

DESIGN CULTURE(S)

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Volume #2

ARTIFICIAL ARTIFICIAL
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LIFE LIFE
MAKING MAKING
NEW NORMAL
MULTIPLICITY
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RESILIENCE
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THINKING THINKING

**Design Culture(s)
Cumulus Conference
Proceedings Roma 2021**

Volume #2

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Food design as a tool for social development: experimental study in the evaluation of child smell

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Abstract | The study is part of a food design research having the aim to assess the relevance of the olfactory experience on social development and the improvement of public health. Its immediate and primitive connection to the emotions zone establishes an experience of direct connection to motivations and desires, transporting memory to the construction of a moral consciousness about what we smell and eat, contributing to the physiological sanity although conditioned by culture. However, the organoleptic diversity in early life can condition the citizen's flexibility concerning the adoption of innovative practices and, consequently, of a greater aptitude related to public health, environmental sustainability, and, most importantly, cultural creativity. Recognizing the implication between the capacity to adopt new behaviors and the extent of children's organoleptic learning, this exploratory study (inquiry) covering a universe of 20 food smells was carried out in educational establishments, considering children aged 3-5, from polarised socio-economic groups.

The data treatment of the study led us to conclude that the most depressed socio-economic group presents a more reduced organoleptic lexicon than the other group, implying, consequently, a lower aptitude for the creative adaptation to the different, a condition for innovation.

KEYWORDS | FOOD DESIGN, SOCIAL INNOVATION, SMELL, SUSTAINABILITY, EDUCATION

1. Contextualization

“A brain does not suit only to think but to act [...] a living creature is an acting memory.” (Laborit, 1979)¹

“The first brain is the gastro-intestinal one, the second one is the intellectual.” (Damásio, 2019)²

Being invisible, the odour is potentially ambiguous, indexing itself to the memories of each existence. Smell activation in the brain takes place in the emotions’ area. This immediate and primitive connection to the *complex emotions’ building* (Damásio, 2017)³ means that, from the point of view of experience, here lies the structure of one of the first senses that the human being detects which, maybe for that reason, is intrinsically connected to pleasure and the survival instinct. This is not about mere pleasure, but about pleasure as a survival function. Smell relevance and its comparison to other senses has acquired a growing prominence nowadays. According to Herz (2018), for example, in feminine gender prevails the sense of smell, to the detriment of vision, sound or touch, as its attraction highest determinant.

Birnbaum (2014)⁴ observes that the sense of smell is at the origin of life, as an agent, conducting the spermatozoid to the egg, as throughout individuals’ life, as an analytical “chemical laboratory”, preserving individuals from toxic contaminations, thereby constituting a vital biofunctional factor, not only for mammals. However, the sedimentation of a nutritional heritage in human collective unconscious could be in the origin of the universal adherence to certain foods such as wheat (in the form of bread, for example), capable of provoking almost addictive behaviours. The neuroscientist Herz⁵ identifies the sense of smell as one of the main affective stimuli: it is desire’s anticipatory sense, memorizing relevant emotional experiences that will influence the preferences to the rest of our lives (Herz, 2018).

1 (1914-1995), human and animal behaviour Philosopher. Developed the first neuroleptic used in the treatment of schizophrenia.

Laborit applied his theory on the human behaviour to examples in the movie from Alain Resnais, *Mon oncle d’Amérique*, Paris, 1979, where he also plays a role.

2 *Ciclo Diálogos do cérebro – encontros de mentes diversas “O Cérebro, o Corpo, e a Naturalidade da Consciência”*, Fundação Calouste Gulbenkian, 2nd June 2019.

3 António Damásio (1944-), Portuguese Neurobiologist that has developed research in University of Southern California.

4 Molly Birnbaum (1982-), Writer. In the “Empire of Scents” documentary she describes the accident that made her lose the sense of smell and that originated her book “Season to Taste: How I lost My sense of Smell and Found My Way” (HarperCollins Publishers, 2011).

