	60,97%	25,81%	3,87%
141	3 N	25 N	169 N	100 N	13 N
	0,97%	8,06%	54,52%	32,26%	4,19%
594	6 N	27 N	185 N	77 N	15 N
	1,94%	8,71%	59,68%	24,84%	4,84%
520	16 N	66 N	178 N	38 N	12 N
	5,16%	21,29%	57,42%	12,26%	3,87%
875	10 N	41 N	197 N	48 N	14 N
	3,24%	13,27%	63,43%	15,53%	4,53%
787	9 N	43 N	185 N	61 N	12 N
	2,90%	13,87%	59,68%	19,68%	3,87%
896	4 N	32 N	196 N	68 N	10 N
	1,29%	10,32%	63,23%	21,94%	3,23%
889	2 N	34 N	175 N	84 N	15 N
	0,65%	10,97%	56,45%	27,10%	4,84%
922	2 N	31 N	167 N	91 N	19 N
	0,65%	10%	53,87%	29,35%	6,13%
920	5 N	32 N	153 N	103 N	17 N
	1,61%	10,32%	49,35%	33,23%	5,48%
386	1 N	30 N	171 N	87 N	21 N
	0,32%	9,71%	55,02%	28,16%	6,80%
226	5 N	26 N	159 N	102 N	18 N
	1,62%	8,41%	51,13%	33,01%	5,83%
981	7 N	34 N	163 N	90 N	16 N
	2,26%	10,97%	52,58%	29,03%	5,16%
833	2 N	37 N	164 N	84 N	23 N
	0,65%	11,94%	52,90%	27,10%	7,42%
811	5 N	31 N	137 N	109 N	28 N
	1,61%	10%	44,19%	35,16%	9,03%
170	14 N	54 N	156 N	60 N	26 N
	4,52%	17,42%	50,32%	19,35%	8,39%
273	2 N	14 N	141 N	110 N	43 N
	0,65%	4,52%	45,48%	35,48%	13,87%
262	6 N	29 N	166 N	83 N	26 N
	1,94%	9,35%	53,55%	26,77%	8,39%
101	2 N	22 N	148 N	107 N	31 N
	0,65%	7,10%	47,74%	34,52%	10%
753	4 N	14 N	128 N	120 N	44 N
	1,29%	4,52%	41,29%	38,71%	14,19%
260	3 N	14 N	127 N	123 N	43 N
	0,97%	4,52%	40,97%	39,68%	13,87%
990	0 N	17 N	106 N	112 N	74 N
	0%	5,50%	34,30%	36,25%	23,95%
577	4 N	22 N	93 N	105 N	85 N
	1,29%	7,12%	30,10%	33,98%	27,51%

Table 26: Cluster 1 – Relative and Absolute Frequencies of JAR Cocoa Flavour

- **Preference Group 1 (N=310)**

Product	Definitely less milky	Somewhat less milky	Just as it is	Somewhat more milky	Definitely more milky
100	4 N	9 N	143 N	121 N	33 N
	1,29%	2,90%	46,13%	39,03%	10,65%
863	4 N	25 N	200 N	70 N	11 N
	1,29%	8,06%	64,52%	22,58%	3,55%
141	6 N	22 N	205 N	64 N	13 N
	1,94%	7,10%	66,13%	20,65%	4,19%
594	3 N	25 N	166 N	90 N	26 N
	0,97%	8,06%	53,55%	29,03%	8,39%
520	7 N	15 N	156 N	99 N	33 N
	2,26%	4,84%	50,32%	31,94%	10,65%
875	1 N	24 N	143 N	114 N	28 N
	0,32%	7,74%	46,13%	36,77%	9,03%
787	3 N	26 N	138 N	108 N	35 N
	0,97%	8,39%	44,52%	34,84%	11,29%
896	4 N	32 N	193 N	69 N	12 N
	1,29%	10,32%	62,26%	22,26%	3,87%
889	4 N	31 N	177 N	85 N	13 N
	1,29%	10%	57,10%	27,42%	4,19%
922	6 N	27 N	191 N	65 N	21 N
	1,94%	8,71%	61,61%	20,97%	6,77%
920	2 N	30 N	184 N	70 N	24 N
	0,65%	9,68%	59,35%	22,58%	7,74%
386	3 N	27 N	169 N	87 N	24 N
	0,97%	8,71%	54,52%	28,06%	7,74%
226	6 N	27 N	165 N	96 N	16 N
	1,94%	8,74%	53,07%	31,07%	5,18%
981	0 N	31 N	177 N	81 N	21 N
	0%	10%	57,10%	26,13%	6,77%
833	4 N	26 N	172 N	97 N	11 N
	1,29%	8,39%	55,48%	31,29%	3,55%
811	5 N	34 N	190 N	57 N	24 N
	1,61%	10,97%	61,29%	18,39%	7,74%
170	7 N	39 N	125 N	91 N	47 N
	2,27%	12,62%	40,45%	29,45%	15,21%
273	7 N	49 N	192 N	55 N	7 N
	2,26%	15,81%	61,94%	17,74%	2,26%
262	3 N	27 N	160 N	100 N	20 N
	0,97%	8,71%	51,61%	32,26%	6,45%
101	3 N	33 N	159 N	88 N	27 N
	0,97%	10,65%	51,29%	28,39%	8,71%
753	7 N	34 N	161 N	68 N	40 N
	2,26%	10,97%	51,94%	21,94%	12,90%
260	6 N	43 N	173 N	72 N	16 N
	1,94%	13,87%	55,81%	23,23%	5,16%
990	19 N	48 N	169 N	58 N	16 N
	6,15%	15,53%	54,37%	18,77%	5,18%
577	6 N	28 N	105 N	92 N	79 N
	1,94%	9,03%	33,87%	29,68%	25,48%

Table 27: Cluster 1 – Relative and Absolute Frequencies of JAR Milk Flavour

- **Preference Group 2 (N=337)**

Product	Definitely lighter	Somewhat lighter	Just as it is	Somewhat darker	Definitely darker
273	2 N	8 N	235 N	84 N	8 N
	0,59%	2,37%	69,73%	24,93%	2,37%
990	3 N	5 N	202 N	98 N	29 N
	0,89%	1,48%	59,94%	29,08%	8,61%
141	2 N	43 N	234 N	58 N	0 N
	0,59%	12,76%	69,44%	17,21%	0%
811	5 N	31 N	253 N	44 N	4 N
	1,48%	9,20%	75,07%	13,06%	1,19%
260	3 N	25 N	232 N	70 N	7 N
	0,89%	7,42%	68,84%	20,77%	2,08%
833	7 N	59 N	234 N	36 N	1 N
	2,08%	17,51%	69,44%	10,68%	0,30%
896	4 N	57 N	218 N	53 N	5 N
	1,19%	16,91%	64,69%	15,73%	1,48%
863	9 N	75 N	204 N	46 N	3 N
	2,67%	22,26%	60,53%	13,65%	0,89%
920	9 N	66 N	225 N	36 N	1 N
	2,67%	19,58%	66,77%	10,68%	0,30%
981	9 N	68 N	210 N	47 N	3 N
	2,67%	20,18%	62,31%	13,95%	0,89%
922	7 N	70 N	216 N	40 N	4 N
	2,08%	20,83%	63,99%	11,90%	1,19%
101	5 N	49 N	235 N	46 N	2 N
	1,48%	14,54%	69,73%	13,65%	0,59%
889	9 N	74 N	207 N	42 N	5 N
	2,67%	21,96%	61,42%	12,46%	1,48%
753	3 N	32 N	239 N	57 N	6 N
	0,89%	9,50%	70,92%	16,91%	1,78%
262	8 N	84 N	189 N	50 N	6 N
	2,37%	24,93%	56,08%	14,84%	1,78%
226	12 N	81 N	201 N	38 N	5 N
	3,56%	24,04%	59,64%	11,28%	1,48%
386	3 N	57 N	214 N	56 N	7 N
	0,89%	16,91%	63,50%	16,62%	2,08%
594	8 N	83 N	196 N	45 N	5 N
	2,37%	24,63%	58,16%	13,35%	1,48%
875	41 N	131 N	144 N	18 N	3 N
	12,17%	38,87%	42,73%	5,34%	0,89%
577	25 N	117 N	138 N	53 N	4 N
	7,42%	34,72%	40,95%	15,73%	1,19%
787	73 N	135 N	100 N	23 N	6 N
	21,66%	40,06%	29,67%	6,82%	1,78%
170	49 N	124 N	127 N	33 N	4 N
	14,54%	36,80%	37,69%	9,79%	1,19%
100	97 N	125 N	90 N	20 N	5 N
	28,78%	37,09%	26,71%	5,93%	1,48%
520	83 N	125 N	101 N	24 N	4 N
	24,63%	37,09%	29,97%	7,12%	1,19%

Table 28: Cluster 2 – Relative and Absolute Frequencies of JAR Colour Appearance

- **Preference Group 2 (N=337)**

Product	Definitely less melting	Somewhat less melting	Just as it is	Somewhat more melting	Definitely more melting
273	2 N	21 N	255 N	56 N	3 N
	0,59%	6,23%	75,67%	16,62%	0,89%
990	2 N	11 N	211 N	99 N	14 N
	0,59%	3,26%	62,61%	29,38%	4,15%
141	3 N	33 N	222 N	67 N	12 N
	0,89%	9,79%	65,88%	19,88%	3,56%
811	7 N	27 N	195 N	94 N	14 N
	2,08%	8,01%	57,86%	27,89%	4,15%
260	3 N	19 N	136 N	139 N	40 N
	0,89%	5,64%	40,36%	41,25%	11,87%
833	2 N	27 N	205 N	89 N	14 N
	0,59%	8,01%	60,83%	26,41%	4,15%
896	13 N	25 N	238 N	58 N	3 N
	3,86%	7,42%	70,62%	17,21%	0,89%
863	4 N	39 N	229 N	60 N	5 N
	1,19%	11,57%	67,95%	17,80%	1,48%
920	5 N	18 N	185 N	102 N	27 N
	1,48%	5,34%	54,90%	30,27%	8,01%
981	0 N	29 N	170 N	114 N	24 N
	0%	8,63%	50,30%	33,93%	7,14%
922	3 N	13 N	162 N	120 N	39 N
	0,89%	3,86%	48,07%	35,61%	11,57%
101	2 N	23 N	146 N	124 N	42 N
	0,59%	6,82%	43,32%	36,80%	12,46%
889	2 N	18 N	146 N	131 N	40 N
	0,59%	5,34%	43,32%	38,87%	11,87%
753	5 N	39 N	159 N	103 N	31 N
	1,48%	11,57%	47,18%	30,56%	9,20%
262	5 N	28 N	169 N	114 N	21 N
	1,48%	8,31%	50,15%	33,83%	6,23%
226	3 N	25 N	165 N	116 N	28 N
	0,89%	7,42%	48,96%	34,42%	8,31%
386	4 N	36 N	134 N	125 N	38 N
	1,19%	10,68%	39,76%	37,09%	11,28%
594	6 N	34 N	138 N	122 N	37 N
	1,78%	10,09%	40,95%	36,20%	10,98%
875	2 N	39 N	127 N	128 N	41 N
	0,59%	11,57%	37,69%	37,98%	12,17%
577	14 N	39 N	101 N	102 N	81 N
	4,15%	11,57%	29,97%	30,27%	24,04%
787	3 N	30 N	96 N	135 N	73 N
	0,89%	8,90%	28,49%	40,06%	21,66%
170	7 N	27 N	109 N	124 N	70 N
	2,08%	8,01%	32,34%	36,80%	20,77%
100	8 N	29 N	106 N	138 N	56 N
	2,37%	8,61%	31,45%	40,95%	16,62%
520	7 N	38 N	114 N	121 N	57 N
	2,08%	11,28%	33,83%	35,91%	16,91%

Table 29: Cluster 2 – Relative and Absolute Frequencies of JAR Melting Mouthfeel

- **Preference Group 2 (N=337)**

Product	Definitely less creamy	Somewhat less creamy	Just as it is	Somewhat more creamy	Definitely more creamy
273	1 N	20 N	259 N	51 N	6 N
	0,30%	5,93%	76,85%	15,13%	1,78%
990	0 N	11 N	231 N	80 N	15 N
	0%	3,26%	68,55%	23,74%	4,45%
141	2 N	19 N	220 N	85 N	11 N
	0,59%	5,64%	65,28%	25,22%	3,26%
811	3 N	15 N	203 N	96 N	20 N
	0,89%	4,45%	60,24%	28,49%	5,93%
260	1 N	22 N	171 N	117 N	26 N
	0,30%	6,53%	50,74%	34,72%	7,72%
833	2 N	22 N	203 N	93 N	17 N
	0,59%	6,53%	60,24%	27,60%	5,04%
896	7 N	35 N	213 N	73 N	9 N
	2,08%	10,39%	63,20%	21,66%	2,67%
863	4 N	31 N	215 N	78 N	9 N
	1,19%	9,20%	63,80%	23,15%	2,67%
920	3 N	18 N	179 N	106 N	31 N
	0,89%	5,34%	53,12%	31,45%	9,20%
981	2 N	35 N	167 N	112 N	21 N
	0,59%	10,39%	49,55%	33,23%	6,23%
922	2 N	18 N	169 N	112 N	36 N
	0,59%	5,34%	50,15%	33,23%	10,68%
101	1 N	17 N	159 N	117 N	43 N
	0,30%	5,04%	47,18%	34,72%	12,76%
889	2 N	16 N	147 N	141 N	31 N
	0,59%	4,75%	43,62%	41,84%	9,20%
753	3 N	26 N	157 N	108 N	43 N
	0,89%	7,72%	46,59%	32,05%	12,76%
262	1 N	14 N	161 N	126 N	35 N
	0,30%	4,15%	47,77%	37,39%	10,39%
226	2 N	20 N	157 N	120 N	38 N
	0,59%	5,93%	46,59%	35,61%	11,28%
386	3 N	19 N	142 N	123 N	50 N
	0,89%	5,64%	42,14%	36,50%	14,84%
594	1 N	26 N	122 N	143 N	45 N
	0,30%	7,72%	36,20%	42,43%	13,35%
875	1 N	18 N	111 N	138 N	69 N
	0,30%	5,34%	32,94%	40,95%	20,47%
577	3 N	22 N	78 N	111 N	122 N
	0,89%	6,55%	23,21%	33,04%	36,31%
787	4 N	26 N	82 N	135 N	90 N
	1,19%	7,72%	24,33%	40,06%	26,71%
170	4 N	30 N	100 N	108 N	95 N
	1,19%	8,90%	29,67%	32,05%	28,19%
100	7 N	18 N	70 N	134 N	108 N
	2,08%	5,34%	20,77%	39,76%	32,05%
520	3 N	29 N	79 N	124 N	102 N
	0,89%	8,61%	23,44%	36,80%	30,27%

