

# Interacting with food: Tasting with the hands

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## ABSTRACT

The focus in the gastronomy and food science literature tends to be squarely on the design of the food/dish itself, rarely stopping to consider how that food makes its way to the mouth of the consumer/diner. The question to be addressed in this narrative historical review concerns how the experience of eating (at least amongst Western diners) changes when they eat with their hands as compared to conventional cutlery. Intriguingly, a number of chefs have recently started to question how their diners interact with the food they serve. At the same time, the latest gastrophysics research has begun to provide empirical evidence concerning the costs and benefits of several different kinds of interaction (e.g., eating with the hands versus with conventional cutlery) on the experience of various foods. In recent years, there has also been something of a relaxation of etiquette guidelines around which foods can be eaten with the hands, coinciding with the general shift toward more informal/casual dining. At the same time, however, the Instagrammability of food served on a diner's hand should not be neglected either as a powerful driver of change in the world of gastronomy and food consumption. Taken together, there would appear to be a move toward new ways of interacting with food, be it in the context of fine dining, or fast food, hence making the interaction with what we eat a topic worthy of further study by designers, chefs, gastrophysicists, food artists, and marketers.

## 1. Introduction

Around the world, many people eat with their hands and have, for that matter, always done so (e.g., Hegde et al., 2018; Permanasari, 2015; Tannahill, 1973). On the contrary, over the past century many developed countries have undertaken the use of western cutlery, chopsticks, and sometimes simultaneously a combination of the two, such as Thailand (Visser, 1991; and see Spence and Piqueras-Fiszman, 2014, for a review of the history of cutlery).<sup>1</sup> In contemporary times, though, there would appear to have been something of a relaxation of etiquette guidelines, matching the shift toward eating out itself becoming more of an informal/casual activity for many (see Houghton, 2014). Another sector of the market that has grown rapidly in recent decades is 'food-to-go' (Muecke, 2004).<sup>2</sup> Once again, though, there tends to be little use of cutlery, with the packaging often serving as the plateware. Simultaneously, the interest in the question of how exactly eating with the hands or using alternative forms of cutlery could change the eating experience has been growing (e.g., Flood and Rosenthal Sloan, 2019; Spence et al.,

2013; Spence and Piqueras-Fiszman, 2014).

The focus in much of the gastronomy and food science literature tends to be squarely on the design of the food/dish itself, with researchers/practitioners (i.e., chefs) rarely stopping to consider how that food makes its way from the plate or bowl to the mouth of the consumer. The question to be addressed in this narrative historical review (see Furley and Goldschmied, 2021, on the narrative style of review) concerns how exactly the experience of eating amongst those Western diners, who are accustomed to eating with conventional cutlery, changes when they eat with their hands instead. Intriguingly, in recent years, a number of chefs have begun to question whether conventional cutlery is necessarily always the best way for their guests to interact with the food they serve (e.g., Michel, 2018; Mugaritz AK, 2016). Designers have also been developing a range of new eating utensils, albeit with some items being more commercially available and/or easily accessible than others (e.g., Fabian, 2011; Jeon, 2012; Spence, 2016; Welch et al., 2016; see also the Playful Spoon on <https://www.jouwstore.com/product-category/cutlery/>; see also Rosenthal Sloan, 2019). At

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<sup>1</sup> Going way back in time, one finds the ancient Fijians apparently eating pretty much everything with their hands except for human flesh, for which, at least according to (Visser 1991, p. 13) they reserved a special wooden fork.

<sup>2</sup> The prediction was that 'food-to-go' would increase by 32% in the UK in 2021 (e.g., see Wells, 2021), following a precipitous (46%) decline during lockdown in 2020.

the same time, however, the Instagrammability of food that is served from/on a diner's hand (e.g., Johnston, 2022) should not be neglected either as a potentially powerful driver of change in the world of gastronomy and food consumption (e.g., Spence, 2017a; Spence et al., 2022).

Gastrophysics refers to the combination of 'gastronomy' and 'psychophysics' (i.e., the systematic study of human perception).<sup>3</sup> In contrast to more traditional approaches to food science (Heldman, 2006; Potter and Hotchkiss, 1998), where the focus has tended to be on the physicochemical structure and shelf stability of foods, the scientific focus in the case of gastrophysics is very much centered on the psychological sciences (including psychophysics, cognitive neuroscience, behavioural economics, anthropology, design, etc.; Velasco et al., 2021). The latest research from the emerging field of gastrophysics has started to provide empirical evidence concerning the benefits of several different kinds of interaction (e.g., eating with the hands versus with conventional cutlery) on the experience of various foods in a range of more-or-less ecologically-valid consumption contexts (Spence, 2017a), e.g., varying from highly-controlled laboratory experiments through to more naturalistic studies conducted in dining rooms and restaurants.

## 2. The history of our interaction with food while eating

For centuries, a knife and trencher plate (a bread bowl) were the standard tools used by the populace to tackle mealtimes in the West (Tannahill, 1973). Various additional items of cutlery slowly came into widespread use over the following centuries. Crumpacker (2006, p. 186) mentions an Englishman who wrote home from abroad to describe the forks that he had seen in Italy. However, when the traveller eventually returned, his acquaintances called him 'Furcifer' or the silly fork carrier for his affected manners. Thomas Coryate first encountered a fork in England in the year 1611. Thereafter, the fork was introduced in North America by John Winthrop, the first governor of Massachusetts Bay colony in the 1630s.<sup>4</sup> However, it took a surprisingly long time before this particular eating utensil was accepted by everyone. According to Wilson, for instance, forks were still being shunned by sailors in the British navy up until around 1900 because they were perceived as effeminate (Wilson, 2012, p. 257).