5 Rachel Herz, Psychologist and cognitive Neuroscientist, acknowledged for research on smell psychology, teaches at Brown Universit

The human being is the only animal that does not present a separation between the passage canals of air and food, though experiencing the most exquisite flavour perception⁶ when compared to any other species, given the exceptional anatomy of the throat, mouth and nose trilogy⁷. In addition, the human being is also capable of distinguishing and identifying more than 1000 million odours. According to Ron Winnegrad⁸ (Nguyen, 2014), the sense of smell is intrinsically linked to taste and flavour, evaluating that 90% of flavour is on smell. In that investigation field, the neuroscientist Gordon Shepherd⁹ developed¹⁰, in 2015, the human model of retronasal smell, generated among the throat, the mouth and the nose, activating in the human brain an extensive system of flavours, the origin of a new field of study, the Neurogastronomy¹¹ — which goal is the comprehension of the contributing factors to problems such as obesity and other eating disorders.

With this investigation we aim to understand and assess how can *food design* explore the sense of smell, as a factor of analysis, pleasure, memory and social mobilisation, not disregarding its contribution to social development, sustainability and development of a democratic regime.

6 80% of food flavour derives from its aroma (Philpott, 2015: 156).

Carl Philpott, honorary consultant and surgeon of the smell and taste clinics at James Paget Hospital, Gorleston, England.

7 On the contrary, the dog, belonging to the family of carnivorous mammals and wolf's descendant, has 32 times more olfactory canals than man, that is why "The dog does not let fool itself by television." (Providência, 2018).

8 Perfumer and Director of IFF Perfumery School, New York.

9 (1933-) Neurobiology Professor at Yale School of Medicine, Connecticut, USA.

10 Through 3D printing technology.

11 A new society and an annual meeting were constituted around The International Society of Neurogastronomy. The same principles were applied to wine tasting in Neuroenology.

2. Declination from the relevance of the sense of smell on science

"(...)Quand d'un passé ancien rien ne subsiste, après la mort des êtres, plus frêles mais plus vivaces, plus immatérielles, plus persistantes, plus fidèles, l'odeur et la saveur restent encore longtemps (...), à porter sans fléchir, sous leur gouttelette presque impalpable, l'édifice immense du souvenir." (Proust, 2012:57)

According to Deborah Lupton (1994), memory operates at several levels: personal memory (of personal experiences), personal memory of not experienced things, social or collective memory and, finally, the academic memory (of History and the past). Even though memories are not always individual, given their social character, they lay on a cultural construction that operates beyond the individual level; olfactory memories are, almost always, more intimate and personal experiences. Given the inaccessibility of each individual's intimate memory (even to the individual himself), the success of its repeated convening, triggering an emotional state of happiness might only derive from one of three situations: chance, self-knowledge or the production of new memorable pleasure experiences.

Despite odours are not savoured, they are regularly categorized into sweet, bitter or salty (Herz, 2018). Samakradhamrongthai (2020) is more rigorous in this classification, opening up the range to groups such as spicy, floral, fruity, resinous or balsamic, burnt or bad. When we repeatedly experience an aroma in the context of these flavours during the act of eating, a pairing between flavour and smell properties is established¹². Proving the association learned between smelling and tasting, the psychologist Dick Stevenson¹³ (Herz, 2018) developed a study based on participants that were unaware of the smell of lychees. To one part of the sample a lychees flavoured sweet water was administered; to the other part, lychees flavoured bitter water. The sample that tasted sweet water classified the natural smell of the fruit as sweet, the ones who tasted the bitter water associated the fruit to a bitter flavour.

A detailed analysis of literature allows us to state that for medicinal purposes sweet scents can be used to minimise pain perception. A team of experimental psychologists¹⁴ proved this concept through the painful experience of immersing the arms in water at a very low temperature for the longest time possible. The participants who, during the experience, tolerated more than twice of the time (2 minutes) were exposed to the smell of sweet

12 For example, when one adds vanilla aroma to milk this one will stay substantially sweeter than without it.

13 Professor at the Psychology Department from Sidney University, Australia, whose investigation areas have been evolutionary psychology, food, the act of eating and applied experimental psychology.

