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**Sensehacking: Maintaining a balanced diet of multisensory
stimulation during COVID-19 lockdown, and why it matters**

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ABSTRACT

Here, it is argued that in order to maintain our social, cognitive, and emotional well-being during the COVID-19 lockdown many of us may need to maintain a more balanced diet of multisensory stimulation than is seemingly often the case currently. This review highlights the importance of catering to our more emotional senses, namely smell, touch, and taste. The indoor social isolation that so many of us have endured over recent months as a result of the various COVID-19 lockdowns has tended to prioritize the higher rational senses of vision and hearing, as more of our everyday activities (i.e., shopping, socializing, and entertaining) take place online than ever before. Many people are already aware of the sensory loss, and resultant sensory imbalance (resulting from a neglect of our more emotional senses), that has been caused by current restrictions. That said, there are also various other unconscious sources of multisensory information (such as the subtle influence of subliminal social smells) that the ‘new normal’ way of doing things may be restricting without our necessarily even realizing their loss. Nevertheless, there are a number of simple sense-hacks that can help any one of us regain the sensory balance that so many of us have lost under lockdown. By so doing, the hope is that the new science of sensehacking can be used to help us all to maintain our social, cognitive, and emotional well-being, whatever the future may hold for us.

KEYWORDS: LOCKDOWN; COVID-19; SOCIAL ISOLATION; SENSORY BALANCE; WELL-BEING; SENSEHACKING.



Figure 1. from *Self-isolation Dinner*, 2020, short film by Tereza Stehlikova

Introduction

In order to maintain our social, cognitive, and emotional well-being during the various periods of lockdown associated with the ongoing global COVID-19 pandemic, we all need to try to maintain a more balanced diet of multisensory stimulation than is perhaps the case for many of us currently. That is, we all need to ensure that our more emotional senses, namely the senses of smell, touch, and taste, are stimulated appropriately (both in terms of the amount and in terms of the variety of stimulation that they receive). However, the indoor social isolation that so many of us have had to deal with over recent months (especially amongst vulnerable and/or elderly populations) has tended to prioritize the higher rational senses (namely vision and hearing), as more of our everyday activities (such as shopping, socializing, and entertainment) have moved online than ever before (e.g., Bond, 2020; Roose, 2020; Velasco & Obrist, 2020). The evidence highlights just how profound the adverse consequences of loneliness can be for our health and well-being (National Academies of Sciences, Engineering, and Medicine, 2020). Similarly, current widespread restrictions have accelerated a number of pre-existing trends, such as toward more of us living and dining alone (at home) than ever before (see also Rizo, 2020).

The current pandemic will, of course, presumably (hopefully) one day subside, as immunization programs are rolled out globally. Nevertheless, many commentators are currently still unsure of which aspects of our daily lives will return to normal post-lockdown (i.e., to how they were before the present pandemic struck) and which may have changed for good! Will we, for example, continue to work and shop from home, once the current restrictions associated with trying to contain COVID-19 recede (Hirschfeld, Fogarty, Frantz, Keating, Lafont, Lufkin, et al., 2020)? And how many years will it be before global travel returns to its pre-pandemic peak? According to a recent press release from IATA, the latter will not be until at least 2024 (see IATA, 2020), though no one, I think, yet rightly knows.

Many people are, at least to a certain extent, already aware of the sensory loss, and resultant sensory imbalance, that has been caused by current restrictions. That said, there are various other multisensory sources of information (such as, for example, the subtle influence of subliminal social smells; Lübke & Pause, 2015) that the ‘new normal’ way of doing things may be restricting without our necessarily even realizing it. The loss of social interaction with friends and family has, of course, undoubtedly had a hugely detrimental impact on the mental health of many people (e.g., Holmes, O'Connor, Perry, Tracey, Wessely, Arseneault, et al., 2020). However, I would argue that we should also worry about the lack of direct physical contact (i.e., interpersonal touch; Geddes, 2020), not to mention the loss of chemosensory information transfer between individuals. The influence of such sensory changes, namely the loss/imbalance to our everyday diet of multisensory stimulation, which, in some cases at least, may amount to sensory deprivation has not, I think, been properly explored yet. Nevertheless, the good news is that there are a number of relatively simple sense-hacks (Spence, 2021) that any one of us can implement in order to regain the sensory balance that so many of us have lost, knowingly or otherwise.

By sensehacking, I refer to the use of our senses, and sensory stimulation, to help improve our social, cognitive and emotional well-being (see Spence, 2021). After all, it is only by recognizing the unique capacities of each and every one of our senses, and by acknowledging the predictable ways in which they interact to guide our feelings and behaviours, that we can hope to hack our own sensory experience most effectively. By so doing, we can all start to improve the quality of life of those we care about, starting with ourselves.



Figure 2. From 2020 Lockdown Diary by Tereza Stehlikova

Review outline

The primary aim of the present review is to draw attention to the sensory imbalance that has been brought about by the various COVID-19 lockdowns (which have, of course, differed in terms of their severity in different places and/or at different times during 2020), and to suggest various routes toward correcting it. The argument is made that the overstimulation of the higher rational senses of vision and hearing (often mediated by the ubiquitous digital technology that so many of us nowadays find ourselves surrounded by), and the concomitant reduction (both in terms of the amount and variety) in the stimulation of our more emotional senses (namely smell, touch, and taste), is leading to an increasingly imbalanced diet of sensory stimulation for many of us. This, in turn, may well be having a negative impact on our social, cognitive, and emotional well-being. Note here that despite optimistic claims to the contrary, the meaningful digital stimulation of taste, smell, or touch, is still largely no more than a fanciful future aspiration (even given the touch-screen and vibration technologies that currently exist

out there; see Obrist, Velasco, Vi, Ranasinghe, Israr, Cheok, Spence, & Gopalakrishnakone, 2016; Spence, Ranasinghe, Velasco, & Obrist, 2017; Twilley, 2016).