Table 30: Cluster 2 – Relative and Absolute Frequencies of JAR Creamy Mouthfeel

- **Preference Group 2 (N=337)**

Product	Definitely less sweet	Somewhat less sweet	Just as it is	Somewhat more sweet	Definitely more sweet
273	2 N	54 N	251 N	29 N	1 N
	0,59%	16,02%	74,48%	8,61%	0,30%
990	7 N	68 N	240 N	21 N	1 N
	2,08%	20,18%	71,22%	6,23%	0,30%
141	3 N	61 N	209 N	54 N	10 N
	0,89%	18,10%	62,02%	16,02%	2,97%
811	5 N	73 N	208 N	46 N	5 N
	1,48%	21,66%	61,72%	13,65%	1,48%
260	6 N	55 N	219 N	53 N	4 N
	1,78%	16,32%	64,99%	15,73%	1,19%
833	9 N	78 N	202 N	46 N	2 N
	2,67%	23,15%	59,94%	13,65%	0,59%
896	8 N	65 N	195 N	59 N	10 N
	2,37%	19,29%	57,86%	17,51%	2,97%
863	3 N	61 N	211 N	56 N	6 N
	0,89%	18,10%	62,61%	16,62%	1,78%
920	5 N	64 N	201 N	53 N	14 N
	1,48%	18,99%	59,64%	15,73%	4,15%
981	7 N	58 N	195 N	69 N	8 N
	2,08%	17,21%	57,86%	20,47%	2,37%
922	8 N	58 N	201 N	55 N	15 N
	2,37%	17,21%	59,64%	16,32%	4,45%
101	7 N	66 N	200 N	54 N	10 N
	2,08%	19,58%	59,35%	16,02%	2,97%
889	10 N	63 N	201 N	53 N	10 N
	2,97%	18,69%	59,64%	15,73%	2,97%
753	8 N	60 N	190 N	64 N	15 N
	2,37%	17,80%	56,38%	18,99%	4,45%
262	8 N	82 N	177 N	59 N	11 N
	2,37%	24,33%	52,52%	17,51%	3,26%
226	3 N	66 N	198 N	61 N	9 N
	0,89%	19,58%	58,75%	18,10%	2,67%
386	2 N	45 N	172 N	91 N	27 N
	0,59%	13,35%	51,04%	27%	8,01%
594	1 N	64 N	181 N	59 N	32 N
	0,30%	18,99%	53,71%	17,51%	9,50%
875	11 N	62 N	137 N	92 N	35 N
	3,26%	18,40%	40,65%	27,30%	10,39%
577	9 N	65 N	140 N	97 N	26 N
	2,67%	19,29%	41,54%	28,78%	7,72%
787	13 N	63 N	115 N	98 N	48 N
	3,86%	18,69%	34,12%	29,08%	14,24%
170	16 N	59 N	108 N	104 N	50 N
	4,75%	17,51%	32,05%	30,86%	14,84%
100	10 N	35 N	67 N	111 N	114 N
	2,97%	10,39%	19,88%	32,94%	33,83%
520	9 N	28 N	85 N	107 N	108 N
	2,67%	8,31%	25,22%	31,75%	32,05%

Table 31: Cluster 2 – Relative and Absolute Frequencies of JAR Sweetness

- **Preference Group 2 (N=337)**

Product	Definitely less cocoa	Somewhat less cocoa	Just as it is	Somewhat more cocoa	Definitely more cocoa
273	1 N	18 N	239 N	69 N	10 N
	0,30%	5,34%	70,92%	20,47%	2,97%
990	1 N	17 N	217 N	89 N	13 N
	0,30%	5,04%	64,39%	26,41%	3,86%
141	8 N	49 N	205 N	69 N	6 N
	2,37%	14,54%	60,83%	20,47%	1,78%
811	5 N	40 N	216 N	69 N	7 N
	1,48%	11,87%	64,09%	20,47%	2,08%
260	4 N	30 N	202 N	91 N	10 N
	1,19%	8,93%	59,82%	27,08%	2,98%
833	7 N	72 N	208 N	47 N	3 N
	2,08%	21,36%	61,72%	13,95%	0,89%
896	24 N	96 N	169 N	44 N	4 N
	7,12%	28,49%	50,15%	13,06%	1,19%
863	14 N	78 N	195 N	46 N	4 N
	4,15%	23,15%	57,86%	13,65%	1,19%
920	10 N	64 N	194 N	60 N	9 N
	2,97%	18,99%	57,57%	17,80%	2,67%
981	13 N	78 N	172 N	66 N	8 N
	3,86%	23,15%	51,04%	19,58%	2,37%
922	9 N	58 N	203 N	64 N	3 N
	2,67%	17,21%	60,24%	18,99%	0,89%
101	9 N	49 N	192 N	76 N	11 N
	2,67%	14,54%	56,97%	22,55%	3,26%
889	8 N	66 N	188 N	69 N	6 N
	2,37%	19,58%	55,79%	20,47%	1,78%
753	3 N	44 N	180 N	90 N	20 N
	0,89%	13,06%	53,41%	26,71%	5,93%
262	15 N	83 N	157 N	72 N	10 N
	4,45%	24,63%	46,59%	21,36%	2,97%
226	5 N	67 N	195 N	60 N	10 N
	1,48%	19,88%	57,86%	17,80%	2,97%
386	17 N	96 N	156 N	56 N	12 N
	5,04%	28,49%	46,29%	16,62%	3,56%
594	22 N	85 N	177 N	44 N	9 N
	6,53%	25,22%	52,52%	13,06%	2,67%
875	45 N	113 N	130 N	42 N	6 N
	13,39%	33,63%	38,69%	12,50%	1,79%
577	8 N	56 N	130 N	99 N	44 N
	2,37%	16,62%	38,58%	29,38%	13,06%
787	74 N	129 N	89 N	38 N	7 N
	21,96%	38,28%	26,41%	11,28%	2,08%
170	52 N	126 N	104 N	41 N	14 N
	15,43%	37,39%	30,86%	12,17%	4,15%
100	107 N	117 N	82 N	23 N	8 N
	31,75%	34,72%	24,33%	6,82%	2,37%
520	88 N	132 N	75 N	34 N	8 N
	26,11%	39,17%	22,26%	10,09%	2,37%

Table 32: Cluster 2 – Relative and Absolute Frequencies of JAR Cocoa Flavour

- **Preference Group 2 (N=337)**

Product	Definitely less milky	Somewhat less milky	Just as it is	Somewhat more milky	Definitely more milky
273	5 N	23 N	260 N	42 N	7 N
	1,48%	6,82%	77,15%	12,46%	2,08%
990	6 N	30 N	259 N	32 N	10 N
	1,78%	8,90%	76,85%	9,50%	2,97%
141	1 N	27 N	195 N	100 N	14 N
	0,30%	8,01%	57,86%	29,67%	4,15%
811	5 N	18 N	215 N	81 N	18 N
	1,48%	5,34%	63,80%	24,04%	5,34%
260	2 N	32 N	212 N	77 N	14 N
	0,59%	9,50%	62,91%	22,85%	4,15%
833	1 N	24 N	200 N	93 N	19 N
	0,30%	7,12%	59,35%	27,60%	5,64%
896	3 N	18 N	180 N	103 N	33 N
	0,89%	5,34%	53,41%	30,56%	9,79%
863	4 N	21 N	171 N	118 N	23 N
	1,19%	6,23%	50,74%	35,01%	6,82%
920	1 N	21 N	177 N	100 N	38 N
	0,30%	6,23%	52,52%	29,67%	11,28%
981	5 N	19 N	160 N	127 N	26 N
	1,48%	5,64%	47,48%	37,69%	7,72%
922	3 N	19 N	173 N	113 N	29 N
	0,89%	5,65%	51,19%	33,63%	8,63%
101	4 N	19 N	193 N	96 N	25 N
	1,19%	5,64%	57,27%	28,49%	7,42%
889	3 N	17 N	168 N	113 N	36 N
	0,89%	5,04%	49,85%	33,53%	10,68%
753	7 N	28 N	168 N	92 N	42 N
	2,08%	8,31%	49,85%	27,30%	12,46%
262	3 N	20 N	154 N	119 N	41 N
	0,89%	5,93%	45,70%	35,31%	12,17%
226	2 N	27 N	173 N	103 N	32 N
	0,59%	8,01%	51,34%	30,56%	9,50%
386	2 N	20 N	141 N	134 N	40 N
	0,59%	5,93%	41,84%	39,76%	11,87%
594	3 N	19 N	137 N	127 N	51 N
	0,89%	5,64%	40,65%	37,69%	15,13%
875	5 N	12 N	97 N	137 N	86 N
	1,48%	3,56%	28,78%	40,65%	25,52%
577	5 N	32 N	95 N	107 N	98 N
	1,48%	9,50%	28,19%	31,75%	29,08%
787	1 N	13 N	65 N	132 N	126 N
	0,30%	3,86%	19,29%	39,17%	37,39%
170	6 N	15 N	89 N	121 N	106 N
	1,78%	4,45%	26,41%	35,91%	31,45%
100	2 N	8 N	45 N	122 N	160 N
	0,59%	2,37%	13,35%	36,20%	47,48%
520	15 N	25 N	43 N	103 N	151 N
	4,45%	7,42%	12,76%	30,56%	44,81%

Table 33: Cluster 2 – Relative and Absolute Frequencies of JAR Milk Flavour

- **Preference Group 3 (N=285)**

Product	Definitely lighter	Somewhat lighter	Just as it is	Somewhat darker	Definitely darker
863	6 N	49 N	197 N	32 N	1 N
	2,11%	17,19%	69,12%	11,23%	0,35%
141	12 N	74 N	183 N	14 N	2 N
	4,21%	25,96%	64,21%	4,91%	0,70%
833	7 N	43 N	202 N	31 N	2 N
	2,46%	15,09%	70,88%	10,88%	0,70%
896	4 N	65 N	194 N	22 N	0 N
	1,40%	22,81%	68,07%	7,72%	0%
922	6 N	51 N	196 N	31 N	1 N
	2,11%	17,89%	68,77%	10,88%	0,35%
981	4 N	56 N	201 N	24 N	0 N
	1,40%	19,65%	70,53%	8,42%	0%
273	46 N	110 N	118 N	8 N	2 N
	16,20%	38,73%	41,55%	2,82%	0,70%
386	16 N	70 N	182 N	17 N	0 N
	5,61%	24,56%	63,86%	5,96%	0%
811	10 N	75 N	187 N	13 N	0 N
	3,51%	26,32%	65,61%	4,56%	0%
889	5 N	58 N	193 N	28 N	1 N
	1,76%	20,42%	67,61%	9,86%	0,35%
594	8 N	57 N	183 N	33 N	4 N
	2,81%	20%	64,21%	11,58%	1,40%
226	10 N	68 N	172 N	33 N	2 N
	3,51%	23,86%	60,35%	11,58%	0,70%
920	8 N	59 N	181 N	37 N	0 N
	2,81%	20,70%	63,51%	12,98%	0%
101	11 N	93 N	159 N	21 N	1 N
	3,86%	32,63%	55,79%	7,37%	0,35%
260	31 N	116 N	128 N	10 N	0 N
	10,88%	40,70%	44,91%	3,51%	0%
262	10 N	82 N	146 N	43 N	4 N
	3,51%	28,77%	51,23%	15,09%	1,40%
100	3 N	9 N	158 N	75 N	40 N
	1,05%	3,16%	55,44%	26,32%	14,04%
875	6 N	27 N	170 N	63 N	19 N
	2,11%	9,47%	59,65%	22,11%	6,67%
787	3 N	15 N	155 N	87 N	25 N
	1,05%	5,26%	54,39%	30,53%	8,77%
990	98 N	106 N	72 N	5 N	4 N
	34,39%	37,19%	25,26%	1,75%	1,40%
753	26 N	111 N	125 N	22 N	1 N
	9,12%	38,95%	43,86%	7,72%	0,35%
520	4 N	21 N	143 N	90 N	27 N
	1,40%	7,37%	50,18%	31,58%	9,47%
170	7 N	28 N	148 N	81 N	21 N
	2,46%	9,82%	51,93%	28,42%	7,37%
577	13 N	79 N	115 N	61 N	17 N
	4,56%	27,72%	40,35%	21,40%	5,96%