14 John Prescott, specialist in experimental psychology, editor of Food Quality and Preference Journal, along with Jenell Wilkie, specialist in psychology, James Cook University, Australia

caramel. The group exposed to a pleasant smell (but not sweet) could only bear for 15 seconds. The origin of the results will be in the caramel smell — based on memory associations to sweet foods — setting off endorphins that will relieve the pain. However, the patient who has never eaten caramel or a sweet flavour (such as crême brûlée or caramel aroma) will not benefit from the same effect. The relationships we have with smells refer to the attributed meaning by our feelings and emotions, emerging from our body or the memory of existential states (more or less positive or negative) autobiographically associated. Experiences with professional perfumers (Scala & Allante, 2017)¹⁵ in order to the research of their extraordinary olfactory abilities¹⁶ called brain development, by associating the feeling to the memory, and not a particular difference of nasal sensors, what conditions their creative work more to the imagination than to experience. From here we highlight the fact that the human sense of smell is a mental phenomenon and not sensory such as the one from dogs, whose caption ability is 10 times higher.

The senses of taste and smell are functionally exercised by the foetus before the birth, through the contact with amniotic fluid. The learning of flavours by the baby, before birth and during breastfeeding, explains how, apart from biological differences, cultural differences are so rooted in food preferences in early stages of life — *influenced choices* (Damásio, 2013). In addition to the taste conditioning through maternal transmission, human behaviour will develop itself oriented by the need of avoiding pain (also used as educational punishment) and repeatedly achieve pleasure (used as educational reward), in a perennial negotiation between the individual's will and the social conditioning of his behaviour. For that reason, the social promotion of a food morality (against sugar, salt, fat and carbohydrates consumption) more and more mobilised through education (against obesity and children's nutritional disorders), by condemning as guilty the "bad foods" forbidding them, will promote them as more desired ones, acquiring a status of *reward*¹⁷. This behavioural standardisation of the *food reward* through the right to the sweet and the fat, as a consolation for the suffered frustration, will follow all the adult life of the human being (Lupton apud James 1990:679-682) and his choices, shaping his food attitude.

15 "Unveiling our senses", documentary directed by Scala & Allante, 2017.

16 The professional perfumers were submitted to tests to evaluate the origin of their extraordinary olfactory abilities, memorising up to 5000 aromas after 10 years of experience, concluding that they were based on brain development and not on the nasal sensors.

17 Damásio reports an experiment with two individuals exposed to the resolution of complex problems. At the end they were offered a food reward and freely choose either a piece of fruit or a tasty slice of cake. The volunteer who solved the problem felt entitled to prefer the cake; the second volunteer chose alternatively the fruit, therefore compensating his low performance by choosing a less pleasant food, even if healthier. The food reward is usually sweet or high in fat, eliciting a feeling of security and indulgence.

A complex correlation of memory, olfactory experience and the individuals' emotional performance is observed, which, conditioned either by their autobiographical experience, or by numerous factors associated to education and to culture, make the olfactory experience depend more on a more psychocognitive system than a physiosensory one, though justifying a scientific approach with a semantic nature.

3. Declination from the relevance of the sense of smell in public health and social development

Considering food as an expression of material culture and, therefore, a communication vehicle with the social past (ethnography), in significant forms (cooking) on the promotion of an individual or emotional experience (anthropology and psychology), it appears that the relationship between food preferences and memories can be considered *symbiotic*, once we tend to recognise as *good* (tasty) those foods that result from a certain culture, adapted to a given territory. Food rituals, seasonality, the foods' supply territory and the elective preferences of each consumer constitute the foundations of a dietary preference not always beneficial, that results from the association between memory and emotion — *we do not favour what is good, but because we like something, we will consider it good* (Espinoza, 2009).

