

Measuring food liking in children: a comparison of non verbal methods

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Abstract

Sensory methods to assess food preference in children have been investigated. Three non verbal methods were used: paired comparison, ranking by elimination and hedonic categorization. In order to assess the reliability of the different methods, three criteria were used: discrimination of products, repeatability of the responses given by children and validity of the methods. One hundred and sixty-nine children aged from 4 to 10 participated in six sessions (three methods tested twice) where they had to evaluate five biscuits dressed with different jams (apricot, banana, lemon, raspberry and strawberry). The products were slightly more discriminated with hedonic categorization than with comparative methods. For the three methods, familiar biscuits are preferred to new products and the color could have also influenced choices made by children. Children aged from 4 to 5 years did not give repeatable results. Children older than 5 made reliable food choices with all three methods. The results are slightly more repeatable with hedonic categorization than with comparative methods. At the end of the experiment, children had to choose a reward among five packets of the biscuits previously tested. The choice of the reward was more consistent with the results of paired comparison and ranking-by elimination, than with the results of hedonic categorization. It is argued that this is due to differences in the use of visual information under the different methods. The color of the products influences the food choices of children more strongly in comparative than in monadic presentation. © 1999 Elsevier Science Ltd. All rights reserved.

1. Introduction

Little is known about the sensory perception of food by children. Much of the research on food for children is carried out on adults. The lack of studies involving children can be partially explained by the limited availability of methodologies to measure food preferences in children. These methods have to be simple in order to be perfectly understandable by young children. At the same time, they must be robust enough to measure food preferences reliably, despite changes in the behavior of the children during the experiments.

Several studies have investigated the acquisition of food acceptance patterns in children through different methods. Intentional food choice has been assessed successfully with children as young as 2 years using the paired comparison method (Birch & Marlin, 1982). Other methods, like ranking by elimination or a simple face scale, have been used with children older than three

years (Birch, 1979a,b, 1980a,b; Johnson, McPhee, & Birch, 1991; Olson & Gemmill, 1981).

Only a couple of studies compare the different methods in terms of discrimination, repeatability, and validity (Kimmel, Sigman Grant, & Guinard, 1994; Kroll, 1990). Kimmel tested paired comparison, hedonic scaling and preference ranking with 2- to 10-year-olds. Children over the age of 2 could reliably perform paired-preference tests. More complex tests, such as hedonic scaling, proved to be reliable with children over the age of 4. In Kimmel et al.'s study, however, the products tested were not the same with the different methods used.

Kroll (1990) assessed the relative merit of the different rating scales that can be used in testing children. A standard hedonic scale, a face scale, a child-oriented verbal scale and paired comparison were used with children between the ages of 5 and 10. The child-oriented verbal scale performed better than the hedonic or face scale in terms of discrimination.

Perception of chemical substances changes throughout the life span. Unlike in adults, no gender effect is observed in children. Koelega and Köster (1974) found

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no gender differences in the olfactory sensitivity of pre-pubescent children. Furthermore, in a review of previous studies (Cowart, 1981) no differences in both gustatory and olfactory perception between prepubescent boys and girls were found. However, the absence of a gender effect on a perceptive level does not imply necessarily that there is no such effect on preference.

The present study envisages to elaborate and to compare three non-verbal hedonic methods in children, using the same stimuli, biscuits in this case. Food choices are assessed in children aged from 4 to 10 years. The three methods used are paired comparison, ranking-by-elimination (Birch, 1979a,b) and a simple categorization method where the child has to associate the biscuit eaten several times per session with one of four proposed faces (dislike very much, dislike, like, like very much).

The methods are compared with regard to their discrimination between products, their repeatability and (to a limited extent) their validity. The latter will be verified in terms of the consistency between the methods and by a comparison of the experimental results with a more natural choice situation. Age and gender effects will also be studied. The cognitive abilities of children may well change over the ages (4–10 years) under study. As mentioned before, biscuits preferences could be different in boys and girls.