Of course, while a number of the changes in the diet of multisensory stimulation that so many of us are facing currently can be attributed directly to the current pandemic (and restrictions brought about by trying to tackle its spread), a number of other trends have instead simply been accelerated as a result of the various periods of lockdown. So, for example, the worrying increase in the number of those living an isolated urban existence,¹ with an ever-growing percentage of the population not only living alone, but also, increasingly-often, eating by themselves too, were already on the rise pre-pandemia (see Spence, Mancini, & Huismans, 2019, for a review). At the same time, we now also do more of our shopping online than ever before, while also ordering more of our food deliveries direct to the door than at any time previously (Shveda, 2020).

‘Touch hunger’ was the evocative name given some two decades ago by North American researcher Tiffany Field to the lack of physical interpersonal contact that she had observed in many western societies (e.g., see Field, 2001). There can be little doubting that the problem of touch hunger has been exacerbated by the various social restrictions that so many of us are facing currently. Most of us have surely seen those pictures of different generations of the same family separated by a glass window – able to see and hear one other, but singularly unable to smell or touch each other. One also has to wonder what the impact that wearing face masks has had on our orthonasal olfactory perception. As we will see below, changes in our olfactory experience are certainly amongst the most noticeable of those that have taken place during the current pandemic. There have, though, also been significant, and important, changes to the kind (and amount) of interpersonal social stimulation that we get from both of our more emotional social senses (namely, smell and touch).

At the same time, however, numerous press reports have also documented our changing tastes for food and drink during (and hence presumably as a result of) the current pandemic (Hargreaves, 2020). Changes have been reported both in what we choose to consume and how we choose to prepare it (if at all). Psychologists such as Dickins and Schalz (2020) have even

¹ The proportion of the world’s population living an urban existence continues to grow year-on-year. In fact, as of 2010, more people around the globe lived in cities than in rural areas, and by 2050, it has been estimated that 60% of the world’s population will be urban (see UN-Habitat, 2010; United Nations Department of Economic and Social Affairs, 2018).

put forward explanations couched in evolutionary theories of foraging, to explain the panic buying (e.g., of foods such as pasta, though also toilet roll, see Dancroft, Lawson, & Patel, 2020) reported during the early days of lockdown (e.g., Bekiempis, 2020; Lufkin, 2020). There have, of course, also been changes to the visual and auditory environments. However, oftentimes, such changes have either been positive or else easily corrected. In the former category, I am thinking specifically of the reduction in air pollution and noise from traffic as a result of lockdown, meaning that vistas heretofore masked by smog have been dramatically revealed, in some cases for the first time in decades (see **Figure 1**). In the latter category, consider only the loss of crowd noise at sporting events (e.g., McDonald, 2017) being replaced by the sound of the crowd being added to digital broadcasts (e.g., Keh, 2020; Ziegler, 2020), or else pumped into empty sporting venues during fixtures for the benefit of the players themselves (e.g., D. Gallagher, 2020; see also Otte, Millar, & Klatt, 2020, for one example of the benefits of crowd noise on professional sporting performance).

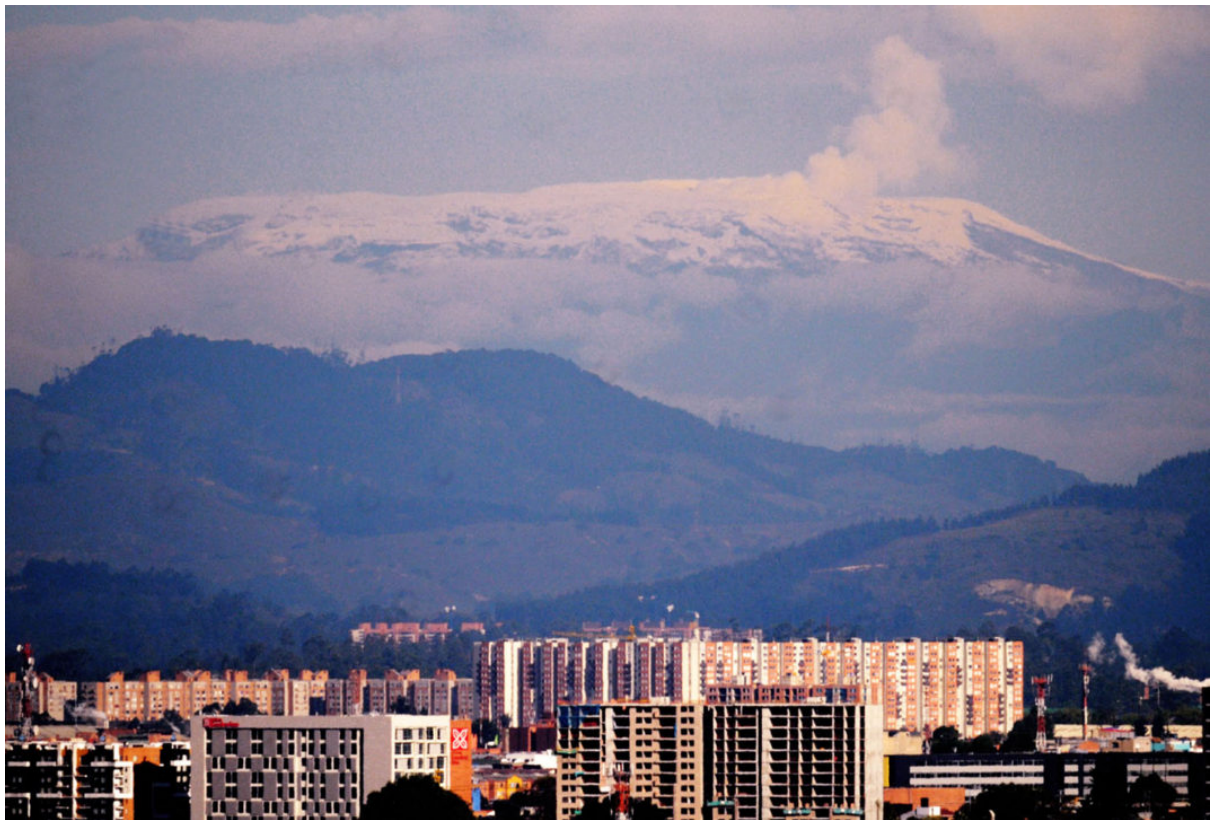


Figure 3. The Nevado del Ruíz volcano as seen from Bogotá for the first time in many years, as a result in the gross reduction of congestion, and the ensuing lifting of the blanket of smog that normally sits snugly over the city, nuzzled as it is high up in the Andes mountains. (Figure courtesy of Richard Emblin/The City Paper, 2020).