The proposed symbiosis between memory and emotion, declined from Damásio's aphorism, *we cannot have consciousness without feelings, nor feelings without consciousness, — we cannot have emotions without memory, nor memory without emotions* — will constitute a valuable instrument not only for the social development of the most protected classes, but also for its opposite, for the stagnation of the others' more unprotected. Varied food, the openness to new experiences and flavours, the adoption of healthier systems and foods, will inexorably depend on the degree of organoleptic literacy founded in the first years of individuals' life. Individuals submitted to richer experiences will be in better adjustment conditions and, mainly, of innovation. On the contrary, individuals submitted to more limited and poor dietary practices will experience greater difficulties in transcending their own culture, demonstrating themselves less suitable to the new, the food progress and, consequently, to the adoption of healthier and more creative practices, thus prolonging the poverty cycle they inherited. The present acknowledgement elevates children food problem to a social level, being considered as a relevant instrument to guarantee democracy and, mainly, as a contribution to the construction of a society not stratified in social classes. In that sense, the phenomenon must be addressed in the structuring of education and school meals programmes, promoters of a society based on knowledge and social development.

It is, therefore, determinant the role of social policies and the appeal to education so that it contributes to a more conscious and free choice of dietary practices of the human being. As early as the eighteenth century, Savarin believed that *the destiny of nations was hostage of their dietary choices* (Loefer, 2012), supported principle by Marion Nestle (Cavallini &

Tedeschi, 2015) that highlights the importance of the speeches conveyed by state organizations and institutions concerning the approval or repression of decision-making on food.

In a study of Dazeley, Price et al. (2012) on the dietary preferences of British children¹⁸, fat and salty foods were predominantly classified as the most popular ones¹⁹ and vegetables as the less appreciated²⁰. It appears that only 16% of children in preschool ages reach the recommended daily dose of 5 portions of fruit and vegetables (at school and not at home) — cause for alarm, given that it is in the first years that the eating habits are developed which will persist throughout life. This circumstance is common in many countries with educational social policies (integrating the food service), therefore acquiring an authority and urgency which public policies cannot neglect²¹. A detailed analysis of the researches and projects developed in this area highlights that the preference for foods such as fruit and vegetables is only developed as a result of the frequency of their administration; in other words, there is a causal link not only between food diversity and its posterior deliberate choice, but also with the age at which this exposition takes place (at the age of 2, choices and preferences that will be chosen at 8 will disseminate).

That is why it is important that parents and educators, the education institutes²² and the local and national governance should be more and more aware to the necessity of implementing food intervention programmes, promoters of healthier and comfortable citizens, through the increase of fruits and vegetables.

In that sense we introduce the projects that have been developed in the scope of the European network of bio-canteens, a program of the European Union Regional Development Fund involving more than 400 city centres), attached to the Mouans-Sartoux model of good practice, characterised by 100% organic meals, with local products and without waste, associating the food activity to an educational function of awareness concerning food sustainability. In Portugal, the municipality of Torres Vedras has subscribed to this network, raising the quality of the 1300 daily meals (2019-2020), with which supplies its nursery and primary schools, whose funding worths currently EUR1,80, to which adds more EUR1,20 on its own resources, in order to correct the actual cost of EUR 3,00 per meal. to Laura

¹⁸ A sample of 1291 children.

¹⁹ Salt increases the flavour, fat amplifies the flavour and makes some possible textures appealing, acid balances and heat determines food's texture (Nosrat, 2018).

²⁰ In a selection of 115 foods.

²¹ Anonymously, 1 out of 3 children suffer from overweight, 90% of them regularly eating *fast food* (Nuno Queiróz Ribeiro, Melting Gastronomy, 15th November 2019, Alfândega do Porto).

²² Preschools and primary schools.