Table 34: Cluster 3 – Relative and Absolute Frequencies of JAR Colour Appearance

- **Preference Group 3 (N=285)**

Product	Definitely less melting	Somewhat less melting	Just as it is	Somewhat more melting	Definitely more melting
863	2 N	30 N	210 N	40 N	3 N
	0,70%	10,53%	73,68%	14,04%	1,05%
141	0 N	26 N	198 N	54 N	7 N
	0%	9,12%	69,47%	18,95%	2,46%
833	1 N	22 N	161 N	91 N	10 N
	0,35%	7,72%	56,49%	31,93%	3,51%
896	2 N	37 N	208 N	34 N	4 N
	0,70%	12,98%	72,98%	11,93%	1,40%
922	2 N	15 N	139 N	100 N	29 N
	0,70%	5,26%	48,77%	35,09%	10,18%
981	3 N	25 N	138 N	101 N	18 N
	1,05%	8,77%	48,42%	35,44%	6,32%
273	5 N	26 N	171 N	69 N	14 N
	1,75%	9,12%	60%	24,21%	4,91%
386	4 N	21 N	135 N	100 N	25 N
	1,40%	7,37%	47,37%	35,09%	8,77%
811	4 N	28 N	134 N	87 N	32 N
	1,40%	9,82%	47,02%	30,53%	11,23%
889	0 N	18 N	119 N	106 N	42 N
	0%	6,32%	41,75%	37,19%	14,74%
594	3 N	20 N	121 N	107 N	34 N
	1,05%	7,02%	42,46%	37,54%	11,93%
226	3 N	20 N	139 N	94 N	29 N
	1,05%	7,02%	48,77%	32,98%	10,18%
920	5 N	23 N	135 N	83 N	39 N
	1,75%	8,07%	47,37%	29,12%	13,68%
101	5 N	21 N	98 N	109 N	52 N
	1,75%	7,37%	34,39%	38,25%	18,25%
260	9 N	17 N	92 N	107 N	60 N
	3,16%	5,96%	32,28%	37,54%	21,05%
262	2 N	29 N	122 N	100 N	32 N
	0,70%	10,18%	42,81%	35,09%	11,23%
100	1 N	25 N	111 N	110 N	38 N
	0,35%	8,77%	38,95%	38,60%	13,33%
875	6 N	24 N	97 N	118 N	40 N
	2,11%	8,42%	34,04%	41,40%	14,04%
787	6 N	25 N	87 N	119 N	48 N
	2,11%	8,77%	30,53%	41,75%	16,84%
990	4 N	27 N	103 N	113 N	38 N
	1,40%	9,47%	36,14%	39,65%	13,33%
753	7 N	38 N	95 N	87 N	58 N
	2,46%	13,33%	33,33%	30,53%	20,35%
520	7 N	27 N	105 N	106 N	40 N
	2,46%	9,47%	36,84%	37,19%	14,04%
170	7 N	19 N	80 N	114 N	65 N
	2,46%	6,67%	28,07%	40%	22,81%
577	18 N	35 N	37 N	77 N	118 N
	6,32%	12,28%	12,98%	27,02%	41,40%

Table 35: Cluster 3 – Relative and Absolute Frequencies of JAR Melting Mouthfeel

- **Preference Group 3 (N=285)**

Product	Definitely less creamy	Somewhat less creamy	Just as it is	Somewhat more creamy	Definitely more creamy
863	4 N	22 N	196 N	57 N	6 N
	1,40%	7,72%	68,77%	20%	2,11%
141	2 N	20 N	195 N	55 N	13 N
	0,70%	7,02%	68,42%	19,30%	4,56%
833	2 N	15 N	178 N	77 N	13 N
	0,70%	5,26%	62,46%	27,02%	4,56%
896	3 N	27 N	194 N	52 N	9 N
	1,05%	9,47%	68,07%	18,25%	3,16%
922	2 N	20 N	154 N	88 N	21 N
	0,70%	7,02%	54,04%	30,88%	7,37%
981	4 N	26 N	151 N	84 N	20 N
	1,40%	9,12%	52,98%	29,47%	7,02%
273	3 N	25 N	190 N	51 N	16 N
	1,05%	8,77%	66,67%	17,89%	5,61%
386	3 N	16 N	140 N	101 N	25 N
	1,05%	5,61%	49,12%	35,44%	8,77%
811	4 N	18 N	152 N	86 N	25 N
	1,40%	6,32%	53,33%	30,18%	8,77%
889	2 N	16 N	134 N	99 N	34 N
	0,70%	5,61%	47,02%	34,74%	11,93%
594	2 N	20 N	120 N	101 N	42 N
	0,70%	7,02%	42,11%	35,44%	14,74%
226	2 N	15 N	131 N	93 N	44 N
	0,70%	5,26%	45,96%	32,63%	15,44%
920	3 N	15 N	131 N	97 N	39 N
	1,05%	5,26%	45,96%	34,04%	13,68%
101	1 N	13 N	113 N	95 N	63 N
	0,35%	4,56%	39,65%	33,33%	22,11%
260	3 N	18 N	110 N	106 N	48 N
	1,05%	6,32%	38,60%	37,19%	16,84%
262	3 N	21 N	112 N	104 N	45 N
	1,05%	7,37%	39,30%	36,49%	15,79%
100	2 N	12 N	80 N	133 N	58 N
	0,70%	4,21%	28,07%	46,67%	20,35%
875	6 N	21 N	89 N	112 N	57 N
	2,11%	7,37%	31,23%	39,30%	20%
787	8 N	21 N	83 N	117 N	56 N
	2,81%	7,37%	29,12%	41,05%	19,65%
990	4 N	23 N	108 N	98 N	52 N
	1,40%	8,07%	37,89%	34,39%	18,25%
753	7 N	30 N	68 N	101 N	79 N
	2,46%	10,53%	23,86%	35,44%	27,72%
520	8 N	27 N	86 N	99 N	65 N
	2,81%	9,47%	30,18%	34,74%	22,81%
170	4 N	28 N	60 N	98 N	94 N
	1,41%	9,86%	21,13%	34,51%	33,10%
577	14 N	15 N	20 N	70 N	166 N
	4,91%	5,26%	7,02%	24,56%	58,25%

Table 36: Cluster 3 – Relative and Absolute Frequencies of JAR Creamy Mouthfeel

- **Preference Group 3 (N=285)**

Product	Definitely less sweet	Somewhat less sweet	Just as it is	Somewhat more sweet	Definitely more sweet
863	5 N	70 N	172 N	35 N	3 N
	1,75%	24,56%	60,35%	12,28%	1,05%
141	5 N	50 N	196 N	30 N	4 N
	1,75%	17,54%	68,77%	10,53%	1,40%
833	5 N	81 N	171 N	25 N	3 N
	1,75%	28,42%	60%	8,77%	1,05%
896	9 N	59 N	179 N	33 N	5 N
	3,16%	20,70%	62,81%	11,58%	1,75%
922	4 N	70 N	180 N	29 N	2 N
	1,40%	24,56%	63,16%	10,18%	0,70%
981	9 N	81 N	151 N	40 N	4 N
	3,16%	28,42%	52,98%	14,04%	1,40%
273	11 N	67 N	174 N	29 N	4 N
	3,86%	23,51%	61,05%	10,18%	1,40%
386	3 N	37 N	176 N	57 N	12 N
	1,05%	12,98%	61,75%	20%	4,21%
811	8 N	83 N	157 N	32 N	5 N
	2,81%	29,12%	55,09%	11,23%	1,75%
889	6 N	81 N	160 N	32 N	6 N
	2,11%	28,42%	56,14%	11,23%	2,11%
594	6 N	67 N	151 N	51 N	10 N
	2,11%	23,51%	52,98%	17,89%	3,51%
226	7N	82 N	156 N	31 N	9 N
	2,46%	28,77%	54,74%	10,88%	3,16%
920	20 N	76 N	149 N	35 N	5 N
	7,02%	26,67%	52,28%	12,28%	1,75%
101	16 N	81 N	142 N	36 N	10 N
	5,61%	28,42%	49,82%	12,63%	3,51%
260	19 N	75 N	140 N	48 N	3 N
	6,67%	26,32%	49,12%	16,84%	1,05%
262	21 N	86 N	129 N	41 N	8 N
	7,37%	30,18%	45,26%	14,39%	2,81%
100	9 N	30 N	109 N	86 N	51 N
	3,16%	10,53%	38,25%	30,18%	17,89%
875	15 N	72 N	121 N	56 N	21 N
	5,26%	25,26%	42,46%	19,65%	7,37%
787	20 N	57 N	123 N	58 N	27 N
	7,02%	20%	43,16%	20,35%	9,47%
990	24 N	92 N	128 N	33 N	8 N
	8,42%	32,28%	44,91%	11,58%	2,81%
753	20 N	86 N	93 N	69 N	17 N
	7,02%	30,18%	32,63%	24,21%	5,96%
520	5 N	21 N	101 N	95 N	63 N
	1,75%	7,37%	35,44%	33,33%	22,11%
170	24 N	58 N	94 N	71 N	38 N
	8,42%	20,35%	32,98%	24,91%	13,33%
577	26 N	82 N	71 N	66 N	40 N
	9,12%	28,77%	24,91%	23,16%	14,04%

Table 37: Cluster 3 – Relative and Absolute Frequencies of JAR Sweetness

- **Preference Group 3 (N=285)**

Product	Definitely less cocoa	Somewhat less cocoa	Just as it is	Somewhat more cocoa	Definitely more cocoa
863	5 N	42 N	178 N	51 N	9 N
	1,75%	14,74%	62,46%	17,89%	3,16%
141	3 N	25 N	170 N	77 N	10 N
	1,05%	8,77%	59,65%	27,02%	3,51%
833	1 N	30 N	180 N	67 N	7 N
	0,35%	10,56%	63,03%	23,59%	2,46%
896	13 N	43 N	143 N	77 N	9 N
	4,56%	15,09%	50,18%	27,02%	3,16%
922	4 N	34 N	164 N	70 N	13 N
	1,40%	11,93%	57,54%	24,56%	4,56%
981	2 N	52 N	154 N	63 N	14 N
	0,70%	18,25%	54,04%	22,11%	4,91%
273	1 N	16 N	126 N	117 N	25 N
	0,35%	5,61%	44,21%	41,05%	8,77%
386	3 N	47 N	156 N	58 N	21 N
	1,05%	16,49%	54,74%	20,35%	7,37%
811	2 N	23 N	141 N	99 N	20 N
	0,70%	8,07%	49,47%	34,74%	7,02%
889	3 N	32 N	157 N	77 N	16 N
	1,05%	11,23%	55,09%	27,02%	5,61%
594	6 N	46 N	153 N	63 N	17 N
	2,11%	16,14%	53,68%	22,11%	5,96%
226	4 N	26 N	152 N	76 N	27 N
	1,40%	9,12%	53,33%	26,67%	9,47%
920	6 N	33 N	140 N	79 N	27 N
	2,11%	11,58%	49,12%	27,72%	9,47%
101	6 N	17 N	129 N	100 N	33 N
	2,11%	5,96%	45,26%	35,09%	11,58%
260	1 N	22 N	95 N	131 N	36 N
	0,35%	7,72%	33,33%	45,96%	12,63%
262	8 N	33 N	126 N	84 N	34 N
	2,81%	11,58%	44,21%	29,47%	11,93%
100	42 N	95 N	125 N	16 N	7 N
	14,74%	33,33%	43,86%	5,61%	2,46%
875	21 N	91 N	111 N	48 N	14 N
	7,37%	31,93%	38,95%	16,84%	4,91%
787	33 N	86 N	127 N	32 N	7 N
	11,58%	30,18%	44,56%	11,23%	2,46%
990	3 N	13 N	85 N	108 N	76 N
	1,05%	4,56%	29,82%	37,89%	26,67%
753	8 N	32 N	67 N	115 N	63 N
	2,81%	11,23%	23,51%	40,35%	22,11%
520	43 N	95 N	92 N	40 N	15 N
	15,09%	33,33%	32,28%	14,04%	5,26%
170	38 N	90 N	75 N	58 N	24 N
	13,33%	31,58%	26,32%	20,35%	8,42%
577	9 N	44 N	38 N	92 N	101 N
	3,17%	15,49%	13,38%	32,39%	35,56%

Table 38: Cluster 3 – Relative and Absolute Frequencies of JAR Cocoa Flavour

▪ Preference Group 3 (N=285)