### 2.1. *I mangiamaccheroni*

According to certain sources, pasta was first introduced to Italy during the Arab conquests of Sicily in the 9th century AD, and by the 12th century, the Italians had learned from the Arabs methods for drying pasta to preserve it while traveling. Further support for this theory can be found by the fact that, in many old Sicilian pasta recipes, there are Arab gastronomic introductions (see Serventi and Sabban, 2002, on the history of pasta). By the 16th Century, due to its cost, it was eaten primarily by wealthy Italians. However, by the 17th Century, as the price of durum wheat fell (here one should not neglect the impact on prices of innovations in milling), and meat and vegetable prices increased rapidly, pasta came to be one of the filling foods consumed by the urban poor who soon became known as *i mangiamaccheroni*, or the macaroni-eaters (see Winke, 2019; in *Italy Magazine*). During the 18th Century, the Neapolitan working class were often to be found eating handfuls of long strands of spaghetti (see Winke, 2019). Served direct from the hot water in which it was cooked, saucy fingers were presumably not a problem for those who chose to, or perhaps had no choice

but to, eat in this way. This early form of street food, which was especially popular in the working class districts of central Naples, became something of a tourist attraction, a tradition that lasted well into the 19th Century. Indeed, the *mangiamaccheroni* were often depicted in paintings, photos, and postcards (see Fig. 1). Intriguingly, this traditional method of eating pasta has inspired at least one contemporary food artist, Giulia Soldati, in one of her edible food performances (see <https://giuliasoldati.com/Mangiamaccheroni> (see also Anonymous, 1982)).

### 2.2. On the expansion of cutlery in the Victorian era

In 1897, Mrs C. E. Humphry wrote in her book *Manners for Men* that only "bread, biscuits, olives, asparagus, celery and bonbon" may be "touched with the fingers" (as quoted in Cloake, 2022; see also Post, 1922). It was at around this time that cutlery sets for the upper classes in the Western world<sup>5</sup> reached their maximum size, in some cases approaching somewhere close to 100 items. There were numerous utensils specifically designed for particular foods, such as chocolate muddlers, tomato servers, and olive fork/spoons (see Brown, 2001; Himsworth, 1953; Petroski, 1994, p. 131). Cutlery sets have though slowly been decreasing in size (i.e., in terms of the number of separate items they include) ever since. In part, this presumably reflects the fact that one would need an army of servants to keep the silverware free from tarnish (not to mention the problem that silver cutlery is not dishwasher-friendly). More recently, the high cost of silver has sometimes led to the replacement of silver service with stainless steel (e.g., Tapsfield, 2017), especially given the amount of cutlery (though, as it happens, especially spoons) that happen to be stolen (e.g., Lim et al., 2005; Tapsfield, 2017).

The typical reaction of people to being confronted with a wide array of cutlery has changed from one of being impressed and/or intimidated through to one of irritation. The latter reaction was highlighted when



Fig. 1. As the price of wheat dropped and that of meat and vegetables rose, the Neapolitan working classes increasingly shifted their diet to past during the 17th and 18th Centuries. This was typically consumed by hand, and by in one go. For a while, this became something of a tourist attraction, and appeared in a number of early paintings. [Napoli, mangiamaccheroni, photo credit: wikimedia commons].

<sup>3</sup> Though see Hinchliffe (2015) and Pedersen et al. (2021) for a couple of other uses of the term.

<sup>4</sup> Prior to the introduction of the fork, more food would have been eaten with the hands, with napkins being used to keep the hands clean (Elias, 2005). Spoons also became increasingly popular during this period (Bohannon, 1995; Emery, 1976).

<sup>5</sup> Note that the West in this review, and in the vast majority of the underpinning literature reviewed herein is based on Anglo-Saxon sources.

Alan Ducasse opened his restaurant ADNY in New York in 2000. According to Steinberger (2010, p. 168), diners were discomfited by being offered a dozen different ornate knives with which to cut their meat. As the New York magazine critic, Gael Greene, put it: “I’m not really amused being forced to choose my knife or my pen just so the house can show off how many it has assembled ... It’s vulgar” (Greene, 2000). And, taking things even further, it has been suggested that the younger generation may nowadays be shunning the use of knives altogether, as they shift to a range of more informal eating habits (Delgado, 2015).

### 2.3. The futurist challenge to cutlery

In the 1930s, Italian Futurists such as the legendary F. T. Marinetti started to question the use of cutlery. In *The Futurist Cookbook*, Marinetti describes a signature Futurist dish by the name of *Aerofood* (Marinetti, 1932/2014). Pieces of olive, fennel, and kumquat were to be eaten with the right hand while the left hand caressed swatches of sandpaper, velvet, and silk.<sup>6</sup> The Futurists were especially interested in the notion of ‘syn-tactilismo’ – which they considered a kind of synaesthetic connection between felt textures and the tastes/flavours of food. Recently, studies have confirmed that the majority of people do indeed appear to share the same consensual crossmodal mappings (or correspondences) between specific textures and tastes. The demonstration of such connections between texture and taste confirms the Futurist’s early intuitions concerning the existence of meaningful connections between these senses. Furthermore, the research increasingly shows that people’s multisensory experience of everything from coffee (Carvalho et al., 2020) to wine (Wang and Spence, 2018), and from biscuits (Biggs et al., 2016; Piqueras-Fiszman and Spence, 2012) through to water (Risso et al., 2019) can all be significantly affected by changing the haptic texture that people happen to be feeling concurrently (cf. Van Rompay and Groothedde, 2019).