Rodrigues, Vice-President and Councillor for Education, it is urgent the importance of well-fed and nourished children so that they can develop and grow up better, emphasising that in pandemic times the school meal should be even more cherished for the probable lack of resources or economic conditions in the domestic setting.²³

Having seen that one of the children's barriers to fruits and vegetables consumption is based on lack of knowledge and alienation of those goods, educational projects such as "Let's grow", in United Kingdom (Dazeley, Price et al., 2012), involve children at different phases of agricultural production. After 8 months of involvement, children revealed a natural predisposition to taste the foods previously unknown (vegetables and fruits) and in which culture they were involved, taking part in their plantation, growth and transformation, a determinant factor to the awareness to foods' origin.

The group that took part in the gardening project was observed eating significantly more vegetables at mealtimes at the school canteen, demonstrating that the participation in experiential activities such as the vegetable garden are, possibly, more effective than theoretical classes about healthy eating, in an attempt to encourage children to make healthy eating choices.

The results of the project, analysing the questionnaire applied to children, revealed that, after the camping, the participants were more attentive and available, asking parents for the regular acquisition of fruit and vegetables, confirming the potential of the involvement in outside interactive activities (garden, vegetable garden), originating positive and significant changes on their daily eating system.

Another children nutrition programme with successful results is the *Alliance for a healthier generation* (2011)²⁴, that invests on children's involvement in interactive shared reading, dramatizing vegetables and fruits as characters providing super powers, thus contributing to the modelling of healthy eating behaviours. The repeated exposition to this kind of inciting exercises will obviously involve children, teachers and parents to potentiate the tasting and consumption of new foods and, consequently, incrementing health in their participants (Droog, S., Valkenburg, P. apud Heath, H. & Kennedy, 2014).

The school model from Reggio Emilia¹, internationally recognised since 1991², is one of the most consistent projects in education for the development of eating (and art) skills and knowledge, motto to rethink the way how we eat, how we prepare food, how we socially interact and how we consume, requirements of children's educational system that might favour learning and social development through inclusion, participation and involvement of all its stakeholders, from coordinators to cooks. At Reggio Emilia, the kitchen is at the center

²³ 7º Simpósio Nacional "Promoção de uma Alimentação Saudável e Segura - SPASS 2020 (7th National Symposium "Promotion of Healthy and Safe diet - SPASS 2020), organized and promoted by the Instituto Dr. Ricardo Jorge, on 25th November 2020."

²⁴ Virtual organization involving different communities.

of school, constituting its biggest knowledge laboratory. The eating system is an important means of human affirmation and, for that reason, should be a part of the central core of children's education, transforming school into a space of social connection and sustainability.

The present national eating overview of low offer on fruits and vegetables consumption, excess of industrial modified products (snacks) and the growing eating neophobia in children (mainly for nutritionally good or healthy foods), reflect on the overweight of 30% of children, confirming the urgency of the execution of educational programmes since first childhood, implementing a healthier eating culture, personalised and mainly under the principle of pleasure, the use of the senses, the manipulation of raw materials and the social conviviality (Alessandra *in* Cavallini and Tedeschi, 2005).

4. Organoleptic literacy experiment: a field study with a preschool population

After the case studies about the correlation between children's olfactory emotional experience and the acquired eating acquis that will condition the future of their eating preferences in adult life, and based on the researches by Herz (2018) and Cavallini & Tedeschi (2015), we aimed to develop field study, investigating the correlation between the organoleptic literacy of 34 children (preschool aged from 3 to 5), guaranteeing their gender parity, from different economic classes. The sample characterisation was divided into two social and territorial different groups, from the district of Porto; one (School 1) located in a suburban economically deprived region (Avintes); the other in a residential urban and economically favored area at the center of Porto. The former, the social charity, a foundation, supported by the Portuguese Government, with a monthly subscription maximum cost of 120€, including food, adjustable to the economic means of the household. The meal system of this school is provided by an external company, that ensures its daily delivery.

The latter (School 2), located nearby one of the main central arteries of Porto, is a private entity with a monthly subscription of 350€, including daily eating service (plus the extracurricular complementary activities with a specific payment). Here the meals' system is managed internally and prepared at its kitchen's facilities, under the technical supervision of a Nutritionist.