2. Material and methods

2.1. Subjects

The sample consisted of 169 children from six different grade levels (82 girls and 87 boys) who attended three different schools in Paris, France. Parents received a consent form which included a clear description of the study. Only those children that returned a form signed by a parent or tutor participated in the study.

The distribution of the children across grades is shown in Table 1.

2.2. Stimuli

Five varieties of biscuits, all of the same shape and dough composition, but dressed with different types of jam, were used in the study. The different biscuits were apricot, raspberry and strawberry, which are commercially available, whereas lemon and banana biscuits

were specially created for the experiment. All jams were presented in their natural colors; banana and lemon biscuits were yellow, whereas strawberry, raspberry and apricot were red and orange respectively. For the familiarization phase (see procedure), curds in the five flavors and colors previously mentioned, were used. In order to reduce the amount of the product consumed over a session, the original biscuits were cut in half. Although the children were asked to simply taste the biscuit, they could eat all of the biscuit if they wanted to. When many different biscuits were to be presented, the children were warned in advance.

2.3. Procedure

Five psychology students were trained to be experimenters. Each experimenter supervised two children at a time. The study took place in a separate room of the school and was especially arranged for the “taste workshop”. Five tables were each divided into two halves by a little pastel-colored screen. Two children were seated at opposite sides of the screen. An experimenter supervised the two children simultaneously by sitting on the side of the table perpendicular to the sides at which the children sat. Thus, the children participated in groups of 10. Each child participated in only one method per session, which lasted on average 15 min. There were three sessions per week during 2 weeks. The second week was a mere repetition of the first one. The order of the methods was counterbalanced for the children according to a MOLS experimental design (Wakeling & MacFie, 1995). In order to have all experimenters equally often in all conditions, the three methods were used in the same order by all experimenters but with different children.

In order to check their understanding, the experimenters familiarized each child with the instructions at the beginning of each session. This was done by giving the instructions for the method that would follow in the main experiment (see below under methods), but using curds instead of biscuits. If the child did not immediately understand, further explanations and exercises were offered.

To assess an aspect of validity, a more natural situation of consumption was created by letting each child choose a packet of biscuits at the end of the last session. The children had the choice between the five previously tasted flavors. Four biscuits of identical flavor were packaged in transparent wrappers. These choices were compared with the experimental data obtained.

2.4. Methods

2.4.1. Paired-comparison

Each child had to choose his favorite biscuit among two. All 10 possible pairs were presented in a random

Table 1
Description of the sample

	Nursery school		Primary school			
	4–5	5–6	6–7	7–8	8–9	9–10
Age	4–5	5–6	6–7	7–8	8–9	9–10
Number of children	28	23	28	24	35	31
Percentage of girls	56.7	29.2	50.0	45.8	51.4	54.8

order, but the presentation of the pair members was counterbalanced for the two children at the same table. The child was instructed as follows: “Each time I will give you two biscuits. I want you to taste them and to show me which one you prefer”. With this method, the children were exposed four times to each biscuit in each session.

2.4.2. Ranking-by-elimination

This method was first used by Birch, 1979a,b). The five biscuits were presented simultaneously and the child received the following instruction: “I want you to taste the five biscuits in front of you and to show me the one you like most”. After tasting and choosing, the child was invited to finish his favorite biscuit. “Now, you will taste again the four remaining biscuits and show me the one you prefer”. This favorite biscuit was then also eaten or, if the child did not want to eat it, eliminated from the choice set, etc., until all biscuits were ranked. With this method, the most preferred biscuit was presented only once per session, whereas the least preferred was presented four times.

2.4.3. Hedonic categorization

In this method, the child must indicate his degree of liking or disliking on a simple scale. Four stylized faces constituted the hedonic categorization scale used for this method. It was explained to the child that he had in front of him funny figures who were smiling or putting on airs because they liked very much, liked, disliked, disliked very much, what they were eating. The children had to point at the face corresponding to their level of liking or disliking while eating the biscuit. In order to assess the intra-session repeatability of the children’s responses, the five products were presented four times in successive blocks. Within these blocks the order of the stimuli was randomized, but remained the same for the successive blocks. Here, as with paired comparison, the children were exposed four times to each product per session.

