

SHORT COMMUNICATION

The Influence of Early Experience with Vanillin on Food Preference Later in Life

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Abstract

A study with 133 adults, who had been breast-fed or bottle-fed after birth, shows that neonatal experience with vanilla influences preferences for other foods in later life.

Introduction

Does very early experience exert a strong influence on later preferences? In 1992 (Pollmer, 1992) it was suggested that the bottle milk fed to newborns and small babies had been flavored with vanilla for many years in Germany. The question arose whether this would influence the preference of bottle-fed persons in later life. It was supposed that such persons would have a greater preference for vanilla-flavored foods. Since there were also some indications from other applied research that men prefer vanilla flavor more than women, it was decided to take this possible factor also into account.

Method

At the occasion of a visitor's day to an 'environmental fair' at the 'Frankfurter Messe', 133 visitors (71 female, 62 male), ranging in age from 12 to 59 years (mean 28.8 years; median 27 years), responded to a questionnaire on food habits and food preferences (see Table 5) in which the following question was hidden: 'Were you breast fed or bottle fed as a newborn?'. Following the questionnaire, they were asked to taste two ketchups and to indicate their preference for one of them. Both ketchups were the same product (Kraft) but to one of them 0.5 g of vanillin per 1 kg ketchup had been added. Ketchup was chosen as the carrier because it is not normally associated with vanillin. Thus it was unlikely that experiences with this combination in other phases of life could interfere. The concentration of vanillin chosen was kept very low, in order to avoid explicit recognition of the vanillin taste. In a preliminary triangular test the difference in taste between the ketchup with and without vanillin was found to be barely detectable ($n = 24$, correct identification

= 14, $P < 0.05$). That such small differences in the triangular test can nevertheless give rise to considerable differences in preference has recently been demonstrated (Lévy and Köster, 1999).

Results

Composition of the group with regard to gender and feeding history

The answers to the hidden question were distributed as shown in Table 1. As can be seen from this table, the numbers of breast- and bottle-fed participants are about equally distributed in the two gender groups.

Gender and ketchup preference

Of the total number of respondents, 83 (62.4%) preferred the pure ketchup and 50 (37.6%) preferred the ketchup with vanillin. Table 2 gives the distributions in the two gender groups. As can be seen from this table, the preferences for

Table 1 Distribution of breast- and bottle-fed participants between the two sexes

	Gender		
	Women ($n = 71$)	Men ($n = 62$)	Total ($n = 133$)
Breast fed	52 (73.2%)	51 (82.3%)	103 (77.4%)
Bottle fed	19 (26.8%)	11 (17.7%)	30 (22.6%)

Fisher exact test: n.s.

Table 2 Distribution of the preference for pure and vanillin added ketchup over the two sexes

Preference	Gender		
	Women (<i>n</i> = 71)	Men (<i>n</i> = 62)	Total (<i>n</i> = 133)
Pure ketchup	43 (60.6%)	40 (64.5%)	83 (62.4%)
Vanillin added	28 (39.4%)	22 (35.5%)	50 (37.6%)

Fisher exact test: *n.s.***Table 3** Distribution of the preference for pure and vanillin added ketchup over the breast fed and bottle fed groups

Preference	Feeding history		
	Breast fed (<i>n</i> = 103)	Bottle fed (<i>n</i> = 30)	Total (<i>n</i> = 133)
Pure ketchup	73 (70.9%)	10 (33.3%)	83 (62.4%)
Vanillin added	30 (29.1%)	20 (66.7%)	50 (37.6%)

Fisher exact test: $P < 0.01$.**Table 4** Age and ketchup preference

Age in years	Preference		
	Pure ketchup	Vanillin ketchup	Total
12–17	11 (73.3%)	4 (26.7%)	15
18–25	26 (61.9%)	16 (38.1%)	42
26–32	22 (56.4%)	17 (43.6%)	39
33–59	24 (64.9%)	13 (35.1%)	37
Total	83 (62.4%)	50 (37.6%)	133

 χ^2 : *n.s.*; $P = 0.69$.**Table 5** Distribution of the answers to the questionnaire in the two groups that differ in ketchup preference

Statement	Pure ketchup (<i>n</i> = 83)		Vanillin added (<i>n</i> = 50)	
	Yes, <i>n</i> (%)	No, <i>n</i> (%)	Yes, <i>n</i> (%)	No, <i>n</i> (%)
Taste is very important to me in food and drink	70 (84.3)	13 (15.7)	44 (88.0)	6 (12.0)
I like to eat out	47 (56.6)	36 (43.4)	33 (66.0)	17 (34.0)
I reduce sugar intake when possible	53 (63.9)	30 (36.1)	39 (78.0)	11 (22.0)
We seldom eat commodity food. We cook our own.	68 (81.9)	15 (18.1)	41 (82.0)	9 (18.0)
When possible I eat low calorie food*	19 (22.9)	64 (77.1)	21 (42.0)	29 (58.0)
As a child I often ate home grown products	52 (62.7)	31 (37.3)	31 (62.0)	19 (38.0)
I use salt as little as possible	55 (66.3)	28 (33.7)	35 (70.0)	15 (30.0)
As an infant I was breast fed by my mother**	73 (88.0)	10 (12.0)	30 (60.0)	20 (40.0)
I suffer from allergy/asthma	18 (21.7)	65 (78.3)	14 (28.0)	36 (72.0)
I consciously buy biodynamic food	32 (38.6)	51 (61.4)	26 (52.0)	24 (48.0)
I consider most industrial food as being unhealthy	57 (68.7)	26 (31.3)	32 (64.0)	18 (36.0)

* $P < 0.05$, ** $P < 0.01$, Fisher exact test.

pure and vanillin-added ketchups are also equally distributed in the two gender groups.