Product	Definitely less milky	Somewhat less milky	Just as it is	Somewhat more milky	Definitely more milky
863	2 N	18 N	188 N	71 N	6 N
	0,70%	6,32%	65,96%	24,91%	2,11%
141	3 N	22 N	190 N	58 N	12 N
	1,05%	7,72%	66,67%	20,35%	4,21%
833	4 N	21 N	159 N	90 N	11 N
	1,40%	7,37%	55,79%	31,58%	3,86%
896	4 N	18 N	179 N	73 N	11 N
	1,40%	6,32%	62,81%	25,61%	3,86%
922	3 N	23 N	154 N	88 N	17 N
	1,05%	8,07%	54,04%	30,88%	5,96%
981	0 N	24 N	152 N	88 N	21 N
	0%	8,42%	53,33%	30,88%	7,37%
273	2 N	32 N	192 N	44 N	15 N
	0,70%	11,23%	67,37%	15,44%	5,26%
386	1 N	16 N	158 N	90 N	20 N
	0,35%	5,61%	55,44%	31,58%	7,02%
811	2 N	30 N	165 N	70 N	18 N
	0,70%	10,53%	57,89%	24,56%	6,32%
889	1 N	20 N	158 N	84 N	22 N
	0,35%	7,02%	55,44%	29,47%	7,72%
594	2 N	23 N	131 N	103 N	26 N
	0,70%	8,07%	45,96%	36,14%	9,12%
226	1 N	27 N	140 N	91 N	26 N
	0,35%	9,47%	49,12%	31,93%	9,12%
920	4 N	24 N	132 N	96 N	29 N
	1,40%	8,42%	46,32%	33,68%	10,18%
101	2 N	22 N	132 N	96 N	33 N
	0,70%	7,72%	46,32%	33,68%	11,58%
260	14 N	30 N	144 N	71 N	25 N
	4,93%	10,56%	50,70%	25%	8,80%
262	5 N	27 N	106 N	103 N	44 N
	1,75%	9,47%	37,19%	36,14%	15,44%
100	2 N	8 N	56 N	118 N	101 N
	0,70%	2,81%	19,65%	41,40%	35,44%
875	2 N	23 N	81 N	123 N	56 N
	0,70%	8,07%	28,42%	43,16%	19,65%
787	3 N	16 N	75 N	115 N	76 N
	1,05%	5,61%	26,32%	40,35%	26,67%
990	14 N	59 N	132 N	65 N	15 N
	4,91%	20,70%	46,32%	22,81%	5,26%
753	4 N	43 N	79 N	99 N	60 N
	1,40%	15,09%	27,72%	34,74%	21,05%
520	4 N	26 N	52 N	105 N	98 N
	1,40%	9,12%	18,25%	36,84%	34,39%
170	9 N	23 N	60 N	111 N	82 N
	3,16%	8,07%	21,05%	38,95%	28,77%
577	9 N	13 N	31 N	109 N	123 N
	3,16%	4,56%	10,88%	38,25%	43,16%

Table 39: Cluster 3 – Relative and Absolute Frequencies of JAR Milk Flavour

APPENDIX 2

Analysis of Variance and Duncan's Multiple Range Test on 'Just Right %' Ratings

and

p-Value Calculations on Groups of Respondents Who Did Not Evaluate the Products as Just Right

- **Preference Group 1 (N=310)**

Analysis of Variance and Duncan's Multiple Range Test on 'Just Right %' Ratings (per JAR Attribute)

JAR COLOUR APPEARANCE (N=310)

Just Right (%)	Product	Duncan Grouping (sign. level α=0.05)													
77,42	**100**	A													
76,77	**520**	A	B												
72,58	**787**	A	B	C											
71,29	**170**	A	B	C	D										
70,97	**875**	A	B	C	D	E									
69,36	**863**		B	C	D	E									
66,45	**920**			C	D	E	F								
64,52	**889**				D	E	F	G							
63,55	**981**					E	F	G	H						
61,61	**833**						F	G	H	I					
60,65	**594**						F	G	H	I					
59,03	**226**						F	G	H	I	J				
58,07	**922**							G	H	I	J	K			
57,74	**896**							G	H	I	J	K			
56,45	**141**								H	I	J	K			
55,48	**386**									I	J	K			
52,58	**262**										J	K	L		
51,61	**577**										J	K	L		
51,61	**811**										J	K	L		
50,97	**101**											K	L		
47,42	**753**												L	M	
40,97	**260**													M	N
35,48	**273**														N	O
30,97	**990**															O

JAR MELTING MOUTHFEEL (N=310)

Just Right (%)	Product	Duncan Grouping (sign. level α=0.05)						
72,58	**896**	A						
71,29	**863**	A						
68,07	**141**	A						
60,32	**100**		B					
59,68	**920**		B					
59,36	**273**		B					
57,42	**833**		B	C				
57,10	**520**		B	C				
56,45	**594**		B	C				
54,52	**981**		B	C	D			
54,19	**811**		B	C	D			
54,19	**226**		B	C	D			
53,87	**922**		B	C	D			
53,87	**889**		B	C	D			
52,58	**875**		B	C	D			
52,26	**386**		B	C	D			
49,03	**262**			C	D	E		
49,03	**753**			C	D	E		
48,07	**990**				D	E		
47,74	**260**				D	E		
46,13	**787**				D	E	F	
43,23	**170**					E	F	
39,36	**101**						F	
29,03	**577**							G

JAR CREAMY MOUTHFEEL (N=310)										
Just Right (%)	Product	Duncan Grouping (sign. level α=0.05)								
67,10	**896**	A								
66,99	**141**	A								
66,45	**863**	A	B							
61,94	**273**	A	B	C						
59,22	**922**		B	C	D					
56,13	**889**			C	D	E				
55,48	**100**			C	D	E				
55,16	**833**			C	D	E				
54,52	**594**			C	D	E	F			
54,19	**920**			C	D	E	F			
54,19	**811**			C	D	E	F			
52,90	**262**				D	E	F	G		
50,65	**386**					E	F	G	H	
50,65	**981**					E	F	G	H	
50,32	**520**					E	F	G	H	
50,00	**260**					E	F	G	H	
50,00	**753**					E	F	G	H	
49,36	**226**					E	F	G	H	
48,39	**990**					E	F	G	H	
46,45	**875**						F	G	H	
45,48	**787**							G	H	
43,55	**101**								H	
43,23	**170**								H	
25,48	**577**									I

JAR SWEETNESS (N=310)									
Just Right (%)	Product	Duncan Grouping (sign. level α=0.05)							
64,52	**141**	A							
63,55	**896**	A	B						
62,90	**863**	A	B	C					
61,94	**100**	A	B	C	D				
60,65	**922**	A	B	C	D	E			
60,00	**875**	A	B	C	D	E			
58,71	**889**	A	B	C	D	E	F		
58,71	**594**	A	B	C	D	E	F		
58,25	**226**	A	B	C	D	E	F		
58,07	**386**	A	B	C	D	E	F		
57,74	**811**	A	B	C	D	E	F		
57,42	**920**	A	B	C	D	E	F		
56,77	**753**	A	B	C	D	E	F		
55,81	**520**		B	C	D	E	F		
55,48	**787**		B	C	D	E	F		
54,84	**260**			C	D	E	F		
53,87	**262**				D	E	F	G	
53,55	**273**				D	E	F	G	
53,55	**981**				D	E	F	G	
52,90	**833**					E	F	G	
50,65	**170**						F	G	
50,65	**101**						F	G	
46,45	**990**							G	H
41,94	**577**								H

JAR COCOA FLAVOUR (N=310)										
Just Right (%)	Product	Duncan Grouping (sign. level α=0.05)								
65,16	**100**	A								
63,43	**875**	A	B							
63,23	**896**	A	B							
60,97	**863**	A	B	C						
59,68	**787**	A	B	C						
59,68	**594**	A	B	C						
57,42	**520**	A	B	C	D					
56,45	**889**		B	C	D					
55,02	**386**			C	D	E				
54,52	**141**			C	D	E				
53,87	**922**			C	D	E				
53,55	**262**			C	D	E	F			
52,90	**833**			C	D	E	F			
52,58	**981**			C	D	E	F			
51,13	**226**				D	E	F	G		
50,32	**170**				D	E	F	G		
49,36	**920**				D	E	F	G		
47,74	**101**					E	F	G	H	
45,48	**273**						F	G	H	
44,19	**811**							G	H	
41,29	**753**								H	I
40,97	**260**								H	I
34,30	**990**									I J
30,10	**577**									J

JAR MILK FLAVOUR (N=310)											
Just Right (%)	Product	Duncan Grouping (sign. level α=0.05)									
66,13	**141**	A									
64,52	**863**	A	B								
62,26	**896**	A	B	C							
61,94	**273**	A	B	C							
61,61	**922**	A	B	C	D						
61,29	**811**	A	B	C	D	E					
59,36	**920**	A	B	C	D	E	F				
57,10	**889**		B	C	D	E	F	G			
57,10	**981**		B	C	D	E	F	G			
55,81	**260**			C	D	E	F	G			
55,48	**833**			C	D	E	F	G			
54,52	**386**			C	D	E	F	G			
54,37	**990**			C	D	E	F	G			
53,55	**594**				D	E	F	G	H		
53,07	**226**					E	F	G	H		
51,94	**753**						F	G	H	I	
51,61	**262**						F	G	H	I	
51,29	**101**						F	G	H	I	
50,32	**520**							G	H	I	
46,13	**875**								H	I	J
46,13	**100**								H	I	J
44,52	**787**									I	J
40,45	**170**										J K
33,87	**577**										K

Table 40: Cluster 1 - ANOVA/ DUNCAN on Just Right Percentage Responses

- **Preference Group 1 (N=310)**

p-Value Calculations on Groups of Respondents Who Did Not Evaluate the Products as Just Right (per JAR Attribute)

JAR COLOUR APPEARANCE (N=310)			
Product	Too Much Ratings (%)	Not Enough Ratings (%)	p- Value
100	15,17	7,42	0,13380051
863	4,52	26,13	5,9476E-05
141	4,52	39,03	3,1082E-08
594	8,07	31,29	0,00029408
520	15,17	8,06	0,21003962
875	11,93	17,09	0,2649309
787	11,61	15,81	0,44206834
896	5,8	36,45	4,4337E-07
889	6,13	29,36	0,00011684
922	6,45	35,48	4,8736E-06
920	5,49	28,07	6,6188E-05
386	3,87	40,65	1,6183E-09
226	6,13	34,84	8,3646E-06
981	6,77	29,68	6,9602E-05
833	6,77	31,62	2,4343E-05
811	5,81	42,58	1,368E-08
170	10	18,71	0,18493334
273	3,23	61,29	4,7428E-15
262	7,1	40,32	1,0709E-06
101	5,48	43,54	7,5972E-09
753	2,91	49,68	6,124E-13
260	5,17	53,87	1,9067E-11
990	5,16	63,87	4,1192E-14
577	11,61	36,78	0,00022224

JAR MELTING MOUTHFEEL (N=310)			
Product	Too Much Ratings (%)	Not Enough Ratings (%)	p- Value
100	8,71	30,97	0,00029408
863	15,49	13,23	0,85055402
141	14,84	17,09	0,72010013
594	7,1	36,45	8,963E-06
520	8,71	34,19	6,8771E-05
875	10,33	37,09	9,8489E-05
787	10,64	43,23	5,5505E-06
896	14,84	12,58	0,70110804
889	8,38	37,74	9,2477E-06
922	7,42	38,71	1,8315E-06
920	9,03	31,29	0,00067955
386	11,93	35,81	0,000346
226	9,35	36,45	6,5747E-05
981	12,58	32,9	0,0024589
833	10	32,58	0,00094067
811	9,67	36,13	6,5747E-05
170	11,29	45,49	5,3783E-06
273	12,58	28,07	0,016589
262	13,23	37,74	0,00093622
101	11,94	48,71	7,5613E-07
753	15,48	35,48	0,00660045
260	6,77	45,49	1,0326E-08
990	12,59	39,36	0,00019804
577	16,46	54,51	5,854E-06

JAR CREAMY MOUTHFEEL (N=310)			
Product	Too Much Ratings (%)	Not Enough Ratings (%)	p- Value
100	4,51	40	1,7051E-08
863	11,29	22,26	0,08014331
141	8,74	24,27	0,00455138
594	4,84	31,61	1,9416E-06
520	8,38	41,29	1,9647E-06
875	8,71	44,84	2,3684E-07
787	8,06	46,45	1,3843E-07
896	12,58	20,33	0,21532715
889	5,16	38,71	2,4995E-07
922	8,42	32,36	0,00018217
920	9,67	36,13	6,5747E-05
386	6,45	42,91	5,7278E-08
226	9,03	41,61	5,6141E-06
981	12,26	37,1	0,00046976
833	10	34,84	0,00038813
811	9,03	36,77	6,5747E-05
170	10,97	45,8	1,2455E-06
273	12,58	25,48	0,03355244
262	7,1	40	1,0709E-06
101	9,03	47,42	2,5716E-07
753	12,26	37,74	0,00030586
260	9,03	40,96	9,2635E-06
990	10,33	41,29	1,4738E-05
577	11,61	62,91	5,3213E-10

JAR SWEETNESS (N=310)			
Product	Too Much Ratings (%)	Not Enough Ratings (%)	p- Value
100	11,29	26,77	0,01385297
863	28,39	8,71	0,0007529
141	26,13	9,36	0,00598812
594	21,94	19,36	0,75522866
520	9,35	34,83	0,00010604
875	22,9	17,09	0,52239738
787	26,45	18,06	0,29121524
896	25,49	10,97	0,01133098
889	31,61	9,67	0,00043086
922	28,07	11,29	0,0094753
920	29,68	12,91	0,0079159
386	21,29	20,65	1
226	30,74	11,01	0,004324
981	30,33	16,13	0,05407603
833	33,23	13,87	0,00308768
811	30	12,26	0,0079159
170	25,49	23,87	0,77544965
273	34,2	12,26	0,00164149
262	29,68	16,46	0,05407603
101	32,9	16,45	0,02129411
753	28,39	14,84	0,0315395
260	30,96	14,2	0,01609436
990	39,03	14,51	0,00080233
577	28,71	29,36	0,89568321