Sensory changes resulting from contracting COVID-19

Many of those who contract COVID-19 report a dramatic loss of chemosensory perception, associated not with nasal blockage but rather with nasal dryness (Navarra, Ruiz-Ceamanos, Moreno, García-Basterrechea, Haro-Licer, Sinnott, Spence, & Gallardo-Pujol, submitted). In fact, a recently-published multi-country study documented a significant decrease in self-reported smell, taste, and trigeminal sensation in a group of more than 4,000 individuals with COVID-19 (Parma, Ohla, Veldhuizen, Niv, Kelly, Bakke, et al., 2020). Patients used a 100-point scale to rate their taste, smell, and trigeminal perception before as well as while infected. The results of the survey highlighted a pretty dramatic 80-point reduction in the sense of smell, a 69-point reduction in their taste perception, and a 37-point self-reported reduction in chemesthesis.

Given what a signature symptom the loss of smell has nowadays become, it is still somewhat surprising to remember just how long it took for chemosensory loss to become one of the recognized symptoms during the early days of the global spread of COVID-19 (e.g., Menni, Valdes, Freidin, Sudre, Nguyen, Drew, et al., 2020; Rahhal, 2020; Xydakis, Dehgani-Mobaraki, Holbrook, Geisthoff, Bauer, Hautefort, et al., 2020). At the same time, however, one can of course only begin to imagine the public horror were a new disease to emerge that robbed people of their sight or hearing, albeit that loss were only temporarily, as is apparently the case for chemosensory loss as a result of COVID-19. That said, given the growing awareness of the many people suffering from long-term health problems associated with contracting COVID-19 (the ensuing syndrome of so-called ‘long-COVID’; e.g., J. Gallagher, 2020), it is presumably also possible that the chemosensory problems might be long-lasting in some unfortunate individuals too. Indeed, according to a recent study, 15% of COVID-19 patients still reported a loss of smell two months after their original diagnosis (Carfi, Bernabei, Landi, for the Gemelli Against COVID-19 Post-Acute Care Study Group, 2020).

If we had to give up one of our senses, then my suspicion is that most people would opt to lose their ability to smell. Should such an intuition stand up to scientific scrutiny then it would perhaps hint both at the downplaying of olfaction in the modern era (see McGann, 2017, for a review), as well as our status as visually-dominant creatures (see Hutmacher, 2019, for a review). Interestingly, however, the evidence suggests that those unfortunate individuals who, for whatever reason, lose their sense of smell often report a profound decline in their well-being (Croy, Nordin, & Hummel, 2014; Oleszkiewicz, Kunkel, Larsson, & Hummel, 2020).

This may be related to the fact that those who lose their ability to see, often retain the ability to visually imagine what things look like (e.g., the sight of a loved one on hearing their voice; see Hull, 1990, for a first-hand description). However, given that olfactory imagery is generally so much weaker than its visual counterpart (Arshamian, Manko, & Majid, 2020), when the sense of smell goes, there is nothing left to replace it. It turns out that food and drink suddenly lose their taste, given that most of what we think we taste we actually smell (Spence, 2015b). Similarly, the often-subliminally perceived social smells that we pick up from others turns out to provide a more important channel of social communication than any of us perhaps realize. Indeed, such losses may well help to explain why it is that some of the highest suicides rate are reported after the loss of the sense of smell (i.e., anosmia) than after losing any of the other senses. To give one concrete example here, commentators suggested that the suicide of Australian INXS singer Michael Hutchence on November 22nd, 1997 at the Ritz-Carlton Hotel in downtown Sydney may well have been linked to the fact that the Australian singer had lost his sense of smell following a violent altercation a couple of years earlier (see Herz, 2007; Minelle, 2019).



Figure 4. From 2020 Lockdown Diary by Tereza Stehlikova

Ambient smell and what it does to us

Pre-pandemia, the majority of us living an urban existence were already spending an estimated 90-95% of our lives indoors (e.g., see Klepeis, Nelson, Ott, Robinson, Tsang, Switzer, et al.,

2001; Ott & Roberts, 1998; Velux YouGov Report, 2018). Hence, the imposition of lockdown restrictions has primarily meant that more of us have been stuck indoors at home (thus exposed to the same monotonous environment; see Draycott, 2015, p. 60) for longer periods of time than ever before. What this presumably means in practice is that many of us have had much greater exposure to the building odour (or BO; McCooey, 2008) that is associated with our own home (see also Anon., 2014).² While this particular ambient smell is not one that we are likely to notice, that doesn't mean that it may not be (adversely) affecting our well-being. We all tend to adapt rapidly to constant ambient odours, such as, for example, the smell of our own homes, only becoming aware of the distinctive BO ourselves, as others presumably normally experience it, when, for instance, returning after a long trip away (Dalton & Wysocki, 1996).

Spending so much of our time at home must, then, inevitably increase our exposure to our own BO, as it were. And, for those of us who are unlucky enough to suffer from it, sick-home syndrome (SHS), a version of the better-known sick-building syndrome (SBS; see Love, 2018; Runeson-Broberg & Norbäck, 2013; see also Niemelä, Seppänen, Korhonen, & Reijula, 2006) can exert a negative pull on our health and well-being. The symptoms include: headache, dizziness, nausea, eye, nose or throat irritation, dry cough, dry or itching skin, difficulty in concentrating, fatigue, enhanced sensitivity to odours, hoarseness of voice, allergies, cold, flu-like symptoms, increased incidence of asthma attacks, and even personality changes (Joshi, 2008; see also Anon., 2000). It is thought to be the damp/mold in the home environment that may be a primary trigger for SBS (Runeson-Broberg & Norbäck, 2013). It should, then, perhaps not come as much of a surprise to find that sales of air freshener are reportedly way up during lockdown (Nikolic, 2020). That said, it is by no means certain that such a simple olfactory sense-hack will necessarily solve the problems brought on by long-term exposure to BO (Nazaroff & Weschler, 2004).