The experiment consisted in a selection of 10 olfactory samples related to eating, in glass jars properly isolated from light and sight, to which children (8 subjects aged 4 years old, 5 aged 5 years old and 4 aged 3 years old) from each one of the schools, were submitted blindfolded to their smell. The samples were selected according to industrially processed

foods (vanilla, coconut, strawberry yogurts, pineapple and strawberry jellies and chocolate), aromatic herbs and spices (oregano, lemon peel, rosemary and cinnamon).



Figure 1. Samples to smell

Children were submitted to an olfactory survey structured into three questions: identification/recognition (“Do you know what this is?”), appraisal (“Does it smell good or bad?”) and association of the smell to the tasting experience (“What does that remind you? Have you eaten it already?”), complemented by research field notes by the author about each subject characterization and its correlations with the environment. In the group of 17 children from the School 1, one of them presented special educational needs — though his pleasure for eating and mainly his will to taste every sample he smelt —, and other presenting respiratory problems inhibiting the full functioning of the nasal system. It was found that, in this school, children were less open-minded to the experience and its novelty, showing a state of inhibition and apprehension, by contrast with School 2, where the interest and the motivation to implement this essay exceeded the expectations, demonstrated by children’s great enthusiasm and sharing with their colleagues about the obtained results. There were two children that particularly stood out in this group: one for his great olfactory and imaginative skills, deeply smelling every provided sample, as he was sharing his daily routines and eating preferences, revealing a full knowledge about every sample. The other one, eventually supported by familiar stimuli, presents a great sensorial experience with food, revealing experience in kitchen shared practices and food preparation at home (naming his parents), confessing his enjoyment for cooking.

In the Table 1 we present our results in both schools organised in this way: 0 right samples (0 right answers), 10 right samples (10 right answers), more than 50% of right answers (at least 5 or more right answers) and less than half of the right answers (at least 4 or less right answers). From the comparison of the results from both schools we recognise a difference of more than 30% concerning the recognition of a greater number of aromas at school 2, as well as the presence of an individual that identified all the scents to which he was submitted.

Table 1 – Evaluation of the extension of the scents’ asset for a total of 10 olfactory samples

	Was not right in any sample*	Was right in every sample	Was right in ≥ 5 samples	Was right in ≤ 4 samples
School 1	12%	0%	41%	59%
School 2	0%	6%	71%	29%



Figure 2. Child smelling

* including the child with respiratory problems.

In the Table 2 we include both categories and afterwards we divide them between recognition of food and recognition of seasoning. In the first column we include both categories and afterwards we divide them between recognition of food and recognition of seasoning.

Table 2_ Evaluation of recognition of food and seasoning aromas for a total of 20 olfactory samples (10 + 10)

	Recognition of food and seasoning	Recognition of food	Recognition of seasoning
School 1	38%	51%	28%
School 2	54%	54%	49%

Comparing the results in the identification of food and seasoning, for 38% (School 1) against 54% (School 2), one can verify a difference in School 2 of +16% than in School 1. But, comparing only the identification rate of the group "Seasoning", one verifies a difference of +21% from School 2 (49%) than from School 1 (28%).

Comparing now the results in the identification of scents related to processed food (as, for example, sausages, scented yoghurts, chocolate, jellies), the difference of the rate of recognition — although maintaining the advantage for School 2 against School 1 —, is of lower magnitude (3%), which leads us to suppose that the major trait of differentiation comes from a more sophisticated and wider gastronomic culture of the pre-schoolers of School 2, marked by the resort to herbs and spices, granted by a more educated and protective family setting. In figure 3 we present the nature of the identified scents (experience 1 and 2) and the percentages in each sample, on both schools.