For the children aged 4 to 5, a simplification of the task was necessary; a scale with two categories (like and dislike) was used, in order to keep their attention during the whole session. No neutral face was proposed. In this way, the child had to decide if the biscuits were liked or not. The forced choice situation made the three methods more comparable. Nevertheless, in contrast to paired comparison and to ranking-by-elimination the child could judge the different biscuits as equal by giving the same score to each product. Hedonic categorization was the only method in which the five stimuli were repeated four times successively within one session. This was not done with paired comparison and ranking by elimination because the consumption of biscuits was already high.

With ranking-by-elimination and hedonic categorization the presentation order of the biscuits was

counterbalanced over children according to MOLS experimental design (Wakeling & MacFie, 1995).

2.5. Data treatment

Since the format of the data differs per method, transformation of the data is necessary in order to compare the methods with regard to product discrimination. Transformation into ranks was considered to be most relevant, because it does not depend on an arbitrary scale and since only two types of results had to be changed: with paired comparison, the number of times each product was chosen was calculated per subject and per session and the resulting score was turned into ranks, with hedonic categorization, the mean of the four judgements for each product was calculated and then turned into ranks. With ranking by elimination, the results did not necessitate any change. Product effects were assessed with the Friedman test and the significance of the differences between products was determined with Friedman’s multiple comparison.

Inter-session repeatability was determined by calculating Kendall’s correlation coefficient for each method by child. With this coefficient, it was not necessary to transform the data for the paired comparison. With hedonic categorization, the mean of the four responses per product and per session was used for the calculation of the rank. Once the correlation was calculated, an analysis of variance for the factor age was carried out. Testing the differences with confidence intervals was used to compare means.

The consistency between methods was assessed using product rankings for the three methods and subsequently calculating an individual Spearman correlation coefficient. The link between the experimental results and a more natural situation was established by the percentage of children who made the same choice in the experimental and the natural situation. To compare the favorite product selected in the experimental situation and the reward finally chosen between methods, chi square was used.

To measure consistency in the paired comparison data, the ratio between the observed proportion of non transitive triplets and the proportion to be expected on the basis of mere chance was calculated for each of the different age groups.

3. Results

3.1. Discrimination of the products within methods

Individual preferences were used to assess the discrimination of the products for each method. Table 2 shows that with each method, banana and lemon are significantly less liked than strawberry, raspberry and

Table 2
Means of ranks of the products per method (1 = most appreciated, 5 = least appreciated)

	Paired preference	Hedonic categorization	Ranking-by-elimination
Apricot	2.67b	2.60b	2.79b
Banana	3.78c	3.85c	3.87
Lemon	3.86c	3.88c	3.68c
Raspberry	2.41ab	2.59b	2.41ab
Strawberry	2.27a	2.07a	2.24a

Within columns, means of ranks sharing the same letter are not significantly different ($p < 0.05$).

apricot biscuits. This is observed for all age groups. Banana and lemon biscuits differed from others biscuits by their flavor, color, and by the fact that those were new products, which were unfamiliar to the children. By contrast, strawberry, raspberry and apricot biscuits were familiar to them, since they are commonly consumed by French children. A possible color effect can also explain this result.

Although the three methods produce very similar results, the products are discriminated slightly better with hedonic categorization (range = 2.07–3.88) than with the other two methods. Hedonic categorization is also the only method that discriminates between the two identically colored red biscuits.

3.2. Repeatability

3.2.1. Inter-session repeatability

Each child participated twice in each method. Table 3 gives the inter session repeatability as measured by the Kendall coefficients.

Inter-session repeatability is found to be slightly higher for hedonic categorization than for the two comparative methods. This result can be partially explained by the fact that with hedonic categorization children could give the same score to different products, whereas this is impossible with ranking-by-elimination, and it was not often observed with paired comparison.