The increasing popularity of so-called 'well-being' flower bouquets had already been noted prior to the global spread of COVID-19 (Carlyle, 2020). And indeed, the evidence has been mounting for the beneficial effects of our exposure to floral scents (Jo, Rodiek, Fujii, Miyazaki, & Park, 2013). That said, while the health and well-being benefits associated with the presence of a pleasant ambient fragrance have been reported in some studies (Glass & Heuberger, 2016; Glass, Lingg, & Heuberger, 2014; Haehner, Maass, Croy, & Hummel, 2017; Spence, *in press*),

² The smell of a room is what Baudelaire once described as 'the soul of the apartment' (Corbin, 1986, p. 169).

they have by no means been documented in all of them (e.g., Spence, 2003; see for a review).³ What may be especially relevant here is Warren and Warrenburg's (1993) observation, summarizing several years of research (on behalf of leading fragrance manufacturer *International Flavors & Fragrances, IFF*) that the beneficial effects of ambient aromatherapy essential oils tend to be more apparent in those who are more stressed to begin with, which, I presume, is likely to be most of us these days (Stanton, Khalesi, Williams, Alley, Thwaite, Fenning, & Vandelanotte, 2020)! One simple sense-hack to consider here is to make sure to change the ambient odour of our home after a stressful meeting in order to avoid the negative aftereffects of stress-associated ambient scents (Spence, 2002).

One should also consider here the fact that most people with indoor heating appear to set their thermostat to imitate the warm temperature of the Ethiopian Highlands where we evolved (Just, Nichols, & Dunn, 2019). The reduction in the variation of ambient temperature experienced in the home made, at least according to certain researchers be having an adverse on our waistlines too (see Mavrogianni, Johnson, Ucci, Marmot, Wardle, Oreszczyn, & Summerfield, 2013).

The growing popularity of open kitchens in the home environment, when combined with the fact that the kitchen has, for many of us, become the communal centre, or heart, of the home (Jessica, 2020; though see also Heath, 2019) means that those of us cooped-up at home during lockdown may be exposed to more food smells than is normally the case, and this may well be causing more problems than any of us realize. After all, a number of studies have demonstrated how the exposure to food aromas (especially delicious ones) can provoke a desire to eat when otherwise there might be none (e.g., see Gaillet-Torrent, Sulmont-Rossé, Issanchou, Chabanet, & Chambaron, 2013, 2014; Nassauer, 2014; Spence, 2015a). While this is by no means a new problem,⁴ my sense is that food smells may be a more regular feature of the home environment than of the typical office environment (Kaysen, 2016). Notice here only how some Japanese office buildings built by the construction firm Shimazu purportedly vent the food aromas from the canteen kitchens to different floors at slightly different times in order to avoid a sudden

³ There is also a condition known as multiple chemical sensitivities (MCI). This condition describes the growing number of individuals seemingly showing physical symptoms in response to airborne chemicals (cf. Anderson & Anderson, 1998; Fletcher, 2005).

⁴ In fact, back in 1888, one finds the Victorian-era architect J. J. Stevenson worrying that: "*unless the kitchen itself is ventilated so that all smells and vapours pass immediately away, they are sure to get into the house, greeting us with their sickly odour in the halls and passages, and finding their way to the topmost bedroom, notwithstanding all contrivances of swing doors and crooked passages.*" This quote spotted by Carolyn Steel (2008).

rush at mealtimes (see Fox, 2001; Spence, 2021). One of the ways in which to help minimize the presence of lingering cooking odours in the home is presumably to order in more ready-made meals. One of the consequences of spending most of our time indoors at home during the pandemic is the seemingly exponentially rise of meals delivered direct to the home.



Figure 5. From 2020 Lockdown Diary by Tereza Stehlikova

Chemosensory signalling: On the loss of social smell signals

It is, however, not just the loss of taste and smell that matters, but likely also the ambient loss of social smell that is important (e.g., Frumin & Haviv, 2015). A few years ago, researchers noted that most people tend to bring their hand up to their face within a minute of having shaken someone else's (Frumin, Perl, Endevelt-Shapira, Eisen, Eshel, Heller, et al., 2015). The suggestion, in this case, is that this seemingly sub-conscious action provides an effective means of picking-up on any relevant chemosensory information about whoever we have just met.⁵ Few of us, note, realise that we engage in such surreptitious olfactory sniffing behaviours. As

⁵ Other forms of greeting (such as French kissing) would presumably also serve much the same function.

such, we are unlikely to recognize the loss of olfactory information that results from the switch to elbow-bumping as the new socially-distanced means of greeting others. Though it is worth noting that even elbow-bumping might not be without risk, especially given the recommendation that people should cough into their elbows (Fourcade & Mulier, 2020; see Liu Gao, & Sun, 2020).

Elbow bumping clearly doesn't achieve the same goal in terms of surreptitiously conveying social smells from one individual to the next. And, for those of you wondering what it is about social smells that is so important, note only that, little though we realize it, social olfactory cues provide useful cues to a person's immune profile (Winternitz, Abbate, Huchard, Havlíček, & Garamszegi, 2017), their health status (Olsson, Lundström, Kimball, Gordon, Karshikoff, Hosseini, et al., 2014), their approximate age (Mitro, Gordon, Olsson, & Lundström, 2012), their emotional state (de Groot, Smeets, Rowson, Bulsing, Blonk, Wilkinson, & Semin, 2015; de Groot & Smeets, 2017), and even their personality (Sorokowska, Sorokowski, & Szmajke, 2012). Hence, eliminating this important (though largely subliminal) channel of social communication will, I imagine, likely result in increased feelings of alienation and social isolation (see also Croy, Bojanowski, & Hummel, 2013).