Notice how such findings provide one (of by now several) explanations for why it should be that eating with the hands might affect the multisensory tasting experience. In this case, it is the crossmodal influence of texture (i.e., of a surface that has a different feel from the typical association we have with cutlery) on taste, aroma, and/or flavour sensations that is key.<sup>7</sup> Bear in mind, though, that such crossmodal transfer effects might well influence the hedonic response to food and/or at the same time bias the perceived sensory-discriminative properties of the food due to the existence of specific crossmodal correspondences. There are likely to be several relatively independent factors influencing the way in which diners respond to the material properties of cutlery: These include everything from the ostentation that may be associated with the use of certain expensive materials (e.g., consider the impression made by gold cutlery; Aldersey-Williams, 2011; cf. Ariely, 2008; Carvalho and Spence, 2021) through to the way in which the cutlery reacts with the food itself. For instance, steel knives may react with fish, which is often aggravated by the addition of lemon juice (Petroski, 1994, p. 149). Various metals have also been shown to convey distinct gustatory properties, as well as any taint that may happen to be conveyed by different metals to the food that people eat (Piqueras-Fiszman et al., 2012). The research also reveals that people can sometimes taste different metals directly by licking them (Laughlin et al., 2009, 2011;

<sup>6</sup> At the same time, the diners were to be blasted with a giant fan (preferably an aeroplane propeller) while waiters sprayed them with the scent of carnation, all to the strains of a Wagner opera (see Spence, 2017a).

<sup>7</sup> Though note that due to the phenomenon of ‘distal attribution’ (Holmes et al., 2004), people typically feel what is happening at the end of a tool, rather than necessarily being aware of the feel of the tool directly against their skin. Nevertheless, when an individual first picks up cutlery, their impression presumably relates to its weight, temperature, and texture (or feel), which may be more or less as expected.

Miodownik, 2008; see also Howes et al., 2014).<sup>8</sup>

### 3. Etiquette guidelines and the rise of informal dining

A decade ago, in their *Guide to Etiquette*, DeBrett’s relaxed the guidelines around the foods such as pizza, chicken wings, spare ribs, and ice-cream cones that could legitimately be eaten by hand at informal gatherings in polite society (see Anonymous, 2012; Furness, 2012, for press reports). It is, however, worth bearing in mind that outside of society gatherings, the majority of fast food is and, in fact, has always been, eaten with the hands. As various commentators have been only too keen to point out (see Michel, 2018, writing in *Mold Magazine*), it surely cannot be mere coincidence that the world’s most popular food, the burger has been held in the hands since the earliest days of McDonald’s.<sup>9</sup> Though, here one might also want to consider also tacos, tortillas, wraps, and wings (Shannon-DiPietro, 2009). There have been occasional exceptions, as when McDonald’s France trialed cutlery for those dining-in on its gourmet burger to try and add a little class to the experience (Hosie, 2017). Meanwhile, in 2016, KFC introduced ‘finger condoms’, or at least that is how they were described in the British press, to prevent diners who were eating with their hands from getting their fingers covered in sauce (Davies, 2016). Perhaps unsurprisingly, though, the trend did not catch on, presumably due, at least in part, to the unfortunate name given to these new hand sheaths. At the same time, however, the design solution would also seem to run counter to the Colonel’s iconic slogan: ‘Finger lickin’ good’. However, as has been mentioned already, these remain as nothing more than rare exceptions to the generalization that fast food is mostly eaten with the hands.

### 4. The instagrammability of food served on the hand

A recent trend at certain high-end restaurants involves the spooning of small mounds of caviar directly onto the back of the guest’s hands. These caviar bumps have proved to be something of an Instagram sensation (Johnston, 2022, writing in a newspaper piece). In a way, perhaps, one can think of this as a simple extension of the rise in unusual plateware (see Spence, 2017a). The innovative NY chef, Jehengir Mehta (<https://natfluence.com/interview/jmehta/>), plated the food for one of the dishes directly on the back of the invited journalists’ hands at the US press launch of the book *Gastrophysics: The New Science of Eating* (Spence, 2017a) (see Fig. 2). In fact, Mehta has been known to go even further when hosting romantic dinners for couples in his New York restaurant *Me and You*. On such intimate occasions, the chef sometimes invites a couple to eat from their partner’s ‘plated’ hand, rather than their own. While such an innovative (not to mention intimate) approach to plating undoubtedly makes for a most memorable dining experience, one with some real ‘Sticktion’ (LaTour and Carbone, 2014; Spence, 2017a), one might wonder what eating with the hands does to one’s enjoyment of the taste/flavour of the food.

### 5. Gastronomic challenges to the unthinking use of cutlery

A few years ago, the two Michelin-starred chef Luis Andoni of Mugaritz restaurant based just outside San Sebastian in Spain’s Basque

<sup>8</sup> Notice though that while shiny tableware has long been deemed attractive, metallic taste sensations are typically rated as unpleasant (see Reith and Spence, 2020; Spence et al., 2021). According to Mark Miodownik, 2008, with each lick, we consume something like 100 billion atoms of spoon (Dunlop, 2012; Miodownik). The participants in the studies mentioned here were blindfolded to rule out any influence of the metal cutlery’s visual appearance.

<sup>9</sup> Here, it is interesting to note that the sandwich was apparently invented by the Earl of Sandwich with tasty elements placed between slices of bread, so that the hands could be kept clean while one was at the card table (see Spence, 2021).