Table 3 also shows that children aged from 4 to 5 are much less repeatable than the other age groups for the three methods. A change in cognitive skills after this age might explain these results. Children aged from 8 to 10 are generally more repeatable than the other age groups. Furthermore, it is remarkable that the 7–8 year olds are particularly instable in their responses and even to a much larger extent than the 5–6 year olds. No difference is found between boys and girls with hedonic categorization and ranking by elimination, but with paired comparison, girls are slightly more repeatable than boys ($F = 3.19, p < 0.0763$). No interaction between age and gender has been found in the three methods.

Table 3
Inter-session repeatability of the three methods (correlation of Kendall)

Age	Paired-preference	Hedonic categorization	Ranking-by-elimination
4–5	0.18a	0.18ab	0.17a
5–6	0.54bd	0.44ab	0.43ab
6–7	0.33abc	0.51bc	0.38ab
7–8	0.29ac	0.21a	0.44b
8–9	0.54d	0.68c	0.43b
9–10	0.47bcd	0.72c	0.50b
Total	0.40	0.50	0.40

Within columns, correlation coefficients sharing the same letter are not significantly different ($p < 0.05$).

3.2.2. Intra-session repeatability

With the hedonic categorization method the five products were tasted four times in the same order.

Table 4 shows that the majority of the children assigns the same category to the same biscuit eaten twice. Successive evaluations are identical for the same product in 63.49% of the responses in session 1 and 77.09% in session 2. The main category changes occur between like very much and like, and between dislike and dislike very much. Changes over two steps, for instance from dislike very much to like or from like very much to dislike are rare (less than 2%). Considering the fact that between the two presentations of the same biscuit, four other biscuits were eaten by the same child, repeatability of the responses seems rather good.

3.3. Validity of the methods

3.3.1. Consistency over methods

The consistency between the results obtained with the three different methods was assessed. As explained above, the data obtained with each method are changed

Table 4
Percentage of responses given to the same biscuit by the same child for two successive presentations in session one and session two

		Following presentation			
		Like very much	Like	Dislike	Dislike very much
<i>Session 1</i>					
Initial presentation	Like very much	35.82	7.82	1.37	1.27
	Like	7.24	11.46	4.70	1.74
	Dislike	1.43	3.65	5.49	3.06
	Dislike very much	0.74	1.22	2.27	10.72
<i>Session 2</i>					
Initial presentation	Like very much	47.22	5.20	0.65	0.85
	Like	5.25	15.01	2.45	0.65
	Dislike	1.10	2.15	4.90	1.70
	Dislike very much	0.75	1.10	1.05	9.95

Session 1: sample size = 1893; session 2: sample size = 1999.

into ranks and the mean of individual coefficients of Spearman has been calculated for each age group (Table 5).

The consistency between paired-comparison and ranking-by-elimination is slightly higher than that of each of those with hedonic categorization. The highest consistency is observed with the children aged from 8 to 10 and no consistency between the three methods is found with children aged from 4 to 5.

3.3.2. Coherence between the experimental data and the final choice

To assess the link between choices made in a natural consumption situation and choices made during the experiments, each child could choose a packet of biscuits to take home. The children had the choice between the five previously tasted flavors. Four biscuits of identical flavor were packaged in transparent wrappers. The child had to choose between one packet of orange colored biscuits (apricot), two packets of yellow colored biscuits (banana and lemon) and two packets of red-colored biscuits (strawberry and raspberry). The red colored biscuits were identical in color, the banana biscuits were of a slightly lighter yellow than the lemon biscuits.

Table 6 shows the relation between the choice made in the experimental situation for the three methods and

the choice of the reward. This table, shows the distribution of children over the choice of the reward given the product chosen in the experimental situation.

For each of the five groups of children that preferred a given biscuit most in the experimental situation, the percentages in which they chose a reward of a given color are presented in this table.