Potentially relevant here, it has been suggested that our choice of which perfume to wear may not be as random as it may at first appear. Rather, it may convey something of our own immune profile to others. At the very least, people tend to rate other people's body odour as smelling better when mixed with their own choice of perfume than when combined with that of others (see Lenochová, Vohnoutová, Roberts, Oberzaucher, Grammer, & Havlíček, 2012; Milinski & Wedekind, 2001). One can only wonder, therefore, as to whether our fragrance use will increase as we try to project something of our own chemosensory profile in a manner that is salient enough to make it through the face coverings and socially-distanced interactions that we are currently faced with.



Figure 6. From 2020 Lockdown Diary by Tereza Stehlikova

Eating and drinking

Eating and drinking are amongst life's most pleasurable multisensory activities (Spence, 2017b). However, the stress and uncertainty surrounding the current global pandemic is undoubtedly having a marked influence on patterns of consumption, hinting perhaps at the emotional support that food so often plays (Coppin, 2020). My suspicion is that our food consumption behaviours will likely shift more toward comfort foods as the uncertainty surrounding the global situation continues (see Spence, 2017a). It has been suggested that comfort foods can provide an element of emotional support whenever we feel threatened. How else to explain the more than 700% increase in sales of instant trifle! Sales of powdered custard and instant mash have also surged during lockdown, as shoppers rush to the emotional security provided by comfort food during the pandemic. Trifle, custard, and instant mashed potatoes, noticeably, not requiring a functioning set of mandibles (i.e., notice the total absence of challenging textures in these foods). Here in the UK, the sale of nostalgia foods and brands has also been on the up – think Spam, Smash, Fray Bentos, and the like (Pearson-Jones & Poulter,

2020; see also Stern, 2020). I believe that we will also see an increase in the popularity of familiar, recognizable brands over the experiential, experimental food and drink offerings (Spence, 2020a).

As of the start of October, people living in the UK had apparently already cooked half a billion more meals under lockdown (see Kraterou, 2020), with sales of steak up by 40% during lockdown. The suggestion being that people in the UK were trying to recreate restaurant meals at home (see Kraterou, 2020). Home baking has been on the rise (as it were; e.g., see The National Trust, 2020), and according to the press reports, people have been making more of their own bread (with sales of flour also increasing; see The Economist, 2020), at least during the early days of the pandemic (Cereceda, 2020). Some commentators have, in fact, even gone so far as to suggest that bread-making might be serving something of a therapeutic function (see Steafel, 2020). At the same time, the revival in home cooking and storing leftovers during the pandemic has led to a revival of fortunes for companies such as Tupperware, with their shares jumping 35% in just one day (Scully, 2020). The media's attention has also been turned to the question of why it is that reheated home foods so often appear to taste better than on original preparation (e.g., see Pass Notes, 2020), once again hinting at the increase in the home preparation of food.

Michelin-starred food delivered direct to your home (assuming that you lived in central London) was the premise behind, not to mention the promise of, one company *Supper* (<https://supper.london/home>) launched a few years ago (e.g., Anon., 2020; Editorial Staff, 2015). However, as many people soon realized, it is rather more difficult to reproduce the experience of a high-end meal at-home. It certainly requires far more than simply just ordering the suitably-expensive home-delivery meal items direct to one's door. Hence, my suspicion is that people will simply fall back on pizzas and burgers (that is, basic unhealthy foods that do not lose much in transit as it were). My gut feeling is that the desire for molecular gastronomy, and for all things experimental in the world of cuisine, probably peaks at times of global or national certainty, when we feel confident about the world and our place in it (see Spence & Youssef, 2018). However, this is certainly not what people are drawn toward in times of uncertainty such as so many of us find ourselves in currently (Spence, 2020a). It is interesting to see, therefore, how former world's top restaurant *Noma* in Copenhagen has reopened selling homely burgers and beer/wine (Hosie, 2020). The increased anxiety about the rise of dark kitchens can, I think, also be seen as highlighting the growing concern about where exactly our food comes from too (e.g., Walters & Crouch, 2020).

There have been some marked changes in alcohol consumption during the pandemic with, for instance, the rise of the so-called ‘quarantini’ cocktail (Hubbard, 2020). This, a concept that was unheard of before the pandemic, refers to those drinks that people can make easily at home. In the US, Google reported an increase in search for cocktail recipes during the early stages of lockdown (e.g., Axelson, 2020). The rise in at-home cocktails has also led to a dramatic increase (or spike) in sales of spirits as consumers stocked up their drinks cabinets with all the relevant ingredients (e.g., Byington, 2020; Chodkiewicz, Talarowska, Miniszewska, Nawrocka, & Bilinski, 2020). Here it is worth noting that given how much restocking has been going on, it becomes somewhat more challenging to infer consumption behaviour from sales data alone. That said, alcohol consumption does appear to be up, especially as the dark winter months draw as the second period of full-lockdown is about to begin in the UK (Morrison, 2020).