**Fig. 2.** Using the back of the hand as a 'plate'. This is a dish served by Jehangir Mehta, the New York chef. The instagrammability of eating from the hands should not be underestimated as a driver of this new approach to eating either.

country dispensed with most of the cutlery for one season. The majority of the 20 or so courses on the tasting menu were to be eaten with the hands, with plenty of moist wipes to help clean the fingers between courses (Mugaritz *et al.*, 2016) – though note that no two services are apparently ever quite the same in this restaurant. The only exception was a meat course for which the diners were offered a sharp stone shard to cut through the flesh. And while few chefs have gone quite this far, there are, in fact, plenty who encourage their guests to eat at least certain of the courses with the hands (e.g., see also the multisensory experience of dining with the hands off the heated worktop at the chef's table at Kebab Queen situated below the Le Bab restaurant in central London; <https://www.eatlebab.com/kebab-queen>). Meanwhile, the opening course on the tasting menu at London-based chef Jozef Youssef's Kitchen Theory Gastrophysics Chef's Table (<https://kitchen-theory.com/the-chefs-table/>), called Quetzalcotl, involves guests being intentionally encouraged to eat with the hands (though cutlery is provided to those who request it). As Youssef notes, there is a sense in which when people use their hands, rather than cutlery to eat, it can make give rise to a more mindful, not to mention intimate, dining experience (see also O'Brien and Smith, 2018; Youssef and Spence, 2021). Intriguingly, the dish is plated by two of the kitchen team directly on the table in front of the diners, thus also emphasizing the hand of the maker (i.e., and not just the hand of the consumer), while also increasing the intimacy as everyone literally eats together from the same food display.<sup>10</sup>

One of the ways in which the hegemony of standard cutlery is being challenged nowadays is by the emergence of new/different eating utensils. Chef Youssef, for instance, does not provide forks during his ten-course meal. Knives and spoons, yes, but also beautifully-designed silver leaves for cutting food (provided by Studio William), while the jellyfish dish is served with a spoon (for the cucumber gazpacho). The strands of jellyfish come wrapped around a pair of metal chopsticks or tweezers (see Fig. 3). The idea, in this case, is simply to make the diners more mindful of what they are eating (Youssef *et al.*, 2019). The premise here being that disrupting the normal western mode of eating (i.e., with



**Fig. 3.** The jellyfish dish served at chef Jozef Youssef's Gastrophysics Chef's Table. Notice the use of metal chopsticks to present the jellyfish (see Youssef *et al.*, 2019).

knife, fork, and spoon) will mean that the diner will have to stop and think about how exactly they are going to tackle the dish (cf. Yamaguchi *et al.*, 2014). Other practitioners approach cutlery with the view to designing it to make diners more mindful, such as by embedding nails in spoons (Gander, 2016; see also Hong *et al.*, 2014). One culinary artist with something of a reputation for encouraging people to sensorially explore the food she provides with their hands is Giulia Soldati (2016). Her Contatto Experience is described as a sensory interactive experience of eating without cutlery (<https://giuliasoldati.com/Contatto-Eating-Experience>). Culinary artist Caroline Hobkinson has also offered her guests edible experiences that require no hands. Elements of the meals she presents are sometimes hang from a balloon or clothes line as the guests are encouraged to eat without the hands, simply biting directly into the food they can see suspended in the air (see Spence *et al.*, 2013). TastyFloats, meanwhile, offers a similar notion of tasting droplets of food that are levitated in the air (Ackerman, 2017).

The interest in challenging the hegemony of conventional eating utensils in western cuisine has undoubtedly been facilitated by the recent emergence of a number of innovative commercialized cutlery designs (Fabian, 2011; Piqueras-Fiszman and Spence, 2011) such as the leaf from Studio William, or the Goûte, a glass wand modelled on a finger by Andreas Fabian and chef-artist Charles Michel. The latter utensil does not hold food like a spoon or fork, working only with dense, creamy dips and spreads (see Perego, 2017). It was only natural therefore, that when Comvita honey developed a multisensory Manuka-tasting experience for the public in Wellington, New Zealand in 2021, they made sure that their premium honey was experienced using a set of beautifully-designed new utensils (e.g., Kulal, 2021).<sup>11</sup>

## 6. Gastrophysics research assessing the impact of eating method/utensil on experience

Over the last decade, a number of gastrophysics studies have started

<sup>10</sup> Beyond the role of the hands in eating, one might also want to consider their role in the act of making/preparing (Fuchs *et al.*, 2015; Shusterman, 2016).

<sup>11</sup> One might also consider the many people who find it intensely pleasurable to eat peanut butter direct from the utensil.

to investigate how different kinds of interaction affect both the sensory-discriminative and hedonic aspects of the experience. For instance, [Barnett-Cowan \(2010\)](#) conducted a study in which two halves of either the same or different pretzel (i.e., the two halves could either be fresh and firm or else softer, having been soaked in water for a few seconds before being patted dry), were glued together. The ten blindfolded participants who took part in this study held the pretzel at one end while rating their experience of the other half which they bit into and then spat out – biting into four pretzels in total. Despite the somewhat contrived nature of this laboratory study, the feel of the pretzel in the hand was nevertheless shown to exert a significant influence over people's in-mouth experience of the freshness and crispness of the pretzels. Specifically, the stale pretzel tips were rated as 94% fresher and 49% crisper when a hard pretzel tip was held in the hand, while the fresh pretzel tips were rated as 38% staler and 16% softer while holding a soft pretzel tip.

In another study, [O'Brien and Smith \(2018\)](#) had one group of participants eat 20 popcorn kernels either with their hands (conventional;  $N = 33$ ) while another group of participants ( $N = 35$ ) used chopsticks instead (unconventional). The results showed increased enjoyment for the first ten kernels in those participants eating with chopsticks. However, there was no effect on their rating for the next ten kernels. Such results suggest that consuming food in a different manner may indeed give rise to a short-term boost (c. 7.5%) in the enjoyment of the experience, due to the increased immersion that may be associated with eating (a familiar) food in a novel manner. As the authors of the study put it: “consuming familiar things in new ways can disrupt and revitalize enjoyment”, going on to suggest that “unconventional methods invite an immersive “first-time” perspective on the consumption object.” ([O'Brien and Smith, 2018, p. 67](#)).<sup>12</sup> Such comments can be seen as backing-up the intuitions of chefs such as Jozef Youssef (mentioned earlier).