As can be seen from this table, for the comparative methods there is a good consistency between the experimental choice and the reward chosen at the end of the experiment. Of the children who showed the strongest preference for apricot in paired comparison or in ranking the majority (54.1 and 61.9%, respectively) chose indeed the packet with the orange biscuits to take home. For the children who preferred the other biscuits most in the experimental sessions, the same is true: their final choices are also in a large majority for the biscuits with the same color as the one of the biscuit they had most preferred during the experimental session. With hedonic categorization however, the children are less consistent in the reward choice. In the case of an experimental preference for apricot for instance, the children chose in 49.8% of the cases the packet with the red biscuits instead of the one with the orange biscuits which was chosen only in 32.6% of the cases (difference between the methods chi square $p = 0.05$). Furthermore, one observes that the children who had preferred strawberry or raspberry during the experiment with hedonic categorization, chose the red biscuits considerably less (55.4 and 59.9%, respectively) than the children who had preferred them with the two comparative methods (between 69.8 and 79.8%). The difference between methods was significant for strawberry ($p = 0.03$), but not for raspberry. The same holds for the children who initially preferred lemon. Only in the case of an initial preference for banana, are the percentages of the final choice for the yellow biscuits comparable over the three methods. These results suggest that the cognitive factors implicated in paired comparison and ranking by elimination are linked closer together than with those implicated in the hedonic categorization method. In the comparative methods the association between taste and color seems to be stronger.

Table 5
Correlations between the responses obtained with the three methods (Spearman)

Age	Paired-preference/ Hedonic categorization	Paired-preference/ Ranking-by- elimination	Hedonic categorization/ Ranking-by- elimination
4–5	0.23a	0.32a	0.16a
5–6	0.61bcd	0.68bc	0.54bc
6–7	0.50bc	0.61bc	0.65bc
7–8	0.47ab	0.49ab	0.50b
8–9	0.81d	0.69bc	0.74c
9–10	0.70cd	0.76c	0.75c
Total	0.58	0.61	0.58

Within columns, correlation coefficients followed by the same letter are not significantly different ($p < 0.05$).

Table 6
Relation between experimental and reward choice (percentages)

	Experimental choice														
	Apricot			Banana			Lemon			Raspberry			Strawberry		
Colour of the reward Pairs	Yellow	Orange	Red	Yellow	Orange	Red	Yellow	Orange	Red	Yellow	Orange	Red	Yellow	Orange	Red
	22.7	54.1	23.2	76.8	3.6	19.6	63.7	25.7	10.6	19.3	6.0	74.7	15.5	4.6	79.8
Hedonic categorization	17.6	32.6	49.8	70.1	1.3	28.7	53.3	6.3	40.4	28.6	16.1	55.4	24.2	15.9	59.9
Ranking	11.9	61.9	26.2	70.7	0	29.3	71.5	14.0	14.5	22.2	8.0	69.8	13.5	8.6	77.9

Yellow = banana + lemon; orange = apricot; red = raspberry + strawberry.

3.3.3. Transitivity in paired-comparison

Transitivity is defined as follows: if A is preferred to B and if B is preferred to C, then A should be preferred to C. In paired-comparison, transitivity has been assessed in order to check the coherence of the choices made by the children within the sessions. In Fig. 1, the proportion of non-transitive triplets is expressed as a multiple of the proportion to be expected on the basis of mere chance (ratio = proportion of non-transitive triplets observed/proportion of non-transitive triplets expected by chance.)

In general good transitivity is observed. Only the youngest children do not perform well. Their results approach random behavior (a proportion of 1.00), although some of them do very well (zero non transitive triplets). For the other age groups, the results show clearly a good discrimination between the products. The 8 to 9 year olds perform particularly well (6 times as many zero non-transitive triplets as might be expected by chance).

4. Discussion

4.1. Factors influencing discriminability and preference

Although there are no very large differences between the methods with regard to discrimination of the stimuli, it should be noted that only the method of hedonic categorization differentiates between the preferences for the raspberry and strawberry biscuits. Otherwise, the results obtained with all three methods show that the biscuits with strawberry, raspberry and apricot jam

are preferred to those with lemon and banana jam. This might be due to familiarity, since apricot and red fruit biscuits are commercialized and therefore known by the majority of the children, whereas banana and lemon biscuits were specially created for the experiment, and were unfamiliar. Thus, these results could be due to neophobia (Pliner, 1982, 1994), a phenomenon defined as the reluctance to eat novel foods. Furthermore, red colored biscuits (strawberry and raspberry) are preferred to orange biscuits (apricot) whereas yellow biscuits are more often rejected (banana and lemon). This leads to the assumption that children are influenced more strongly by color than by taste in their preferential choices of biscuits. Further study of this assumption is in progress.