JAR COCOA FLAVOUR (N=310)			
Product	Too Much Ratings (%)	Not Enough Ratings (%)	p- Value
100	22,58	12,26	0,12144948
863	9,35	29,68	0,00106502
141	9,03	36,45	6,5747E-05
594	10,65	29,68	0,00222143
520	26,45	16,13	0,1641494
875	16,51	20,06	0,61771932
787	16,77	23,55	0,26818725
896	11,61	25,17	0,02881672
889	11,62	31,94	0,00191396
922	10,65	35,48	0,00015642
920	11,93	38,71	9,0215E-05
386	10,03	34,96	0,00038813
226	10,03	38,84	6,1696E-05
981	13,23	34,19	0,00308768
833	12,59	34,52	0,00108854
811	11,61	44,19	8,6994E-06
170	21,94	27,74	0,39160291
273	5,17	49,35	3,8914E-10
262	11,29	35,16	0,00053559
101	7,75	44,52	6,9738E-08
753	5,81	52,9	3,4965E-11
260	5,49	53,55	1,9067E-11
990	5,5	60,2	4,8696E-13
577	8,41	61,49	3,2433E-11

JAR MILK FLAVOUR (N=310)			
Product	Too Much Ratings (%)	Not Enough Ratings (%)	p- Value
100	4,19	49,68	7,054E-11
863	9,35	26,13	0,00598812
141	9,04	24,84	0,01353099
594	9,03	37,42	4,056E-05
520	7,1	42,59	3,6246E-07
875	8,06	45,8	2,3684E-07
787	9,36	46,13	4,3364E-07
896	11,61	26,13	0,02007385
889	11,29	31,61	0,00288725
922	10,65	27,74	0,00509764
920	10,33	30,32	0,00222143
386	9,68	35,8	6,5747E-05
226	10,68	36,25	0,00015642
981	10	32,9	0,00094067
833	9,68	34,84	0,00010604
811	12,58	26,13	0,03355244
170	14,89	44,66	6,5306E-05
273	18,07	20	0,87141468
262	9,68	38,71	1,5222E-05
101	11,62	37,1	0,00022224
753	13,23	34,84	0,00208811
260	15,81	28,39	0,04876677
990	21,68	23,95	0,76599182
577	10,97	55,16	6,9014E-09

Table 41: Cluster 1 – p-Value Calculations on 'Not Just Right' Percentage Responses

- **Preference Group 2 (N=337)**

Analysis of Variance and Duncan's Multiple Range Test on 'Just Right %' Ratings (per JAR Attribute)

JAR COLOUR APPEARANCE (N=337)

Just Right (%)	Product	Duncan Grouping (sign. level α=0.05)								
75,07	**811**	A								
70,92	**753**	A	B							
69,73	**101**	A	B	C						
69,73	**273**	A	B	C						
69,44	**141**	A	B	C						
69,44	**833**	A	B	C						
68,84	**260**	A	B	C	D					
66,77	**920**		B	C	D	E				
64,69	**896**		B	C	D	E	F			
63,99	**922**		B	C	D	E	F			
63,50	**386**		B	C	D	E	F	G		
62,32	**981**			C	D	E	F	G		
61,42	**889**				D	E	F	G		
60,53	**863**					E	F	G		
59,94	**990**					E	F	G		
59,64	**226**					E	F	G		
58,16	**594**						F	G		
56,08	**262**							G		
42,73	**875**								H	
40,95	**577**								H	
37,69	**170**								H	
29,97	**520**									I
29,67	**787**									I
26,71	**100**									I

JAR MELTING MOUTHFEEL (N=337)

Just Right (%)	Product	Duncan Grouping (sign. level α=0.05)											
75,67	**273**	A											
70,62	**896**	A	B										
67,95	**863**		B	C									
65,88	**141**		B	C									
62,61	**990**			C	D								
60,83	**833**			C	D	E							
57,86	**811**				D	E							
54,90	**920**					E	F						
50,30	**981**						F	G					
50,15	**262**						F	G					
48,96	**226**						F	G					
48,07	**922**						F	G	H				
47,18	**753**							G	H	I			
43,32	**101**							G	H	I	J		
43,32	**889**							G	H	I	J		
40,95	**594**								H	I	J	K	
40,36	**260**									I	J	K	
39,76	**386**									I	J	K	
37,69	**875**										J	K	L
33,83	**520**											K	L	M
32,34	**170**												L	M
31,45	**100**												L	M
29,97	**577**													M
28,49	**787**													M

JAR CREAMY MOUTHFEEL (N=337)

Just Right (%)	Product	Duncan Grouping (sign. level α=0.05)								
76,86	**273**	A								
68,55	**990**		B							
65,28	**141**		B	C						
63,80	**863**		B	C						
63,21	**896**		B	C						
60,24	**811**			C						
60,24	**833**			C						
53,12	**920**				D					
50,74	**260**				D	E				
50,15	**922**				D	E				
49,56	**981**				D	E	F			
47,77	**262**				D	E	F			
47,18	**101**				D	E	F			
46,59	**753**				D	E	F			
46,59	**226**				D	E	F			
43,62	**889**					E	F			
42,14	**386**						F	G		
36,20	**594**							G	H	
32,94	**875**								H	
29,67	**170**								H	I
24,33	**787**									I J
23,44	**520**									I J
23,21	**577**									I J
20,77	**100**									J

JAR SWEETNESS (N=337)

Just Right (%)	Product	Duncan Grouping (sign. level α=0.05)								
74,48	**273**	A								
71,22	**990**	A	B							
64,99	**260**		B	C						
62,61	**863**			C	D					
62,02	**141**			C	D					
61,72	**811**			C	D	E				
59,94	**833**			C	D	E	F			
59,64	**920**			C	D	E	F			
59,64	**889**			C	D	E	F			
59,64	**922**			C	D	E	F			
59,35	**101**			C	D	E	F			
58,75	**226**			C	D	E	F	G		
57,86	**981**			C	D	E	F	G		
57,86	**896**			C	D	E	F	G		
56,38	**753**				D	E	F	G		
53,71	**594**					E	F	G		
52,52	**262**						F	G		
51,04	**386**							G		
41,54	**577**								H	
40,65	**875**								H	I
34,13	**787**									I J
32,05	**170**									J
25,22	**520**									K
19,88	**100**									K

JAR COCOA FLAVOUR (N=337)

Just Right (%)	Product	Duncan Grouping (sign. level α=0.05)								
70,92	**273**	A								
64,39	**990**	A	B							
64,10	**811**	A	B							
61,72	**833**		B	C						
60,83	**141**		B	C	D					
60,24	**922**		B	C	D	E				
59,82	**260**		B	C	D	E				
57,86	**863**		B	C	D	E	F			
57,86	**226**		B	C	D	E	F			
57,57	**920**		B	C	D	E	F			
56,97	**101**		B	C	D	E	F			
55,79	**889**			C	D	E	F			
53,41	**753**				D	E	F	G		
52,52	**594**					E	F	G		
51,04	**981**						F	G		
50,15	**896**						F	G		
46,59	**262**							G		
46,29	**386**							G		
38,69	**875**								H	
38,58	**577**								H	
30,86	**170**									I
26,41	**787**									I J
24,33	**100**									I J
22,26	**520**									J

JAR MILK FLAVOUR (N=337)

Just Right (%)	Product	Duncan Grouping (sign. level α=0.05)							
77,15	**273**	A							
76,86	**990**	A							
63,80	**811**		B						
62,91	**260**		B						
59,35	**833**		B	C					
57,86	**141**		B	C	D				
57,27	**101**		B	C	D	E			
53,41	**896**			C	D	E	F		
52,52	**920**			C	D	E	F		
51,34	**226**				D	E	F		
51,19	**922**				D	E	F		
50,74	**863**				D	E	F		
49,85	**889**					E	F		
49,85	**753**					E	F		
47,48	**981**						F	G	
45,70	**262**						F	G	
41,84	**386**							G	
40,65	**594**							G	
28,78	**875**								H
28,19	**577**								H
26,41	**170**								H
19,29	**787**								I
13,35	**100**								I
12,76	**520**								I

Table 42: Cluster 2 - ANOVA/ DUNCAN on Just Right Percentage Responses

- **Preference Group 2 (N=337)**

p-Value Calculations on Groups of Respondents Who Did Not Evaluate the Products as Just Right (per JAR Attribute)

JAR COLOUR APPEARANCE (N=337)			
Product	Too Much Ratings (%)	Not Enough Ratings (%)	p- Value
273	2,96	27,3	8,6799E-07
990	2,37	37,69	1,4934E-09
141	13,35	17,21	0,58466471
811	10,68	14,25	0,54125619
260	8,31	22,85	0,01067384
833	19,59	10,98	0,09873715
896	18,1	17,21	1
863	24,93	14,54	0,10812902
920	22,25	10,98	0,03508203
981	22,85	14,84	0,18774156
922	22,91	13,09	0,13249816
101	16,02	14,24	0,85553555
889	24,63	13,94	0,07295139
753	10,39	18,69	0,13604595
262	27,3	16,62	0,12628947
226	27,6	12,76	0,016589
386	17,8	18,7	0,8679394
594	27	14,83	0,05958389
875	51,04	6,23	5,6762E-10
577	42,14	16,92	0,00058436
787	61,72	8,6	1,8268E-11
170	51,34	10,98	5,7136E-08
100	65,87	7,41	3,845E-13
520	61,72	8,31	1,8268E-11

JAR MELTING MOUTHFEEL (N=337)			
Product	Too Much Ratings (%)	Not Enough Ratings (%)	p- Value
273	6,82	17,51	0,02265584
990	3,85	33,53	1,2331E-07
141	10,68	23,44	0,02430651
811	10,09	32,04	0,00094067
260	6,53	53,12	1,7539E-10
833	8,6	30,56	0,00029408
896	11,28	18,1	0,2649309
863	12,76	19,28	0,21532715
920	6,82	38,28	5,4178E-07
981	8,63	41,07	1,9647E-06
922	4,75	47,18	2,4163E-10
101	7,41	49,26	7,4552E-09
889	5,93	50,74	1,1703E-10
753	13,05	39,76	0,00040954
262	9,79	40,06	9,2635E-06
226	8,31	42,73	6,8671E-07
386	11,87	48,37	7,5613E-07
594	11,87	47,18	1,2416E-06
875	12,16	50,15	1,2144E-06
577	15,72	54,31	1,6525E-06
787	9,79	61,72	7,3353E-11
170	10,09	57,57	4,0421E-09
100	10,98	57,57	2,3616E-09
520	13,36	52,82	7,2372E-07

JAR CREAMY MOUTHFEEL (N=337)			
Product	Too Much Ratings (%)	Not Enough Ratings (%)	p- Value
273	6,23	16,91	0,03468966
990	3,26	28,19	4,6492E-06
141	6,23	28,48	0,00019513
811	5,34	34,42	2,4299E-06
260	6,83	42,44	5,7278E-08
833	7,12	32,64	7,0255E-05
896	12,47	24,33	0,06524534
863	10,39	25,82	0,01133098
920	6,23	40,65	3,1028E-07
981	10,98	39,46	2,3861E-05
922	5,93	43,91	7,5972E-09
101	5,34	47,48	1,2848E-09
889	5,34	51,04	1,1703E-10
753	8,61	44,81	2,3684E-07
262	4,45	47,78	1,3065E-10
226	6,52	46,89	5,8053E-09
386	6,53	51,34	5,6762E-10
594	8,02	55,78	9,7617E-10
875	5,64	61,42	1,4195E-13
577	7,44	69,35	6,418E-14
787	8,91	66,77	1,0099E-12
170	10,09	60,24	8,0048E-10
100	7,42	71,81	1,0591E-14
520	9,5	67,07	4,3344E-12

JAR SWEETNESS (N=337)			
Product	Too Much Ratings (%)	Not Enough Ratings (%)	p- Value
273	16,61	8,91	0,10775214
990	22,26	6,53	0,00371917
141	18,99	18,99	1
811	23,14	15,13	0,25587508
260	18,1	16,92	0,7358788
833	25,82	14,24	0,08069047
896	21,66	20,48	0,87761433
863	18,99	18,4	1
920	20,47	19,88	0,87462931
981	19,29	22,84	0,64396896
922	19,58	20,77	0,87462931
101	21,66	18,99	0,635828
889	21,66	18,7	0,635828
753	20,17	23,44	0,76079164
262	26,7	20,77	0,3816934
226	20,47	20,77	1
386	13,94	35,01	0,00208811
594	19,29	27,01	0,30199561
875	21,66	37,69	0,03634318
577	21,96	36,5	0,04794032
787	22,55	43,32	0,01250255
170	22,26	45,7	0,00674145
100	13,36	66,77	6,4151E-10
520	10,98	63,8	8,9574E-11