The method of eating has also been shown to impact the eating rate and glycemic response of healthy adults ([Sun et al., 2015](#)). This study was conducted in Singapore, an island state where the inhabitants consume food using either chopsticks (Chinese), fingers (Malay and Indian), or spoon (Chinese, Malay and Indian). Eleven volunteers came to the lab to eat white rice on 6 non-consecutive days. Twice using a spoon, twice using their fingers, and twice using chopsticks. Their glycemic response over the following 2 h was significantly when eating with chopsticks ( $M = 68$ ) than with spoon ( $M = 81$ ), with intermediate response on those days where the participants used their fingers instead. Here, it is worth noting that there are multiple different designs for chopsticks, and this might be expected to exert a material impact over the patterns of consumption observed ([Chen, 1998](#)).

[Madzharov \(2019\)](#) revealed that North American consumers tend to rate food as both tastier and more desirable after having touched it with their hands. Intriguingly, the effect of fondling a cube of Muenster cheese was particularly noticeable amongst those participants who generally reported applying self-control to their food consumption behaviours (i.e., high self-control consumers). The 45 volunteers in a first study looked at the cheese before eating it. Half of the participants held the cheese on a cocktail stick, while the remainder held it between their fingers instead. Those individuals who reported normally exerting a high level of self-control over what they ate tended to rate the cheese as tastier, and consumed more of it, if they had touched the food with their hands first.<sup>13</sup> [Madzharov](#) documented similar results in several subsequent experiments. [Harrar and Spence \(2013\)](#), meanwhile, documented

that the utensil that their participants used to sample a piece of cheese (cocktail stick, the point of a knife, a spoon or a fork) influenced their ratings of the saltiness of the cheese, being significantly higher when the cheese was presented on the end of the knife rather than via any of the other utensils.

Finally, in a study that has so far only been reported as a conference proceeding, a trained sensory panel in Arkansas (USA) and a group of regular consumers in Brazil were invited to eat pizza with either their hands or else with a knife and fork ([Seo, 2016](#)). In this case, people's ratings were pretty much identical, except for an increase in aroma ratings amongst the cutlery-wielding Brazilians. The latter difference was put down to the knife releasing volatiles from tomato slices when the consumers cut through the pizza (see [Spence, 2017a](#)).

### 6.1. Assessing the impact of the sensory qualities of cutlery

The weight of the cutlery exerts a significant influence over the tasting experience (e.g., [Piqueras-Fiszman et al., 2011](#); cf. [Ackerman et al., 2010](#)). In a number of studies conducted in ecologically-valid settings, it has been demonstrated that people are willing to pay more for exactly the same food when consuming it with heavier, rather than lighter, cutlery (e.g., [Michel et al., 2015](#)).<sup>14</sup> Cutlery designers stress the importance of balance over-and-above simply the weight. Furthermore, there is some evidence that when cutlery is experienced as heavier than expected that is likely to deliver a better tasting experience than when it is lighter than expected (e.g., as when picking up plastic cutlery that looks like it is made of silver).<sup>15</sup> That is, the weight of the cutlery influences people's enjoyment and willingness to pay for food. The material properties of cutlery directly influence the taste of food ([Piqueras-Fiszman et al., 2012](#); cf. [Carvalho and Spence, 2021](#)).

[Wilson \(2012, p. 262\)](#) notes that silver chopsticks were used at the imperial Chinese table both for their obvious luxury but also because they could supposedly aid in the detection of poison – the idea being that arsenic would turn the silverware black. However, it should be noted that silver is less useful as a culinary utensil given its (lack of) gripping power and because of the fact that the chopsticks would likely transfer too much heat to the diner's hand if one tried to eat a dish that was too hot. Talking of the temperature of cutlery, a few years ago, chefs in one Bilbao restaurant deliberately chilled (or warmed) the cutlery before placing it in front of their guests to provide a subtle thermal indicator concerning the temperature of the next dish (see [Spence and Piqueras-Fiszman, 2014](#)). On the theme of the differing materials used for chopsticks, [Shusterman \(2016, pp. 270–271\)](#) writes: “Compare the pointy hard metal feel of a forkful of rice in one's mouth to the soft wooden feel of Japanese chopsticks in ingesting the same bowl of rice. Besides these sensory aesthetic differences there are aesthetic differences of cultural symbolism in one's choice of implements: using a fork for some kinds of noodles and chopsticks for others. Even among chopsticks, there are choices between the pointy metal Korean style and the wood or enamel Japanese. These differences reflect different traditional habits of eating. Korean food is traditionally rich in hot, meaty dishes and stews where wooden chopsticks could get burned and broken, while ancient Japanese cuisine typically relied more on cold foods, including many uncooked varieties such as raw fish.” Clearly, the sensory/material qualities associated with different cuisines, from bamboo, to steel, to lacquered wood are likely going to affect the tasting experience in different ways. However, there would appear to have been

<sup>12</sup> As, the culinary artists, Honey and Bunny note that: “Handling food in a way that violates social norms is bound to be confusing. People are triggered by eating situations that undermine traditional conventions, even if only in minute details.” ([Stummerer and Hablesreiter, 2019, p. 144](#)).

<sup>13</sup> It is currently an open question as to whether these are the same people who seem to derive so much pleasure from licking the cake mix bowl out with their fingers ([Johnson, 2018](#)).

<sup>14</sup> Designers have also come up with some, presumably tongue-in-cheek, solutions to the question of weighty cutlery ([Bates, 2012](#)).