Oram et al. (1995) have shown a strong effect of color on drink identification by young children. Walsch, Toma, Tuveson, and Sondhi (1990), investigating color preference and food choice among children, found a significant effect of color which indicated that the order in which children preferred candies was red, green, orange and yellow. Green has not been used in this study, but the order of color preference is coherent with the overall results obtained with the three methods for each age group. Nevertheless, the relationship between color and preference is not a simple one, as becomes clear from the interesting results shown in Table 6 of this study, which will be discussed in more detail below.

4.2. Repeatability

The results of this study show the levels of reliability and the limitations of the three methods. These limitations

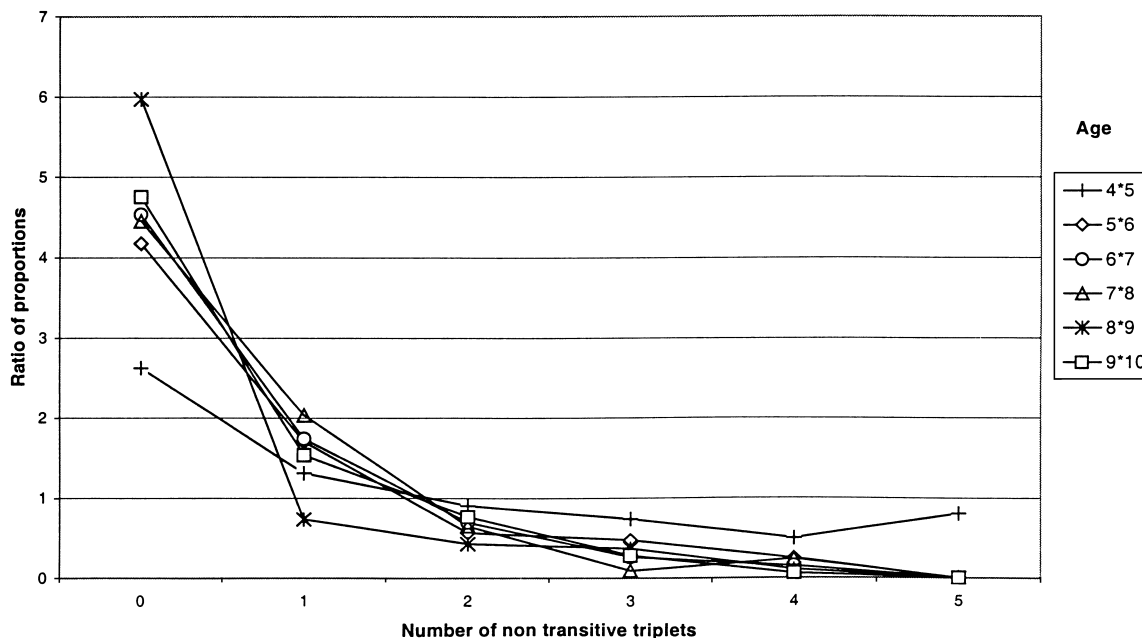


Fig. 1. Ratio between the observed proportion of non-transitive triplets and the expected proportion when choice is at random.

become clear in the children aged from 4 to 5. They show significantly less repeatable results than the other children in all three methods, whereas children aged from 8 to 10 obtained results significantly more repeatable than the overall mean score. In order to explain these observations, two explanations concerning the younger children can be proposed: either children less than 5 years old are truly less stable in their preferences than older children, or the protocols used are not well fitted for this age group. For example, 10 pairs were tested within one session and this may have been too much for their span of attention. Birch and Marlin (1982) used the same number of food stimuli with 2-year-old children, but most of the children were familiarized with the food and the method during several days and then she presented 10 pairs in one to three sessions. In our study, the children tested 14 to 20 biscuits within one session, following a short familiarization task.