JAR COCOA FLAVOUR (N=337)			
Product	Too Much Ratings (%)	Not Enough Ratings (%)	p- Value
273	5,64	23,44	0,00054611
990	5,34	30,27	2,2362E-05
141	16,91	22,25	0,33678364
811	13,35	22,55	0,17546525
260	10,12	30,06	0,00222143
833	23,44	14,84	0,14330665
896	35,61	14,25	0,00380165
863	27,3	14,84	0,04355852
920	21,96	20,47	0,87761433
981	27,01	21,95	0,47087901
922	19,88	19,88	1
101	17,21	25,81	0,22205282
889	21,95	22,25	0,88039582
753	13,95	32,64	0,00453386
262	29,08	24,33	0,58313215
226	21,36	20,77	0,87761433
386	33,53	20,18	0,09837065
594	31,75	15,73	0,01862384
875	47,02	14,29	2,7192E-05
577	18,99	42,44	0,0018681
787	60,24	13,36	2,3071E-08
170	52,82	16,32	9,0951E-06
100	66,47	9,19	7,6588E-12
520	65,28	12,46	5,9177E-10

JAR MILK FLAVOUR (N=337)			
Product	Too Much Ratings (%)	Not Enough Ratings (%)	p- Value
273	8,3	14,54	0,28627872
990	10,68	12,47	0,67763948
141	8,31	33,82	6,8771E-05
811	6,82	29,38	6,9602E-05
260	10,09	27	0,00763208
833	7,42	33,24	4,2277E-05
896	6,23	40,35	3,1028E-07
863	7,42	41,83	3,6246E-07
920	6,53	40,95	1,7717E-07
981	7,12	45,41	6,9738E-08
922	6,54	42,26	1,0087E-07
101	6,83	35,91	2,8289E-06
889	5,93	44,21	4,2099E-09
753	10,39	39,76	2,3861E-05
262	6,82	47,48	3,2565E-09
226	8,6	40,06	3,3053E-06
386	6,52	51,63	3,1582E-10
594	6,53	52,82	1,7539E-10
875	5,04	66,17	1,1902E-14
577	10,98	60,83	4,6446E-10
787	4,16	76,56	2,7578E-18
170	6,23	67,36	3,9473E-14
100	2,96	83,68	9,6728E-23
520	11,87	75,37	4,2114E-13

Table 43: Cluster 2 – p-Value Calculations on 'Not Just Right' Percentage Responses

- **Preference Group 3 (N=285)**

Analysis of Variance and Duncan's Multiple Range Test on 'Just Right %' Ratings (per JAR Attribute)

JAR COLOUR APPEARANCE (N=285)

Just Right (%)	Product	Duncan Grouping (sign. level α=0.05)									
70,88	**833**	A									
70,53	**981**	A									
69,12	**863**	A	B								
68,77	**922**	A	B								
68,07	**896**	A	B	C							
67,61	**889**	A	B	C							
65,61	**811**	A	B	C							
64,21	**594**	A	B	C	D						
64,21	**141**	A	B	C	D						
63,86	**386**	A	B	C	D	E					
63,51	**920**	A	B	C	D	E					
60,35	**226**		B	C	D	E	F				
59,65	**875**			C	D	E	F	G			
55,79	**101**				D	E	F	G	H		
55,44	**100**					E	F	G	H		
54,39	**787**						F	G	H		
51,93	**170**						F	G	H	I	
51,23	**262**							G	H	I	
50,18	**520**								H	I	
44,91	**260**									I	J
43,86	**753**									I	J
41,55	**273**										J
40,35	**577**										J
25,26	**990**										K

JAR MELTING MOUTHFEEL (N=285)

Just Right (%)	Product	Duncan Grouping (sign. level α=0.05)								
73,68	**863**	A								
72,98	**896**	A								
69,47	**141**	A								
60,00	**273**		B							
56,49	**833**		B							
48,77	**226**			C						
48,77	**922**			C						
48,42	**981**			C						
47,37	**386**			C						
47,37	**920**			C						
47,02	**811**			C						
42,81	**262**			C	D					
42,46	**594**			C	D	E				
41,75	**889**			C	D	E	F			
38,95	**100**				D	E	F	G		
36,84	**520**				D	E	F	G	H	
36,14	**990**				D	E	F	G	H	I
34,39	**101**					E	F	G	H	I
34,04	**875**						F	G	H	I
33,33	**753**							G	H	I
32,28	**260**							G	H	I
30,53	**787**								H	I
28,07	**170**									I
12,98	**577**									J

JAR CREAMY MOUTHFEEL (N=285)										
Just Right (%)	Product	Duncan Grouping (sign. level α=0.05)								
68,77	**863**	A								
68,42	**141**	A								
68,07	**896**	A								
66,67	**273**	A								
62,46	**833**	A								
54,04	**922**		B							
53,33	**811**		B							
52,98	**981**		B							
49,12	**386**		B	C						
47,02	**889**		B	C	D					
45,97	**226**		B	C	D	E				
45,97	**920**		B	C	D	E				
42,11	**594**			C	D	E				
39,65	**101**				D	E				
39,30	**262**				D	E				
38,60	**260**					E	F			
37,90	**990**					E	F			
31,23	**875**						F	G		
30,18	**520**							G		
29,12	**787**							G		
28,07	**100**							G	H	
23,86	**753**							G	H	
21,13	**170**								H	
7,02	**577**									I

JAR SWEETNESS (N=285)											
Just Right (%)	Product	Duncan Grouping (sign. level α=0.05)									
68,77	**141**	A									
63,16	**922**	A	B								
62,81	**896**	A	B								
61,75	**386**	A	B	C							
61,05	**273**	A	B	C	D						
60,35	**863**	A	B	C	D						
60,00	**833**		B	C	D						
56,14	**889**		B	C	D	E					
55,09	**811**		B	C	D	E					
54,74	**226**		B	C	D	E					
52,98	**594**			C	D	E	F				
52,98	**981**			C	D	E	F				
52,28	**920**				D	E	F				
49,83	**101**					E	F	G			
49,12	**260**					E	F	G			
45,26	**262**						F	G	H		
44,91	**990**						F	G	H		
43,16	**787**							G	H	I	
42,46	**875**							G	H	I	
38,25	**100**								H	I	J
35,44	**520**									I	J
32,98	**170**										J
32,63	**753**										J
24,91	**577**										K

JAR COCOA FLAVOUR (N=285)											
Just Right (%)	Product	Duncan Grouping (sign. level α=0.05)									
63,03	**833**	A									
62,46	**863**	A	B								
59,65	**141**	A	B	C							
57,54	**922**	A	B	C	D						
55,09	**889**	A	B	C	D						
54,74	**386**	A	B	C	D						
54,04	**981**		B	C	D						
53,68	**594**			C	D	E					
53,33	**226**			C	D	E					
50,18	**896**				D	E	F				
49,47	**811**				D	E	F				
49,12	**920**				D	E	F				
45,26	**101**					E	F	G			
44,56	**787**						F	G			
44,21	**273**						F	G			
44,21	**262**						F	G			
43,86	**100**						F	G			
38,95	**875**							G	H		
33,33	**260**								H	I	
32,28	**520**								H	I	
29,83	**990**									I	J
26,32	**170**									I	J
23,51	**753**										J
13,38	**577**										K

JAR MILK FLAVOUR (N=285)										
Just Right (%)	Product	Duncan Grouping (sign. level α=0.05)								
67,37	**273**	A								
66,67	**141**	A								
65,97	**863**	A								
62,81	**896**	A	B							
57,90	**811**		B	C						
55,79	**833**		B	C	D					
55,44	**386**		B	C	D					
55,44	**889**		B	C	D					
54,04	**922**			C	D	E				
53,33	**981**			C	D	E				
50,70	**260**			C	D	E				
49,12	**226**				D	E				
46,32	**101**					E				
46,32	**990**					E				
46,32	**920**					E				
45,97	**594**					E				
37,19	**262**						F			
28,42	**875**							G		
27,72	**753**							G		
26,32	**787**							G	H	
21,05	**170**							G	H	I
19,65	**100**								H	I
18,25	**520**									I
10,88	**577**									J

Table 44: Cluster 3 - ANOVA/ DUNCAN on Just Right Percentage Responses

- **Preference Group 3 (N=285)**

p-Value Calculations on Groups of Respondents Who Did Not Evaluate the Products as Just Right (per JAR Attribute)

JAR COLOUR APPEARANCE (N=285)			
Product	Too Much Ratings (%)	Not Enough Ratings (%)	p- Value
863	11,58	19,3	0,20048842
141	5,61	30,17	2,2362E-05
833	11,58	17,55	0,2649309
896	7,72	24,21	0,00332689
922	11,23	20	0,14961278
981	8,42	21,05	0,02411954
273	3,52	54,93	2,2599E-13
386	5,96	30,17	1,2913E-05
811	4,56	29,83	6,1649E-06
889	10,21	22,18	0,05010246
594	12,98	22,81	0,08953108
226	12,28	27,37	0,0237027
920	12,98	23,51	0,06524534
101	7,72	36,49	5,2996E-06
260	3,51	51,58	1,5419E-12
262	16,49	32,28	0,02930495
100	40,36	4,21	1,7051E-08
875	28,78	11,58	0,00642658
787	39,3	6,31	5,4178E-07
990	3,15	71,58	7,1574E-18
753	8,07	48,07	4,6882E-08
520	41,05	8,77	1,9647E-06
170	35,79	12,28	0,00071727
577	27,36	32,28	0,6029232

JAR MELTING MOUTHFEEL (N=285)			
Product	Too Much Ratings (%)	Not Enough Ratings (%)	p- Value
863	11,23	15,09	0,55719709
141	9,12	21,41	0,04277395
833	8,07	35,44	4,1934E-05
896	13,68	13,33	1
922	5,96	45,27	2,328E-09
981	9,82	41,76	3,3888E-06
273	10,87	29,12	0,00337785
386	8,77	43,86	4,0393E-07
811	11,22	41,76	3,5888E-05
889	6,32	51,93	3,1582E-10
594	8,07	49,47	2,7169E-08
226	8,07	43,16	6,8671E-07
920	9,82	42,8	2,0378E-06
101	9,12	56,5	2,0492E-09
260	9,12	58,59	6,8115E-10
262	10,88	46,32	7,513E-07
100	9,12	51,93	1,8028E-08
875	10,53	55,44	1,1754E-08
787	10,88	58,59	1,3765E-09
990	10,87	52,98	3,3822E-08
753	15,79	50,88	1,0096E-05
520	11,93	51,23	1,6735E-07
170	9,13	62,81	7,3353E-11
577	18,6	68,42	3,3216E-08

JAR CREAMY MOUTHFEEL (N=285)			
Product	Too Much Ratings (%)	Not Enough Ratings (%)	p- Value
863	9,12	22,11	0,02944937
141	7,72	23,86	0,00332689
833	5,96	31,58	7,4275E-06
896	10,52	21,41	0,07075555
922	7,72	38,25	3,1213E-06
981	10,52	36,49	9,8489E-05
273	9,82	23,5	0,01353099
386	6,66	44,21	3,2437E-08
811	7,72	38,95	1,8315E-06
889	6,31	46,67	1,0326E-08
594	7,72	50,18	4,2367E-09
226	5,96	48,07	3,8914E-10
920	6,31	47,72	3,2565E-09
101	4,91	55,44	9,0845E-13
260	7,37	54,03	4,3221E-10
262	8,42	52,28	5,2057E-09
100	4,91	67,02	8,7358E-16
875	9,48	59,3	3,9141E-10
787	10,18	60,7	8,0048E-10
990	9,47	52,64	1,0507E-08
753	12,99	63,16	1,0023E-09
520	12,28	57,55	3,7422E-08
170	11,27	67,61	6,1183E-11
577	10,17	82,81	3,3047E-15

JAR SWEETNESS (N=285)			
Product	Too Much Ratings (%)	Not Enough Ratings (%)	p- Value
863	26,31	13,33	0,05325191
141	19,29	11,93	0,14961278
833	30,17	9,82	0,00106502
896	23,86	13,33	0,09887175
922	25,96	10,88	0,01133098
981	31,58	15,44	0,01862384
273	27,37	11,58	0,01385297
386	14,03	24,21	0,14330665
811	31,93	12,98	0,00365777
889	30,53	13,34	0,01371819
594	25,62	21,4	0,56006463
226	31,23	14,04	0,01609436
920	33,69	14,03	0,00794273
101	34,03	16,14	0,01534668
260	32,99	17,89	0,03283914
262	37,55	17,2	0,00907334
100	13,69	48,07	7,6652E-06
875	30,52	27,02	0,79136643
787	27,02	29,82	0,89385309
990	40,7	14,39	0,00035528
753	37,2	30,17	0,46381762
520	9,12	55,44	3,5422E-09
170	28,77	38,24	0,22154873
577	37,89	37,2	1

JAR COCOA FLAVOUR (N=285)			
Product	Too Much Ratings (%)	Not Enough Ratings (%)	p- Value
863	16,49	21,05	0,51137578
141	9,82	30,53	0,00067955
833	10,91	26,05	0,01133098
896	19,65	30,18	0,15240777
922	13,33	29,12	0,01952047
981	18,95	27,02	0,23269319
273	5,96	49,82	2,1358E-10
386	17,54	27,72	0,13515645
811	8,77	41,76	1,1636E-06
889	12,28	32,63	0,00365777
594	18,25	28,07	0,18392482
226	10,52	36,14	0,00015642
920	13,69	37,19	0,00093622
101	8,07	46,67	1,3843E-07
260	8,07	58,59	1,7951E-10
262	14,39	41,4	0,00035528
100	48,07	8,07	4,6882E-08
875	39,3	21,75	0,02041471
787	41,76	13,69	0,00011361
990	5,61	64,56	2,2154E-14
753	14,04	62,46	2,3237E-08
520	48,42	19,3	0,00052161
170	44,91	28,77	0,06037004
577	18,66	67,95	5,2937E-08