<sup>15</sup> When aluminium cutlery was trialled on Concorde, it was rapidly rejected since it did not have enough heft (see [Spence and Piqueras-Fiszman, 2014](#)).



far less gastrophysics research to date involving chopsticks (though see Hsu and Wu, 1991; Wu, 1995).<sup>16</sup>

Another tactile/visual element of cutlery that several culinary artists and chefs have been experimenting with recently is the texture of the handle of the utensil. For instance, chef/food artist Charles Michel experimented with wrapping the pelt of the hare around the cutlery when serving a stew made from the rest of the animal (see Fig. 4a). While such close proximity to the animal has an element of Meret Oppenheimer's fur-covered cup and spoon (covered with Chinese gazelle fur) about it (see Caws, 2011), the pelt also delivered a distinctive odour to the dish as well. This evocative, and one might even say shocking, use of textured cutlery undoubtedly had 'sticktion' (LaTour & Carbone, 1994) – that is, it gave rise to a highly memorable eating experience. Of course, any difference from the normal feel of things (e.g., cutlery) is likely to capture the diner's attention.

The unexpectedly heavy furry spoon that accompanied the final dish at Heston Blumenthal's The Fat Duck restaurant, called 'Counting sheep' (see Fig. 4b) can certainly be seen as inspired by these prior gastrophysics explorations. And, given the research mentioned earlier concerning the way in which felt textures influence the tasting experience (Biggs et al., 2016; Carvalho et al., 2020; Piqueras-Fiszman and Spence, 2012; Risso et al., 2019; Van Rompay and Groothedde, 2019; Wang and

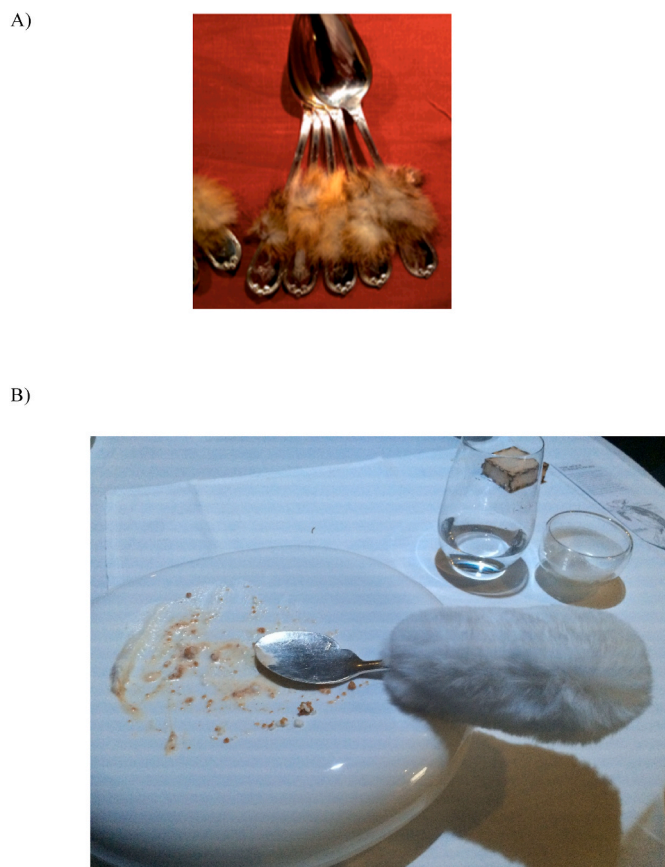
Spence, 2018), these examples of fur-covered cutlery may also help to emphasize particular aspects of the tasting experience due to the existence of crossmodal correspondences (see also Pramudya et al., 2020; Pramudya and Seo, 2019; Pramudya et al., 2021). Of course, over and above the feel of the cutlery itself is the question of whether the feel is familiar or not. Consumers' attention is likely to be drawn to the feel of cutlery that is somehow unusual/unexpected. Nevertheless, given the fact that the feel of the cutlery does not directly tell one about the tenderness/ripeness of the food, the best explanation as to why the material properties of the cutlery should affect the tasting experience is presumably in terms of sensation transference (Spence and Gallace, 2011).

Finally here, it is worth noting that there are certain combinations of cutlery, texture, material, and food that take on a particular meaning/association/nostalgic connection amongst consumers. Here, one might only think of the pleasure that many people associated with eating ice-cream from a wooden stick, or else fish and chips, which again would have come with a flat two-pronged wooden fork. In such cases, the sensory properties of the utensil are in some way integrated into the ritual of the total multisensory experience (Spence, 2021). Ultimately, whether or not food tastes better when it is eaten with the hands likely depends on what one happens to be consuming, e.g., pizza, pasta, or pastry (see Spence, 2020). The effects likely depend of both the conventions associated with consuming the food itself, as well as any physical differences (e.g., in terms of aroma, or flavour release) with the multisensory experience of the food that may differ in the two cases. Note that any crossmodal effects of cutlery, or our interaction with food may relate both to hedonic as well as sensory-discriminative aspects of the eating experience.

## 6.2. Feeling the food

When eating and assessing food directly with the hand, we may actually pick up useful information about the freshness, ripeness, and/or temperature of foods. Most people have presumably had the experience of assessing the ripeness/tenderness of many foods (e.g., fruits and vegetables) by using the hands, oftentimes providing more nuanced information than that available to sight (Spence, 2017a). There can be a real pleasure attached to the feeling of food. As Shusterman (2016, pp. 267–268) notes: "Beyond the tactile pleasures of handling our eating instruments, various forms of "finger food" provide the hands with direct tactile enjoyment of what we eat; for example, the textured feel of a waffle cone; the warm grainy feel of a toasted sesame bagel. Before the use of knives and forks became common, this direct tactile experience of eating was probably more prominent in the diner's consciousness. But also today (and even if not explicitly noticed), the tactile sensations of handling food form part of our eating experience, so more attentive appreciation of them (along with the tactility of our eating instruments) can increase our sensory enjoyment in dining."