Feeding history and ketchup preference

The repartition of those who prefer the pure ketchup and those who prefer the vanillin-added ketchup over the two groups with different early feeding experiences is shown in Table 3. Of the total number of participants who indicated that they were breast fed ($n = 103$; 77.4% of the total), 73 (70.9%) had a preference for the pure ketchup and only 30 (29.1%) had a preference for the ketchup with vanillin, whereas of those who were bottle fed ($n = 30$; 22.6% of the total) only 10 (33.3%) had a preference for the pure ketchup and 20 (66.7%) showed a preference for the ketchup with added vanillin (Fisher exact test, $P < 0.01$).

To answer the two hypotheses mentioned above, a log-linear model was created, taking the three factors gender, feeding history and ketchup preference into account. It could be shown that only feeding history, not gender, had an influence on the ketchup preference.

Preference and age

To answer the question of whether there was an influence of age on ketchup preference, the participants were divided into four age groups, as shown in Table 4. As can be seen from this table, the incidence of preference for vanillin-added ketchup was lowest in the youngest group and highest in the 26–32 years group, although in general there was no significant difference between age groups (χ^2 , $P = 0.69$).

The questionnaire

The repartition of the full set of answers to the questionnaire over those who preferred the pure ketchup and those who preferred the vanillin added ketchup is shown in Table 5. The answers to only two questions were differently distributed among those who favor the pure and those who

Table 6 Distribution of fear and no fear of calories between the breast- and bottle-fed groups: total group and adults (19–59 years) only

Fear of calories	Feeding history, total group		Feeding history, adults only	
	Breast fed (<i>n</i> = 103)	Bottle fed (<i>n</i> = 30)	Breast fed (<i>n</i> = 103)	Bottle fed (<i>n</i> = 30)
Fear	28 (27.2%)	12 (40.0%)	27 (29.7%)	9 (33.3%)
No fear	75 (72.8%)	18 (60.0%)	64 (70.3%)	18 (67.7%)

Fisher exact test: n.s. across all groups.

favor the vanillin-added ketchup in a significant way—one concerning the desire to reduce calorie uptake and the hidden question about feeding history.

Discussion

In interpreting the results of this small investigation it should be remembered that vanillin is not a common taste in ketchup and it is not surprising that a population which shows a considerable distrust of industrial products (last question in Table 4) prefers the pure ketchup as the most natural. Nevertheless, the dislike for the vanillin-added ketchup is reversed into a preference among those who indicate that they have had vanillin already in the first feeding experiences of their life. At the same time, this group does not differ from the others on all the other attitude questions in the questionnaire, with the exception of the question on calorie uptake. Although with this latter question the difference is more marginal, one might ask the question whether fear for calories and not vanillin liking was the driving factor. In order to check this, the partition of those with and without fear for calories over the two groups with different feeding histories was considered in Table 6.

As can be seen from this table, the fear of calories is

somewhat lower among those who were breast fed than among those who were bottle fed, but the difference is not significant. It can also be shown that the difference found was to a large extent due to the lowest age group (12–18 years, *n* = 15), where 11 of the 12 breast-fed children showed no fear of calories and all of the three bottle-fed children indicated that they avoided calories. When the youngest group was left out the significance of the partition of the responses to question 5 in Table 5 disappeared, but the significance of the results obtained with the question about feeding history remained at the same level ($P < 0.01$). None of the results from the other questions in Table 5 gained significance when the youngest group was left out. Although other explanations of the phenomenon can never be completely excluded, it seems reasonable to conclude that early experience with vanillin is responsible for the attractiveness of ketchup with added vanillin to the bottle-fed group much later in life. Whether this finding is vanillin-specific or would also be true for other taste components (e.g. the particular milk used) in such early experiences cannot be concluded from this experiment.

Apart from its practical implications, this finding has theoretical importance because it sheds light on the question of whether olfactory memory exists independent of verbal memory. Bottle feeding stops long before children speak, let alone try to identify their experiences with words. The results are also a clear demonstration of the effectiveness of unintentional learning in olfaction.

References

- Lévy, C.M. and Köster, E.P. (1999) *The relevance of initial hedonic judgements in the prediction of subtle food choices*. Food Qual. Pref., 10, 185–200.
- Pollmer, U. (1991) *Novel foods: flavour design and malnutrition*. Agro-Ind. High Tech., 2, 43–45.

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