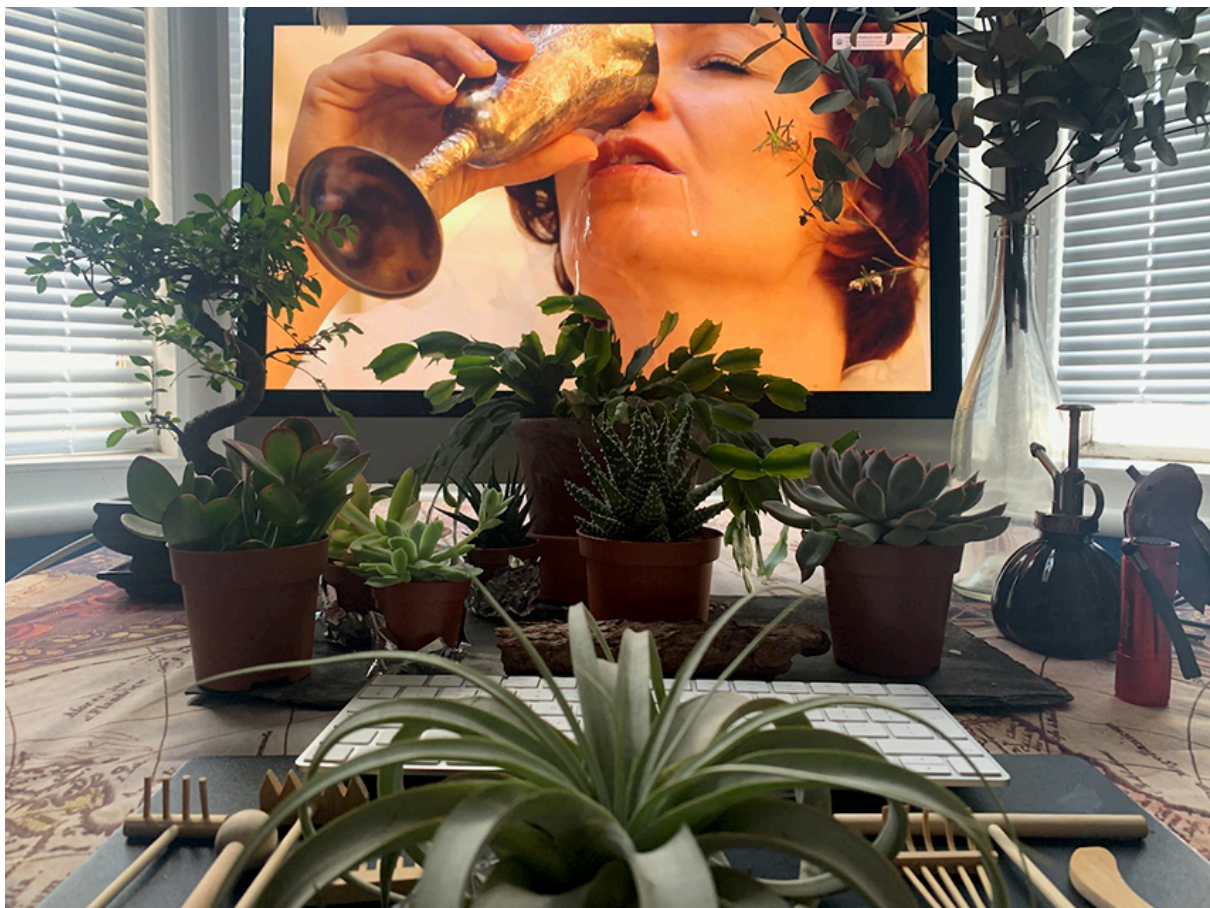


Figure 7. From 2020 Lockdown Diary by Tereza Stehlikova

Social isolated dining

As mentioned already, the pandemic and associated lockdown has seen a marked increase in solo dining. As such, there is a growing need for digital commensality (see Spence et al., 2019, for a review). Indeed, given that dining is fundamentally a social activity, it is the shared social interaction that has been one of the most obvious casualties of the current series of lockdowns (see also Holmes et al., 2020). I would argue that this is what is most obviously missing currently for so many at mealtimes. Various studies had already documented the dangers for those dining alone in terms of lowered mood, and impaired food behaviours – either consuming more (just think about how few portions of food are for just one person) through to not eating enough due to loneliness (see Spence, 2017b). In response to this enforced (and, by now, increasingly prolonged) social isolation that so many of us have been facing (giving rise to what Ezra Klein, 2020, has described as an epidemic of loneliness), there has been a growth in digital surrogates: Everything from Zoom cocktails (of which I myself have partaken, never having done so previously; Smith, 2020; Tilley, 2020), Zumba classes (not one, I fear, for me; Barr, 2020), Skeating (i.e., Skyping while eating) meals online (Bernard & Bastone, 2020), as predicted by Spence (2017b), and online cooking classes (e.g., Petter, 2020).

That said, the Korean fashion for *Mukbang* would not seem to have caught on in the west just yet, even despite the lockdown (e.g., Choe, 2019; Kim, 2018; Pereira, Sung, & Lee, 2019; Vice Food, 2015). The latter term refers to the increasingly popular trend in Korea, as well as in certain other parts of Asia, for people living and eating alone to seek solace (and some form of companionship) by tuning in to a broadcast jockey at mealtimes (Spence, 2017b). The latter is typically shown close-up in front of large bowls and plates of energy-dense foods such as noodles and fried chicken. This ‘thin’ form of digital commensality is undoubtedly intriguing from a social psychology standpoint.

The enforced rise in isolated living (especially amongst the vulnerable elderly told to self-isolate indoors) is, then, leading to a worrying rise in loneliness (and associated decline in physical health and mental well-being; e.g., see National Academies of Sciences, Engineering, and Medicine, 2020), and, at the same time, more of us eating alone than ever before. Hence, one of the most important challenges currently concerns how we can sense-hack commensality, most likely by connecting solo diners at home via digital technology (see Spence et al., 2019). Figuring out how best to do this looks to me like one of the most intriguing, not to mention important challenges for the difficult months (and, heaven-forbid) years ahead. There would

also seem to be untapped possibilities for those delivering food to synchronize it with our home entertainment, given that it is often the same global companies delivering both. However, getting to the bottom of that is undoubtedly the topic for another day!



Figure 8. From *Self-isolation Dinner*, 2020, short film by Tereza Stehlikova

The nature effect

The nature effect is the name given to the remarkable cognitive/attentional benefits that appear to result from our exposure to nature (e.g., Berman, Jonides, & Kaplan, 2008; Williams, 2017). This, again, something that many of us were simply not getting enough of, pre-lockdown, with Richard Louv (2005) writing some years ago of what he calls a ‘Nature Deficit Disorder’. It can, I think, be argued that getting out into nature has become even more important for our physical and mental well-being during lockdown than ever before. No matter where we live, it is important to recognize that any outdoor nature space provides one of the most important opportunities to lower our stress levels and improve our physical and mental well-being (Spence, 2021). No wonder, then, that many national papers in the UK were endorsing the benefits of growing-your-own (not to mention garden allotments; Jones, 2020) during the coronavirus lockdown (Black, 2019; Whitbread, 2020). Touching nature also exerts a beneficial effect on our well-being (Koga & Iwasaki, 2013). So, the advice has to be that no matter where you happen to connect with nature, be it in your own back garden, in an allotment,

or the local park or forest, just make sure to enjoy it with as many of your senses as you can. Our experience of gardens and of nature, more generally, should be enjoyed with all the senses (e.g., Franklin, 2012). The benefits for your social, cognitive and emotional well-being of engaging with nature will all your senses will be well worth the effort, whether you realize it or not (Spence, 2021).