JAR MILK FLAVOUR (N=285)			
Product	Too Much Ratings (%)	Not Enough Ratings (%)	p- Value
863	7,02	27,02	0,0008214
141	8,77	24,56	0,00455138
833	8,77	35,44	2,5449E-05
896	7,72	29,47	0,00019108
922	9,12	36,84	6,5747E-05
981	8,42	38,25	9,2477E-06
273	11,93	20,7	0,11018417
386	5,96	38,6	1,4052E-07
811	11,23	30,88	0,00288725
889	7,37	37,19	5,2996E-06
594	8,77	45,26	1,3843E-07
226	9,82	41,05	5,6141E-06
920	9,82	43,86	1,2209E-06
101	8,42	45,26	2,3684E-07
260	15,49	33,8	0,00939924
262	11,22	51,58	2,7756E-07
100	3,51	76,84	1,4128E-19
875	8,77	62,81	1,0271E-11
787	6,66	67,02	3,9473E-14
990	25,61	28,07	0,7838463
753	16,49	55,79	2,3973E-06
520	10,52	71,23	1,7993E-12
170	11,23	67,72	6,1183E-11
577	7,72	81,41	2,4284E-17

Table 45: Cluster 3 – p-Value Calculations on 'Not Just Right' Percentage Responses

APPENDIX 3

Mean Values - Overall Liking and JAR Responses

and

Analysis of Variance and Duncan's Multiple Range Test on JAR Differences to the Ideal Point '0'

- **Preference Group 1 (N=310)**

Mean Values - Overall Liking and JAR Responses

Product	Overall Liking	Colour Appearance	Melting Mouthfeel	Creamy Mouthfeel	Sweetness	Cocoa Flavour	Milk Flavour
100	7,92	2,91	3,26	3,42	3,20	2,86	3,55
863	7,57	3,23	2,98	3,13	2,77	3,24	3,19
141	7,51	3,39	3,02	3,16	2,81	3,31	3,18
594	7,36	3,25	3,36	3,44	2,96	3,22	3,36
520	7,34	2,94	3,31	3,40	3,35	2,88	3,44
875	7,27	3,05	3,34	3,47	2,93	3,04	3,46
787	7,27	3,05	3,43	3,49	2,92	3,08	3,47
896	7,26	3,34	2,95	3,07	2,82	3,15	3,17
889	7,22	3,26	3,34	3,41	2,76	3,25	3,23
922	7,21	3,33	3,39	3,30	2,80	3,30	3,22
920	7,21	3,24	3,27	3,35	2,77	3,31	3,27
386	7,18	3,42	3,27	3,45	3,01	3,30	3,33
226	7,15	3,33	3,30	3,39	2,74	3,32	3,28
981	7,04	3,26	3,26	3,30	2,85	3,24	3,30
833	7	3,28	3,25	3,31	2,76	3,29	3,27
811	6,95	3,42	3,30	3,35	2,78	3,40	3,20
170	6,87	3,10	3,45	3,48	3,02	3,10	3,42
273	6,87	3,75	3,17	3,16	2,73	3,57	3,02
262	6,7	3,38	3,32	3,45	2,83	3,30	3,35
101	6,7	3,45	3,47	3,53	2,83	3,46	3,33
753	6,65	3,57	3,27	3,36	2,83	3,60	3,32
260	6,64	3,62	3,49	3,43	2,78	3,61	3,16
990	6,15	3,92	3,35	3,42	2,67	3,77	3,00
577	6,03	3,29	3,61	3,80	2,99	3,78	3,68

Table 46: Cluster 1 – Mean Values

- **Preference Group 1 (N=310)**

Analysis of Variance and Duncan's Multiple Range Test on JAR Differences to the Ideal Point '0'

JAR COLOUR APPEARANCE (N=310)

Means Difference to Ideal	Product	Duncan Grouping (sign. level α=0.05)											
0,09	**100**	A											
0,06	**520**	A	B										
0,00	Ideal Product		B	C									
-0,05	**787**			C	D								
-0,05	**875**			C	D								
-0,10	**170**				D								
-0,23	**863**					E							
-0,24	**920**					E	F						
-0,25	**594**					E	F	G					
-0,26	**889**					E	F	G					
-0,26	**981**					E	F	G					
-0,28	**833**					E	F	G					
-0,29	**577**					E	F	G	H				
-0,33	**226**					E	F	G	H	I			
-0,33	**922**						F	G	H	I			
-0,34	**896**							G	H	I			
-0,38	**262**								H	I	J		
-0,39	**141**									I	J		
-0,42	**386**									I	J		
-0,42	**811**									I	J		
-0,45	**101**										J		
-0,57	**753**											K	
-0,62	**260**											K	
-0,75	**273**												L
-0,92	**990**												M

JAR MELTING MOUTHFEEL (N=310)

Means Difference to Ideal	Product	Duncan Grouping (sign. level α=0.05)							
0,05	**896**	A							
0,02	**863**	A							
0,00	Ideal Product	A							
-0,02	**141**	A							
-0,17	**273**		B						
-0,25	**833**		B	C					
-0,26	**981**		B	C	D				
-0,26	**100**		B	C	D				
-0,27	**920**		B	C	D				
-0,27	**753**		B	C	D				
-0,27	**386**		B	C	D				
-0,30	**811**			C	D				
-0,30	**226**			C	D				
-0,31	**520**			C	D	E			
-0,32	**262**			C	D	E			
-0,34	**875**			C	D	E	F		
-0,34	**889**			C	D	E	F		
-0,35	**990**			C	D	E	F		
-0,36	**594**			C	D	E	F	G	
-0,39	**922**				D	E	F	G	H
-0,43	**787**					E	F	G	H
-0,45	**170**						F	G	H
-0,47	**101**							G	H
-0,49	**260**								H
-0,61	**577**								I

JAR CREAMY MOUTHFEEL (N=310)

Means Difference to Ideal	Product	Duncan Grouping (sign. level α=0.05)							
0,00	Ideal Product	A							
-0,07	**896**	A	B						
-0,13	**863**		B						
-0,16	**273**		B						
-0,17	**141**		B						
-0,30	**981**			C					
-0,31	**922**			C	D				
-0,31	**833**			C	D				
-0,35	**811**			C	D	E			
-0,35	**920**			C	D	E			
-0,36	**753**			C	D	E	F		
-0,39	**226**			C	D	E	F	G	
-0,40	**520**			C	D	E	F	G	H
-0,41	**889**			C	D	E	F	G	H
-0,42	**100**			C	D	E	F	G	H
-0,42	**990**			C	D	E	F	G	H
-0,43	**260**				D	E	F	G	H
-0,44	**594**				D	E	F	G	H
-0,45	**386**					E	F	G	H
-0,45	**262**					E	F	G	H
-0,47	**875**					E	F	G	H
-0,48	**170**						F	G	H
-0,49	**787**							G	H
-0,53	**101**								H
-0,80	**577**								I

JAR SWEETNESS (N=310)

Means Difference to Ideal	Product	Duncan Grouping (sign. level α=0.05)						
0,33	**990**	A						
0,27	**273**	A	B					
0,25	**226**	A	B					
0,24	**889**	A	B					
0,24	**833**	A	B					
0,23	**863**	A	B					
0,23	**920**	A	B					
0,22	**811**	A	B					
0,22	**260**	A	B					
0,20	**922**		B					
0,19	**141**		B	C				
0,18	**896**		B	C	D			
0,17	**101**		B	C	D			
0,17	**753**		B	C	D			
0,17	**262**		B	C	D			
0,15	**981**		B	C	D			
0,08	**787**			C	D	E		
0,07	**875**				D	E		
0,04	**594**					E		
0,01	**577**					E		
0,00	Ideal Product					E		
-0,01	**386**					E		
-0,02	**170**					E		
-0,20	**100**						F	
-0,35	**520**							G

JAR COCOA FLAVOUR (N=310)

Means Difference to Ideal	Product	Duncan Grouping (sign. level α=0.05)							
0,14	**100**	A							
0,12	**520**	A							
0,00	Ideal Product		B						
-0,05	**875**		B	C					
-0,08	**787**		B	C					
-0,10	**170**		B	C					
-0,15	**896**			C	D				
-0,22	**594**				D	E			
-0,24	**981**				D	E			
-0,24	**863**				D	E			
-0,25	**889**				D	E			
-0,29	**833**					E	F		
-0,30	**262**					E	F		
-0,30	**922**					E	F		
-0,31	**920**					E	F		
-0,31	**141**					E	F		
-0,31	**386**					E	F		
-0,33	**226**					E	F		
-0,40	**811**						F	G	
-0,46	**101**							G	
-0,57	**273**								H
-0,60	**753**								H
-0,61	**260**								H
-0,79	**990**								I
-0,79	**577**								I

JAR MILK FLAVOUR (N=310)

Means Difference to Ideal	Product	Duncan Grouping (sign. level α=0.05)									
0,00	Ideal Product	A									
-0,01	**990**	A									
-0,02	**273**	A									
-0,16	**260**		B								
-0,17	**896**		B	C							
-0,18	**141**		B	C	D						
-0,19	**863**		B	C	D						
-0,20	**811**		B	C	D						
-0,22	**922**		B	C	D	E					
-0,23	**889**		B	C	D	E	F				
-0,27	**920**		B	C	D	E	F	G			
-0,27	**833**		B	C	D	E	F	G			
-0,29	**226**			C	D	E	F	G			
-0,30	**981**				D	E	F	G			
-0,32	**753**					E	F	G	H		
-0,33	**386**					E	F	G	H		
-0,33	**101**					E	F	G	H		
-0,35	**262**						F	G	H		
-0,36	**594**							G	H	I	
-0,43	**170**								H	I	
-0,44	**520**								H	I	J
-0,46	**875**									I	J
-0,47	**787**									I	J
-0,55	**100**										J
-0,68	**577**										K

Table 47: Cluster 1 – Product Differences to Ideal

- **Preference Group 2 (N=337)**

Mean Values - Overall Liking and JAR Responses

Product	Overall Liking	Colour Appearance	Melting Mouthfeel	Creamy Mouthfeel	Sweetness	Cocoa Flavour	Milk Flavour
273	8,13	3,26	3,11	3,12	2,92	3,20	3,07
990	7,84	3,43	3,33	3,29	2,82	3,28	3,03
141	7,59	3,03	3,15	3,25	3,02	3,05	3,29
811	7,37	3,03	3,24	3,34	2,92	3,10	3,26
260	7,35	3,16	3,58	3,43	2,98	3,21	3,20
833	7,28	2,90	3,26	3,30	2,86	2,90	3,31
896	7,28	2,99	3,04	3,12	2,99	2,73	3,43
863	7,18	2,88	3,07	3,17	3,00	2,85	3,40
920	7,1	2,86	3,38	3,43	3,02	2,98	3,45
981	7,07	2,90	3,39	3,34	3,04	2,93	3,45
922	7,06	2,88	3,53	3,48	3,03	2,98	3,42
101	7,03	2,97	3,54	3,55	2,98	3,09	3,35
889	6,97	2,88	3,56	3,54	2,97	3,00	3,48
753	6,89	3,09	3,34	3,48	3,05	3,24	3,40
262	6,84	2,89	3,35	3,53	2,95	2,94	3,52
226	6,83	2,83	3,42	3,51	3,02	3,01	3,40
386	6,57	3,02	3,47	3,59	3,28	2,85	3,56
594	6,53	2,87	3,45	3,61	3,17	2,80	3,61
875	5,91	2,44	3,50	3,76	3,23	2,55	3,85
577	5,54	2,69	3,58	3,96	3,20	3,34	3,77
787	5,28	2,27	3,73	3,83	3,31	2,33	4,09
170	5,18	2,46	3,66	3,77	3,34	2,52	3,91
100	4,5	2,14	3,61	3,94	3,84	2,13	4,28
520	4,5	2,23	3,54	3,87	3,82	2,23	4,04

Table 48: Cluster 2 – Mean Values

- **Preference Group 2 (N=337)**

Analysis of Variance and Duncan's Multiple Range Test on JAR Differences to the Ideal Point '0'

JAR COLOUR APPEARANCE (N=337)

Means Difference to Ideal	Product	Duncan Grouping (sign. level α=0.05)											
0,86	**100**	A											
0,77	**520**	A	B										
0,73	**787**		B										
0,56	**875**			C									
0,54	**170**			C									
0,31	**577**				D								
0,17	**226**					E							
0,14	**920**					E							
0,13	**594**					E	F						
0,12	**863**					E	F						
0,12	**889**					E	F						
0,11	**262**					E	F						
0,11	**922**					E	F	G					
0,10	**833**					E	F	G					
0,10	**981**					E	F	G	H				
0,03	**101**						F	G	H	I			
0,01	**896**							G	H	I	J		
0,00	**Ideal Product**								H	I	J		
-0,02	**386**									I	J		
-0,03	**141**									I	J		
-0,03	**811**									I	J		
-0,09	**753**										J	K	
-0,16	**260**											K	
-0,26	**273**												L
-0,43	**990**												M

JAR MELTING MOUTHFEEL (N=337)