Cloake (2022, p. 56) mentions the: "simple pleasure to be had in feeling the silky, sun-warmed skin of a tomato between your fingers as you bite into it like an apple. Equally, a sausage is better appreciated in its magnificent whole, rather than emasculated with a knife – as is a hard-boiled egg dipped in salt, or a juicy cucumber." Meanwhile, the legendary North American chef Alice Waters used to enjoy eating salad with her fingers. According to Shannon-DiPietro: "Alice will eat salad with her fingers just about anywhere. Her answer, as you can imagine, was sensual, practical, and thought-provoking. The first words out of her mouth were simple. "That fork gets in the way." She paused, as she wondered out loud how to explain further. "Salad is tender and irregularly shaped. It doesn't easily go on the fork. And the fork is metal, and you're having a vinaigrette. There's something about the metal and the vinaigrette. You stir with wooden utensils. Maybe I would use a wooden fork," she offered. "You get to know your salad when you eat with your hands. Cooking is parallel. "Using a mortar and pestle, she explained, was entirely different than using a machinelike food processor. "The fork and the machine separate you from your senses. When you use your



**Fig. 4.** A) The hare pelt augmented silver service as created by Franco-Colombian chef Charles Michel to consume a hare stew; B) 'Counting sheep' – the dessert at The Fat Duck that comes with surprisingly-heavy furry scented cutlery.

<sup>16</sup> Although beyond the scope of this article, one might also consider the impact of the material of straws, which has started to attract some scientific interest (Lin et al., 2013; Pramudya et al., 2021).

hands, you've really engaged. You are using your senses." "

## 7. Cultural differences in eating with the hands

It is not uncommon to come across those expressing the opinion that food really does taste better when eaten with the hands. This intuition was captured by the Indian narrator in Yann Martel's bestselling novel *The Life of Pi*, when he says that: "The first time I went to an Indian restaurant in Canada I used my fingers. The waiter looked at me critically and said, "Fresh off the boat, are you?" I blanched. My fingers, which a second before had been taste buds savouring the food a little ahead of my mouth, became dirty under his gaze. They froze like criminals caught in the act. I didn't dare lick them. I wiped them guiltily on my napkin. He had no idea how deeply those words wounded me. They were like nails being driven into my flesh. I picked up the knife and fork. I had hardly ever used such instruments. My hands trembled. My sambar lost its taste." (Martel, 2001, p. 7). Notably the Bukhara restaurant in New Delhi has for decades given diners a bib and encouraged them to eat with their hands. Those who commonly eat with their hands are sometimes colloquially referred to 'tumeric fingers' in India because of the colour that the spice imparts to the skin. Long ago, a certain Shah of Persia apparently once criticized Europeans for not recognizing that taste begins at the finger tips (see Harper, 1952, p. 3).

Following recent press comments regarding the benefits of eating with the hands (see Blakely, 2022), Islamic scholars have also wanted to highlight how fundamental eating with the right hand is encouraged in Muslim culture. At the same, it should be noted that the cultural differences in the use of cutlery, when interacting with the food we eat, will likely also give rise to proprioceptive differences in the fluency of eating.

## 8. The postural aspects of eating

Inevitably, the different tools we use to eat with, involve somewhat different proprioceptive actions/gestures. Relevant here, Shusterman (2016, p. 261) talks of "the much overlooked proprioceptive qualities and postural aspects of the art of eating". The way in which we consume, or ingest food may also be associated with its own proprioceptive pleasures. While Shusterman's focus is more on gross body posture (e.g., sitting vs. standing), and whether or not the posture is attentive (see Sitwell, 2020, p. 215),<sup>17</sup> there are more subtle, but nevertheless perhaps still important postural/proprioceptive differences between eating directly with the hands, versus with cutlery or chopsticks, say. At one point, Shusterman draws attention to the particular "proprioceptive pleasure of strongly sucking the long noodle into the mouth, a feeling that anyone will notice, once it is pointed out. There is an enjoyable feeling of micro-muscular power and focused energy through the vigorous suction movement, a pleasure that may be related but cannot be reduced to its symbolic association with our initial infant sucking bliss nor to the amusing sound that noodle-sucking makes." Shusterman (2016, p. 268).

Shusterman's article is, in fact, worth quoting at length:

"A third category concerns the accessories of eating, the choice of eating implements. Which eating and serving utensils make for an aesthetically enjoyable ingestion of food? This goes beyond visually attractive presentation. Certain eating and serving instruments are tactilely and proprioceptively more pleasing to use because of their shape, weight, size, surface, volume, or other material qualities that relate to agreeable sensory perceptions and ease of handling. Think of the difference of tactile aesthetic quality, for example, between drinking tea from a Styrofoam cup and drinking from fine china, not only in the

hands but on the lips. Think of stirring one's espresso with a sleek little spoon as compared with a bland, flat plastic stirrer. (Here we should note that stirring one's cup of coffee can contribute to the pleasures of eating as an art, as can other anticipatory acts of ingestion such as dunking one's croissant tip in that coffee.)" (Shusterman, 2016, pp. 270–271).

There is a long well-documented history of North Americans struggling with the use of chopsticks stretching all the way back from the first ship of North American sailors to arrive in East Asia all the way through to President Kissinger's much publicized inability to use chopsticks when he visited China (Coe, 2009).<sup>18</sup> Contrast such a clumsy usage of chopsticks with Petroski's (1994, p. 3) assertion that: "The eating utensils that we use daily are as familiar to us as our own hands. We manipulate knife, fork, and spoon as automatically as we do our fingers, and we seem to become conscious of our silverware only when right- and left-handers cross elbows at a dinner party." Such anecdotal observations suggest that proprioceptive (dis-)fluency may be part of why particular eating utensils influence the tasting experience in quite the way they do. Undoubtedly, people's familiarity with different ways of eating may also contribute to these proprioceptive differences. So, for example, for western diners unfamiliar with chopsticks, the use of the latter may make the act of eating more mindful (Hong et al., 2014; Spence, 2017a). In fact, it has even been suggested as a weight reduction strategy, at least according to the now-discredited marketing researcher Brian Wansink (Wansink, 2006; though see also Spence, 2017b).