It is important to note that the new normal also has positive potential benefits, with, for example, less commuting (and thus less traffic noise, see Prochnik, 2011; Russell, 2020), less traffic jams, and less pollution. There is thus an increased opportunity for increased engagement with nature. Indeed, what has been especially noticeable is how many commentators have started listening to the birds outside their windows in the spring (see **Figure 2**).⁶



Figure 9. Multisensory nature as captured by Tereza Stehlikova MP4.

⁶ Even though urban birdsong differs somewhat in pitch, given that the birds have had to adapt in order to compete with the low-pitched urban rumble (Slabbekoorn & Ripmeester, 2008).

However, for those vulnerable individuals who have been instructed not even to leave their own homes then the question/challenge remains of if, and/or how, the nature effect can be brought into the indoor environment. Indoor plants have often been suggested as beneficial to indoor air quality (London, 2014). However, the latest research suggests that in the numbers typically found indoors this would not work (Cummings & Waring, 2020; see also Walker, 2000). It is, however, important to dissociate the question of indoor plants' ability to clean the air versus their psychological impact on well-being (Bringslimark, Hartig, & Patil, 2009). What is more, there is an ongoing discussion as to whether screen savers, and large screens projecting the outside world, and hopefully nature, might not help (Kahn Jr., Friedman, Gill, Hagman, Severson, Freier, et al., 2008; Kahn Jr., Severson, & Ruckert, 2009). And that is before one gets to the question of what is lost if we happen to be surrounded by plastic plants. Not much, according to Krieger (1973) writing in the pages of top science journal *Science*.

For me, the most striking change to the multisensory environment was on Port Meadow, the flood plain situated in the outskirts of North Oxford. The traffic noise that has always been there, in the background, and so never really noticed, at least not until it was no longer there, when all traffic seemingly stopped during the initial phases of the first lockdown in the UK. Given that incongruent sensory inputs have been shown to reduce the potential benefit from our exposure to nature (Benfield, Rainbolt, Troup, & Bell, 2020; Mace, Bell, & Loomis, 1999; Spence, 2021), one can only imagine what has been lost. After all, exposure to traffic noise while in (and hence viewing) nature would seem like one such example of multisensory incongruency.

The detrimental effects of noise pollution on our health and well-being have been widely documented (e.g., Owen, 2019), exerting a profoundly negative influence over mood, sleep, quality of life, not to mention our waistlines (e.g., Basner, Babisch, Davis, Brink, Clark, Janssen, & Stansfeld, 2014). The detrimental effect of air pollution on our appreciation of the multisensory environment is also becoming increasingly apparent too (e.g., Ba & Kang, 2019a, b; Hosey, 2013; Jin, Jin, & Kang, 2020; Jiang, Masullo, & Maffei, 2016). One has, of course, to feel sorry for all those living under the flight path of busy international airports such as Heathrow in London – they are, presumably, not complaining about the sensory change and the reduction in plane noise these last few months as a result drastic reduction in air travel under lockdown.

I, like many others, have been sleeping better during lockdown (Miller, 2020), though whether this is a result of the lack of constant jetlag resulting from travelling every few days, or rather the reduction in transport noise (not to mention the sounds of carousing and periodically vomiting students – just one of the joys of living in central Oxford) is not altogether clear. At the same time, however, it is clear that many other people are suffering from disrupted patterns of sleep (e.g., see Reddy, 2020; Stanton et al., 2020). What everyone agrees on, though, are the health benefits of regularly getting a good night's sleep (see Walker, 2018). Hence, for those who are struggling to get a good night's sleep due to the stress and anxiety brought on by the evolving pandemic, sensehacking is likely to help. Crucially, many people need to learn how to stimulate their senses more appropriately during, as well as shortly before, going to bed. One of the main problems currently is the exposure to the blue light emitted by many digital e-readers (Chang, Aeschbach, Duffy, & Czeisler, 2015). At the same time, however, stimulating our more emotional senses, be it by drinking a relaxing aroma (Goel, Kim, & Lau, 2005; Goel & Lau, 2006), taking a drink of chamomile tea (Srivastava, Shankar, & Gupta, 2010), or heating up our extremities (i.e., the feet; Kräuchi, Cajochen, Werth, & Wirz-Justice, 1999) have all been shown to improve the quality and duration of sleep. Once again, therefore, it would appear to be all about balancing our senses and the diet of multisensory stimulation that we receive.

Touch hunger

The skin is by far our largest sense organ, accounting for something like 16-18% of body mass, (Montagu, 1971), and yet this highly 'emotional' sense has traditionally been neglected. The failure to ensure an adequate diet of the right kinds of tactile stimulation leading to what Tiffany Field (2001) has evocatively labelled 'touch hunger'. In recent years, there has undoubtedly been a growing awareness of just how important the stimulation of the skin really is regardless of one's age or health status (e.g., Denwith, 2015; Gallace, 2012; Gallace & Spence, 2010; Spence, 2021). It would not, in fact, be going too far, I think, to suggest that there is a sense in which we actually *need* to stimulate our largest sense in order to promote our physical and emotional well-being (e.g., Croy, Luong, Triscoli, Hofmann, Olausson, & Sailer, 2016; Jones, 2018; Löken, Wessberg, Morrison, McGlone, & Olausson, 2009). Here, though, it is important to bear in mind that there are actually several different kinds of touch (e.g., Bolanowski, Verrillo, & McGlone, 1999), with interpersonal (social) touch being particularly beneficial. In fact, interpersonal stroking appears to be optimized for the stimulation of the c-tactile

afferents coding pleasant touch (Morrison, Löken, & Olausson, 2009). These relatively recently discovered pleasure receptors are to be found throughout the hairy skin, which, if you were wondering, is pretty much everywhere except the soles of the feet and the palms of the hands.