Means Difference to Ideal	Product	Duncan Grouping (sign. level α=0.05)											
0,00	**Ideal Product**	A											
-0,04	**896**	A											
-0,07	**863**	A	B										
-0,11	**273**	A	B										
-0,15	**141**		B	C									
-0,24	**811**			C	D								
-0,26	**833**			C	D								
-0,33	**990**				D	E							
-0,34	**753**				D	E							
-0,35	**262**				D	E							
-0,38	**920**					E	F						
-0,40	**981**					E	F	G					
-0,42	**226**					E	F	G					
-0,45	**594**					E	F	G	H				
-0,47	**386**						F	G	H	I			
-0,50	**875**							G	H	I	J		
-0,53	**922**								H	I	J		
-0,54	**101**								H	I	J		
-0,54	**520**								H	I	J		
-0,56	**889**								H	I	J	K	
-0,58	**260**									I	J	K	
-0,58	**577**										J	K	
-0,61	**100**										J	K	
-0,66	**170**											K	L
-0,73	**787**												L

JAR CREAMY MOUTHFEEL (N=337)												
Means Difference to Ideal	Product	Duncan Grouping (sign. level α=0.05)										
0,00	Ideal Product	A										
-0,12	**273**		B									
-0,12	**896**		B									
-0,17	**863**		B	C								
-0,25	**141**			C	D							
-0,29	**990**				D							
-0,30	**833**				D							
-0,34	**981**				D	E						
-0,34	**811**				D	E						
-0,43	**920**					E	F					
-0,43	**260**					E	F	G				
-0,48	**922**						F	G	H			
-0,48	**753**						F	G	H			
-0,51	**226**						F	G	H	I		
-0,53	**262**						F	G	H	I		
-0,54	**889**						F	G	H	I		
-0,55	**101**							G	H	I		
-0,59	**386**								H	I		
-0,61	**594**									I		
-0,76	**875**										J	
-0,77	**170**										J	
-0,83	**787**										J	
-0,87	**520**										J	K
-0,94	**100**											K
-0,97	**577**											K

JAR SWEETNESS (N=337)								
Means Difference to Ideal	Product	Duncan Grouping (sign. level α=0.05)						
0,18	**990**	A						
0,14	**833**	A	B					
0,08	**811**	A	B	C				
0,08	**273**	A	B	C				
0,05	**262**		B	C	D			
0,03	**889**		B	C	D			
0,02	**101**		B	C	D			
0,02	**260**		B	C	D			
0,01	**896**			C	D			
0,00	Ideal Product			C	D			
0,00	**863**			C	D			
-0,02	**226**			C	D			
-0,02	**920**			C	D			
-0,02	**141**			C	D			
-0,03	**922**			C	D			
-0,04	**981**			C	D			
-0,05	**753**				D			
-0,17	**594**					E		
-0,20	**577**					E	F	
-0,23	**875**					E	F	G
-0,28	**386**						F	G
-0,31	**787**							G
-0,34	**170**							G
-0,82	**520**							H
-0,84	**100**							H

JAR COCOA FLAVOUR (N=337)												
Means Difference to Ideal	Product	Duncan Grouping (sign. level α=0.05)										
0,87	**100**	A										
0,77	**520**	A	B									
0,67	**787**		B									
0,48	**170**			C								
0,44	**875**			C								
0,27	**896**				D							
0,20	**594**				D	E						
0,15	**863**					E	F					
0,15	**386**					E	F					
0,10	**833**					E	F	G				
0,07	**981**						F	G	H			
0,06	**262**						F	G	H			
0,02	**920**							G	H	I		
0,02	**922**							G	H	I		
0,00	**889**							G	H	I		
0,00	Ideal Product							G	H	I		
-0,01	**226**							G	H	I		
-0,05	**141**								H	I		
-0,09	**101**									I		
-0,10	**811**									I	J	
-0,20	**273**										J	K
-0,22	**260**											K
-0,24	**753**											K L
-0,28	**990**											K L
-0,34	**577**											L

JAR MILK FLAVOUR (N=337)													
Means Difference to Ideal	Product	Duncan Grouping (sign. level α=0.05)											
0,00	Ideal Product	A											
-0,03	**990**	A											
-0,07	**273**	A											
-0,20	**260**		B										
-0,26	**811**		B	C									
-0,29	**141**		B	C	D								
-0,31	**833**		B	C	D								
-0,35	**101**			C	D	E							
-0,40	**753**				D	E	F						
-0,40	**863**				D	E	F	G					
-0,40	**226**				D	E	F	G					
-0,43	**896**					E	F	G					
-0,43	**922**					E	F	G					
-0,45	**981**					E	F	G					
-0,45	**920**					E	F	G	H				
-0,48	**889**						F	G	H				
-0,52	**262**							G	H	I			
-0,56	**386**								H	I			
-0,61	**594**									I			
-0,77	**577**										J		
-0,85	**875**										J	K	
-0,91	**170**											K	
-1,04	**520**												L
-1,09	**787**												L
-1,28	**100**												M

Table 49: Cluster 2 – Product Differences to Ideal

- **Preference Group 3 (N=285)**

Mean Values - Overall Liking and JAR Responses

Product	Overall Liking	Colour Appearance	Melting Mouthfeel	Creamy Mouthfeel	Sweetness	Cocoa Flavour	Milk Flavour
863	7,74	3,09	3,04	3,14	2,86	3,06	3,21
141	7,68	3,28	3,15	3,20	2,92	3,23	3,19
833	7,62	3,08	3,31	3,29	2,79	3,16	3,29
896	7,55	3,18	3,00	3,13	2,88	3,09	3,24
922	7,38	3,11	3,49	3,37	2,84	3,19	3,33
981	7,27	3,14	3,37	3,32	2,82	3,12	3,37
273	7,2	3,66	3,21	3,18	2,82	3,52	3,13
386	7,12	3,30	3,42	3,45	3,13	3,16	3,39
811	7,07	3,29	3,40	3,39	2,80	3,39	3,25
889	7,06	3,12	3,60	3,52	2,83	3,25	3,37
594	6,95	3,11	3,52	3,56	2,97	3,14	3,45
226	6,79	3,18	3,44	3,57	2,84	3,34	3,40
920	6,55	3,13	3,45	3,54	2,75	3,31	3,43
101	6,48	3,32	3,64	3,72	2,80	3,48	3,48
260	6,31	3,59	3,67	3,62	2,79	3,63	3,21
262	6,05	3,18	3,46	3,59	2,75	3,36	3,54
100	6	2,51	3,56	3,82	3,49	2,48	4,08
875	5,96	2,78	3,57	3,68	2,99	2,80	3,73
787	5,93	2,59	3,62	3,67	3,05	2,63	3,86
990	5,67	4,01	3,54	3,60	2,68	3,85	3,03
753	5,22	3,49	3,53	3,75	2,92	3,68	3,59
520	5,19	2,60	3,51	3,65	3,67	2,61	3,94
170	4,84	2,72	3,74	3,87	3,14	2,79	3,82
577	3,99	3,04	3,85	4,26	3,04	3,80	4,14

Table 50: Cluster 3 – Mean Values

- **Preference Group 3 (N=285)**

Analysis of Variance and Duncan's Multiple Range Test on JAR Differences to the Ideal Point '0'

JAR COLOUR APPEARANCE (N=285)

Means Difference to Ideal	Product	Duncan Grouping (sign. level α=0.05)								
0,49	**100**	A								
0,41	**787**	A								
0,40	**520**	A								
0,28	**170**		B							
0,22	**875**		B							
0,00	**Ideal Product**			C						
-0,04	**577**			C	D					
-0,08	**833**			C	D	E				
-0,09	**863**			C	D	E				
-0,11	**922**			C	D	E				
-0,11	**594**				D	E				
-0,13	**920**				D	E				
-0,13	**889**				D	E				
-0,14	**981**				D	E				
-0,18	**262**					E	F			
-0,18	**896**					E	F			
-0,18	**226**					E	F			
-0,28	**141**						F	G		
-0,29	**811**						F	G		
-0,30	**386**							G		
-0,32	**101**							G		
-0,49	**753**								H	
-0,59	**260**									I
-0,67	**273**									I
-1,01	**990**									J

JAR MELTING MOUTHFEEL (N=285)

Means Difference to Ideal	Product	Duncan Grouping (sign. level α=0.05)												
0,00	**Ideal Product**	A												
0,00	**896**	A												
-0,04	**863**	A	B											
-0,15	**141**		B	C										
-0,21	**273**			C	D									
-0,31	**833**				D	E								
-0,37	**981**					E	F							
-0,40	**811**					E	F	G						
-0,42	**386**					E	F	G	H					
-0,44	**226**						F	G	H	I				
-0,45	**920**						F	G	H	I				
-0,46	**262**						F	G	H	I				
-0,49	**922**						F	G	H	I	J			
-0,51	**520**							G	H	I	J	K		
-0,52	**594**							G	H	I	J	K		
-0,53	**753**							G	H	I	J	K		
-0,54	**990**								H	I	J	K		
-0,56	**100**								H	I	J	K	L	
-0,57	**875**									I	J	K	L	
-0,60	**889**										J	K	L	
-0,62	**787**											K	L	M
-0,64	**101**											K	L	M
-0,67	**260**												L	M
-0,74	**170**													M N
-0,85	**577**													N

JAR CREAMY MOUTHFEEL (N=285)															
Means Difference to Ideal	Product	Duncan Grouping (sign. level α=0.05)													
0,00	Ideal Product	A													
-0,13	**896**		B												
-0,14	**863**		B												
-0,18	**273**		B	C											
-0,20	**141**		B	C	D										
-0,29	**833**			C	D	E									
-0,32	**981**				D	E									
-0,37	**922**					E	F								
-0,39	**811**					E	F								
-0,45	**386**						F	G							
-0,52	**889**							G	H						
-0,54	**920**							G	H	I					
-0,56	**594**							G	H	I					
-0,57	**226**							G	H	I					
-0,59	**262**								H	I					
-0,60	**990**								H	I	J				
-0,62	**260**								H	I	J	K			
-0,65	**520**									I	J	K			
-0,67	**787**									I	J	K			
-0,68	**875**									I	J	K			
-0,72	**101**										J	K	L		
-0,75	**753**											K	L		
-0,82	**100**												L	M	
-0,88	**170**													M	
-1,26	**577**														N

JAR SWEETNESS (N=285)									
Means Difference to Ideal	Product	Duncan Grouping (sign. level α=0.05)							
0,32	**990**	A							
0,25	**920**	A	B						
0,25	**262**	A	B						
0,21	**833**	A	B	C					
0,21	**260**	A	B	C					
0,20	**811**	A	B	C					
0,20	**101**	A	B	C					
0,18	**273**	A	B	C					
0,18	**981**	A	B	C					
0,17	**889**		B	C					
0,16	**226**		B	C	D				
0,16	**922**		B	C	D				
0,14	**863**		B	C	D	E			
0,12	**896**		B	C	D	E			
0,08	**753**			C	D	E	F		
0,08	**141**			C	D	E	F		
0,03	**594**				D	E	F		
0,01	**875**					E	F		
0,00	Ideal Product					E	F		
-0,04	**577**						F	G	
-0,05	**787**						F	G	
-0,13	**386**							G	
-0,14	**170**							G	
-0,49	**100**								H
-0,67	**520**								I

JAR COCOA FLAVOUR (N=285)														
Means Difference to Ideal	Product	Duncan Grouping (sign. level α=0.05)												
0,52	**100**	A												
0,39	**520**		B											
0,37	**787**		B											
0,21	**170**			C										
0,20	**875**			C										
0,00	Ideal Product				D									
-0,06	**863**				D	E								
-0,09	**896**				D	E								
-0,12	**981**				D	E	F							
-0,14	**594**					E	F							
-0,16	**386**					E	F							
-0,17	**833**					E	F							
-0,19	**922**					E	F	G						
-0,23	**141**						F	G	H					
-0,25	**889**						F	G	H					
-0,31	**920**							G	H	I				
-0,34	**226**								H	I				
-0,36	**262**								H	I	J			
-0,39	**811**									I	J			
-0,48	**101**										J	K		
-0,52	**273**											K	L	
-0,63	**260**												L	M
-0,68	**753**													M
-0,82	**577**													N
-0,85	**990**													N

JAR MILK FLAVOUR (N=285)														
Means Difference to Ideal	Product	Duncan Grouping (sign. level α=0.05)												
0,00	Ideal Product	A												
-0,03	**990**	A	B											
-0,13	**273**		B	C										
-0,19	**141**			C	D									
-0,21	**863**			C	D	E								
-0,22	**260**			C	D	E								
-0,24	**896**			C	D	E	F							
-0,25	**811**			C	D	E	F							
-0,29	**833**				D	E	F	G						
-0,33	**922**					E	F	G	H					
-0,37	**889**						F	G	H	I				
-0,37	**981**						F	G	H	I				
-0,39	**386**							G	H	I				
-0,40	**226**							G	H	I				
-0,43	**920**								H	I	J			
-0,45	**594**								H	I	J			
-0,48	**101**									I	J	K		
-0,54	**262**										J	K		
-0,59	**753**											K		
-0,73	**875**												L	
-0,82	**170**												L	M
-0,86	**787**													M
-0,94	**520**													M
-1,08	**100**													N
-1,14	**577**													N

Table 51: Cluster 3 – Product Differences to Ideal

Eidesstattliche Erklärung

Ich versichere, dass ich die vorliegende Arbeit ohne fremde Hilfe selbstständig verfasst und nur die angegebenen Quellen und Hilfsmittel benutzt habe. Wörtlich oder dem Sinn nach aus anderen Werken entnommene Stellen sind unter Angabe der Quelle kenntlich gemacht.

_____ Hamburg, 02. September 2005

Kerstin Jahnke