The proprioceptive idiosyncracies introduced by different forms of interaction/cutlery, can also be influenced by atmospheric conditions. The latter idea is captured by a quote appearing in Horwitz (2004, p. 291) concerning the way in which the astronauts on Skylab had to learn to manipulate using a spoon in space to stop the food flying off the spoon: "They developed a smooth, arc-like motion tipping the spoon slowly so that it would always be directly in back of whatever was on it. And they had to keep their mouths open and perfectly aligned with the spoon arc because there would be no way to stop the spoonful once it was on its way." (Cooper, 1976, p. 47).

Ultimately, the ease (or fluency) versus difficulty of the bodily movements required to manipulate food from plate or bowl to mouth by means of different kinds of cutlery are very often culturally-determined and may either enhance, or impede, a diner's enjoyment of a particular food/multisensory eating experience (cf. McKean et al., 2020). As such, proprioceptive fluency (or disfluency) is another important factor that can enhance or negatively impact the experience of what we are eating.

## 9. Conclusions

In conclusion, a variety of factors contribute to the impact of how we eat, or interact with food, on the multisensory experience of food (and drink). Culture (Mugaritz AK, 2016),<sup>19</sup> convention, the nature of the food itself, not to mention the qualities of the tactile and proprioceptive stimulation (and our familiarity with them) have all been shown to play a role in helping to explain why the same food may be rated as tasting different (not to mention the eating experience being more or less enjoyable) depending upon how we interact with it. As has briefly been mentioned in this narrative historical review, cutlery, as well as the conventions around its use, have undoubtedly changed, sometimes quite radically, over the centuries. Increasing the direct tactile contact with

<sup>17</sup> Nico Ladenis, the Greek-born restaurateur who "disliked people slouching when they ate his food, and once kicked the chair leg of a diner who was looking a little too relaxed, barking: 'Sit properly in my restaurant!'" (Sitwell, 2020, p. 215).

<sup>18</sup> It is uncertain how this compares to the original US encounter with chopsticks as recounted in the following quote (from Wilson 2012, p. 260): "Monkeys with knitting needles would not have looked more ludicrous than some of us did" commented one of those present on the first recorded occasion of Americans eating Chinese food in China in 1819."

<sup>19</sup> As Visser (1991, p. 167) puts it: "One of the more spectacular triumphs of human 'culture' over 'nature' is our determination when eating to avoid touching food with anything but metal implements."

food would appear to enhance the experience of food and drink. While we rarely tend to give much thought to the impact of cutlery on eating, any suggestion that the standard utensils are changed is often met with a surprisingly vociferous backlash (Fahrenthold and Sonmez, 2011; Tapsfield, 2017). At the same time, however, there have recently been some intriguing developments in the world of augmented cutlery. So, for example, researchers working at Meiji University, Japan, and Kirin Holdings, developed electrified chopsticks designed to enhance the salty taste of food (see Finney, 2022).

At the same time, however, it is interesting to note how researchers in other areas have also started to highlight the benefits of touch in relation to our experience of a wide range of products (Silva et al., 2021; see also Gallace and Spence, 2014). According to Shen et al. (2016), our tactile interaction with iPads and other touch-screen devices may increase the choice of certain (i.e., hedonic) foods (cf. Malefy, 2012). Even just touching pictures of food when ordering online has been shown to lead to an increased choice of indulgent food options (Shen et al., 2016).

Ultimately, therefore, it can be argued that the answer to the question of whether food tastes better if eaten with the hands really depends on who is doing the eating, what they are eating, and what they are accustomed to, hence delivering a diplomatic answer to the question raised by Venugopal (2014): "Is everything more delicious when you eat with your hands?" One of the interesting questions for future research would be to study the contrast between eating with the hands in the context of different foods and textures. So, for example, eating nachos with guacamole versus eating them with cheese sauce drizzled over them, as the tactile properties/experience would be very different in the two cases.

## Implications for gastronomy

Pretty much everything we eat makes its way to the mouth by means of cutlery or, on occasion, directly by means of the hands. But how does the interaction with food affect the sensory discriminative and hedonic aspects of tasting? To date, the majority of the gastronomy and food science research has tended to focus on the food itself. However, a growing number of chefs, culinary artists, designers, and gastro-physicists are now questioning quite why we eat in the ways that we do, and how the gastronomic/culinary/sensual experience might be different were we to consume food differently. This narrative historical review highlights a number of factors from proprioceptive (dis-)fluency through sensation transference based on the crossmodal correspondences between texture and taste (what the Italian Futurists once referred to as 'syn-tactilism') that may help to explain how the act of eating may influence the multisensory tasting experience. Culture, convention, ostentation, and direct chemical interactions between the cutlery and the food/diner's tasting apparatus may all play an important role in determining the nature of the taster's experience as a function of the mode of interaction with the food.

## Declaration of competing interest

The authors confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome. We confirm that the manuscript has been read and approved by all named authors and that there are no other persons who satisfied the criteria for authorship but are not listed. We further confirm that the order of authors listed in the manuscript has been approved by all of the authors. We understand that the Corresponding Author is the sole contact for the Editorial process (including Editorial Manager and direct communications with the office). He is responsible for communicating with the other authors about progress, submissions of revisions and final approval of proofs.

## Data availability

No data was used for the research described in the article.

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