Given the absence of tactile contact resulting from the enforced social distancing, one might therefore expect that those of us who are increasingly touch hungry (given that we are being denied the opportunity for real physical contact during lockdown), to seek some somatosensory solace elsewhere. Such a desire, then, may perhaps help to explain the dramatic increase in the sale of pets that has been documented in recent months (e.g., Bawden, 2020; Kavin, 2020). Intriguingly, the evidence supports the psychological, if not necessarily the physiological, beneficial effects of petting animals on stress relief (e.g., Lass-Hennemann, Peyk, Streb, Holz, & Michael, 2014).

It is in this context that I am also particularly interested by ideas around digital tactile stimulation as a means of making up for ‘touch hunger’. Just imagine if it were possible to send a caress, or hug, to a loved one at a distance, over the internet. Could such digitally-mediated touch help in some small way to relieve some of the social isolation that so many of us are suffering from currently? According to the promotional materials, the Hug Shirt (listed by *Time* magazine as one of the best inventions of 2006) already makes it possible to transmit tactile stimulation from one person to another over a distance. Or perhaps what you really need in these most taxing of times is the rather more reassuringly-firm grip of something like the HuggieBot, a modified 450lb (204kg) research robot (see Bridge, 2018)? It is, however, currently an open question as to whether being embraced by such a robot would necessarily provide the same stress-buffering social support as the real thing. Bear in mind here only that physically hugging has been shown to reduce a person’s susceptibility to upper respiratory infection and illness (Cohen, Janicki-Deverts, Turner, & Doyle, 2015).

Recently, there have been reports in the press of a Japanese robot that can give full body massage (Klein, 2020). However, I can’t help but wondering if there is still not something missing here. After all, digitally-mediated touch apparently fails to deliver the ‘Midas Touch’ effect (see Gallace & Spence, 2010). I can’t help but wonder just how important thermal temperature cues might be in all of this. So much digital touch tends to be cold, while c-tactile afferents turn out (perhaps unsurprisingly) to be optimized to respond to the warm touch of skin temperature (Ackerley, Backlund Wasling, Liljencrantz, Olausson, Johnson, & Wessberg,

2014). One can only wonder at the role played by social olfactory cues, given that if you are physically close enough to touch someone, then you are likely close enough to smell each other (consciously or otherwise) too. It is here, therefore, where even the most advanced of remote digital tactile stimulation devices fail (see Gallace & Spence, 2014). It may also be the social intention behind the personal touch, i.e., as much as the physical stimulation itself, that helps, for instance, to reduce pain in those couples who are able to hold hands (Goldstein, Weissman-Fogel, & Shamay-Tsoory, 2017) – this something notably denied to the majority of those living in care homes during the pandemic.

Here, of course, it is important to note that touch, just like pretty much everything else, is fundamentally multisensory with olfactory cues (e.g., Croy, D'Angelo, & Olausson, 2015; Croy, Drechsler, Hamilton, Hummel, & Olausson, 2016; Demattè, Sanabria, Sugarman, & Spence, 2006) and background music having been shown to affect our perception of both social and object-based touch (Fritz, Brummerloh, Urquijo, Wegner, Reimer, Gutekunst, Schneider, Smallwood, & Villringer, 2017; Imschloss & Kuenhl, 2019).



Figure 10. Safer Breakfast, honey & bunny / Daisuke Akita

Conclusions

There can be little doubting the profound changes to our social, emotional, and sensory environment that have resulted from the current ongoing series of COVID-19 lockdowns (at least here in the UK). As has hopefully become clear, I certainly believe that in order to maintain our social, cognitive, and emotional well-being, it is going to become increasingly important to recognize the benefits, or rather the need, of ensuring a balanced diet of multisensory stimulation for each and every one of us. And while technology typically serves to increase the overstimulation of the higher rational senses, there can be little doubting that it can also provide an essential source of social/emotional connection to the outside world for those individuals who are isolating. In this review, I have tried to emphasize the need to maintain sensory balance. While digital stimulation of our higher rational senses of hearing and vision can provide some of what we lack during lockdown (see Roose, 2020), I cannot stress enough just how important it is to ensure the adequate stimulation of our more emotion senses, of smell, touch, and/or taste, during the current, and forthcoming, restrictions.

So, in this strangest of years when, seemingly without warning, global pandemics and lockdowns are devastating the global economy, I would argue that there has never been a moment when sensehacking was more important (though see Sheldon & Arens, 1932, on the notion of ‘humaneering’, or ‘consumer engineering’, as a corporate solution to reinvigorating the multisensory marketplace following the Great Crash of 1929 in The States). Sensehacking, defined as the use of our senses, and sensory stimulation, to help improve our social, cognitive and emotional well-being, is undoubtedly what we need to help maintain our emotional balance currently (Spence, 2021). We also need to consider what sensory stimuli have been lost: both those that we may be aware of having disappeared, or else being denied, as well as the many other sensory cues we were perhaps never really aware of in the first place (such as subliminal social smell). We all need to think about how to rebalance our senses, recognize multisensory nature of existence, and simulate nature effect indoors.

Sensory overload, sensory underload, sensory (in-)balance, multisensory congruency, and the technology-mediated sensorium in which we find ourselves increasingly often are, then, key concepts here. It is my opinion that the current sensory imbalance is only going to get worse as social distancing and long-term isolation as a result of the coronavirus pandemic, and indeed any others that might follow it, take their inevitable toll on our physical and emotional well-being (see Spence et al., 2019). As such, it is essential that every one of us tries to optimize the

indoor multisensory environments, typically, as we have seen, the home, where we now spend so much of our lives indoors (see Spence, 2020b, for a review). At the same time, however, we should also make sure to make the most of the profoundly beneficial effects that the multisensory exposure to nature, be it outdoors or in(doors), can have on our attentional resources and well-being (Spence, 2021).

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