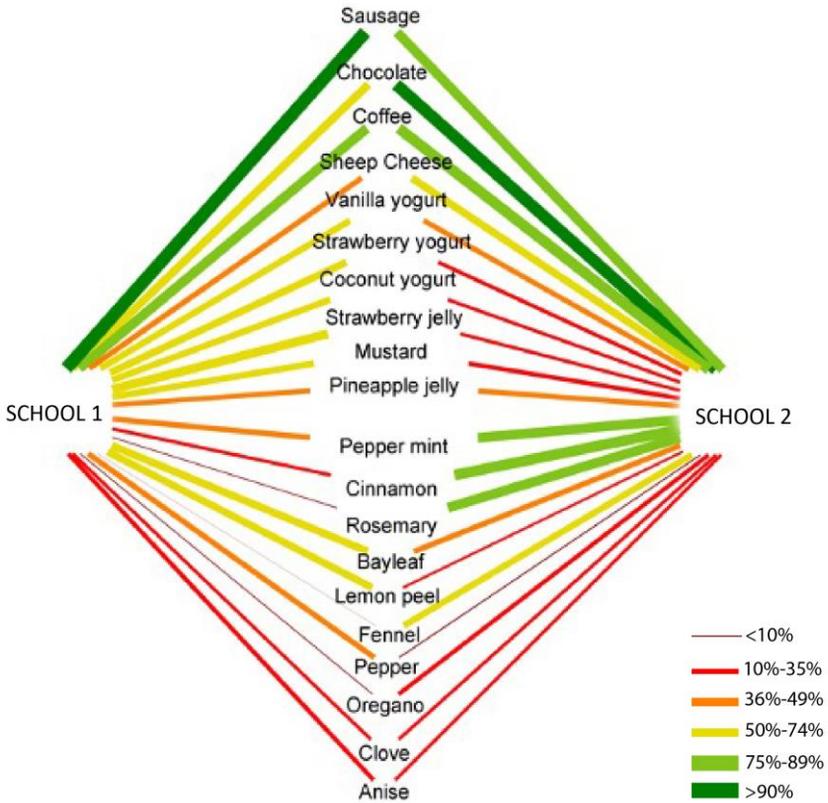


Figure 3. Percentages of each smelled sample in both schools, 1 and 2.

5. Conclusions

Although we had the intention of giving continuity to the empirical work, repeating the inquiry to validate results, the growing difficulties concerning the access due to the sanitary conditioning imposed by the covid19 pandemic would not permit us to proceed with our intent.

After observing the state of the art and the literature review (studies on children food behaviour habits) and understanding the sensorial and neurological correlations between the individuals' autobiographical experiences and the possibility of changing their food

habits, we realised that education, mainly pre-school (Carvalho and Sâmia 2016; Dazeley, Houston-Price, and Hill 2012, 2015; Geller and Dzewaltowski 2009; M. de Droog, Buijzen, and M. Valkenburg 2014), plays a crucial role in building a better future. The openness to the new and the cultural variety of sensory experiences may definitely contribute to the upbringing of more flexible, creative, free (Damásio, 2013), responsible individuals, and, therefore, more suitable for the future and, consequently, more thriving.

Therefore, recognising the implication of the skill to adopt new (food) behaviours, as a result of the acquisition of a bigger organoleptic repertoire, we concluded that the public school may have a decisive responsibility on food education and culture, as we infer from the inquiry conducted in the two schools.

This study data treatment led us to conclude that the most depressed socio-economic group presents a more reduced organoleptic lexicon than the other one, thus implying a lower skill for the creative adjustment to the different, the foundation of innovation.

This experimental study, though incipient, allows to observe other patterns, namely when comparing behaviours between genders, enabling further studies and conclusions to which we intend to give continuity.

The study observes the relevance of the olfactory knowledge, not only as a diagnostic predictor but, and above all, as an enabling feature of a bigger adaptive skill of individuals through the cultural diversity of their repertoires and childhood organoleptic experiences. If the inciting interest of this investigation was guided by a subjective intuition of its author on the acknowledged relevance assigned to smell, it now appears that its impact through food design exceeds the pure sensorial dimension, to acquire a social, sanitary and political ambition.

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