In this study, the products used belonged to the same variety. The biscuits were identical, but for the color and taste of the jams. Kimmel et al. (1994), who used even more similar products (cheese low fat, normal...), found no clear preferences and with paired comparison no age effect on repeatability was observed. Nevertheless, paired comparison using photographs of very different products showed a higher level of repeatability associated with an age effect.

Birch (1979a) used preference ranking by elimination on different fruits and found a quite good level of repeatability even with children as young as 3 years. In her study, preschool children had to indicate their liking for eight different fruits like bananas, dates, apples, etc... Although it is obvious that discrimination between products is an essential prerequisite for repeatability, further investigation is needed to establish the links between the degree of discriminability of the stimuli and the level of repeatability. In later studies (Birch, 1980a,b; Birch & Sullivan, 1991). Birch used a hybrid method which combined category and comparative methods and it is well possible that such a combination leads to better discrimination.

In paired comparison girls were slightly, but not significantly, more repeatable than boys. Otherwise, no difference has been found between boys and girls of the same age group. This is in good agreement with the fact that no significant difference of taste perception between boys and girls in childhood has been found by several authors (Enns et al., 1979; Yasaki et al., 1976; Cowart, 1981). Also, no significant difference between prepubescent boys and girls is found in olfactory perception of biological and neutral odors, except for amyl acetate. This exception is partially explained by the experimental conditions mentioned by the authors (Koelega & Köster, 1974). This study shows that not only perception, but also the

preferential choice of biscuits, is similar for boys and girls aged from 4 to 10.

4.3. Factors influencing validity

Two criteria were used to assess the validity of the methods: the consistency between the three methods and the coherence between the choice of the final reward and the preference assessed by each method.

Testing for consistency between methods shows that the correlation between paired comparison and ranking by elimination is slightly higher than between those and hedonic categorization. This can be partially explained by the fact that the first two methods are comparative tasks, where direct observation plays an important role, whereas in hedonic categorization the children have to take a decision based on internally memorized references. This latter distinction may also help to understand why the choice of the reward was more coherent with the experimentally selected product in paired comparison and ranking by elimination than in hedonic categorization. It should be remembered that in the experimental situation biscuits are both seen and tasted, whereas in the choice of the reward, biscuits are only seen. In the comparative methods where always two colors are present, color becomes perhaps the dominant feature by which the preferred biscuit is remembered, but in hedonic categorization, where only one color is present, the favorite biscuit seems to be determined mainly on the basis of taste and less strong a link is established with the visual information. Unlike in comparative methods, in the case of hedonic categorization color has not become the most characteristic feature to remember their preference. This explanation is in good agreement with the fact that only in hedonic categorization the children differentiate between the two identically colored red fruits (Table 2). Obviously taste differences are more important in this type of measurement than in the comparative methods where the color differences play a dominant role.

On the basis of the present results it is difficult to make a definite choice for one of the methods investigated. With the rather large variation in the products tested all three methods lead globally to the same results at the different age levels of the children tested. The monadic method of hedonic categorization performs slightly better in a few respects (discriminability, repeatability and perhaps sensitivity to taste differences) than the two comparative methods.

In conclusion, the results of this study demonstrate that children between ages 5 and 10 can provide relatively reliable and consistent information on food choice by using comparative and monadic methods. For 4–5 year olds, the methods used are not reliable when the products are quite similar and belong to the same variety. Obviously, the reliability of the methods is linked to

the age of the children and to the discriminability of the products used. The more the products are distinguishable, the more reliable are the methods, particularly with children under the age of 5. However, it may well be that the protocol, asking them to judge 20 stimuli, surpassed their span of attention.

The color of the products influences the food choices of children more strongly in comparative than in monadic presentation. With hedonic categorization discrimination on taste seems to be somewhat better and the results are slightly more repeatable than with the comparative methods. Further studies with products that are closer to each other in taste and appearance should be carried out in order to assess differences in the robustness of the methods.

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