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„Nudging for healthier food choices in a co-worker restaurant"

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Content

Abstract (Deutsch)

Trotz der Tatsache, dass die meisten Menschen glauben zu wissen, was am besten für sie ist, entscheiden sich viele für suboptimale Alternativen. Zum Beispiel präferieren sie ungesundes gegenüber gesundem Essen. Viele Studien haben gezeigt, dass Nudging Menschen helfen kann, gesündere Lebensentscheidungen zu treffen, vor allem in Umgebungen in denen sie unter Zeitstress stehen und ohne lang zu überlegen Entscheidungen treffen müssen, beispielsweise was sie während der Mittagspause konsumieren wollen. In dieser Arbeit geht es um zwei Nudges die in einem Mitarbeiter:innenrestaurant einer großen Firma in Österreich implementiert wurden. Dem Beispiel von bereits erfolgreich implementierten Nudges folgend, war der erste Nudge eine Kombination aus Platzierungs-, Verfügbarkeits- und Positions-Nudge. Der zweite Nudge war ein Informations-Nudge. Das Ziel war es zu sehen, ob diese Nudges einen Einfluss auf das Essverhalten haben, indem der Fruchtkonsum und die Verkaufszahlen von Essen im Restaurant analysiert wurden. Es konnte gezeigt werden, dass der erste Nudge einen signifikant positiven Einfluss auf den Fruchtkonsum und den Konsum von veganem Essen hatte und dass der zweite Nudge einen signifikant positiven Einfluss auf den Konsum von vegetarischem Essen hatte. Diese longitudinale Feldstudie hat einige Schwächen die aus der Sicht der Firmenleitung notwendig waren. Deshalb und aufgrund der Umstände durch die Covid-19 Pandemie, sind die Ergebnisse möglicherweise beeinflusst. Wegen verpflichtendem Homeoffice für viele Angestellte, untersucht diese Studie, das Verhalten der Personen die am Arbeitsort waren und somit hauptsächlich Fachkräfte mit geringerer Bildung. Die Studienergebnisse werden in Bezug auf die gegenwärtigen Theorien zum Thema Nudging diskutiert.

Abstract (English)

Despite the fact that most people believe to know what is best for themselves, many indulge in unhealthy behaviours, like preferring unhealthy to healthy food. Many studies have shown that nudging can help people in making healthier life choices, especially in environments where people suffer from time pressure and need to make quick decisions, like what to consume during a lunchbreak. This thesis is about two nudges implemented in the co-worker restaurant of a big company in Austria. Following the example of nudges proven as successful the first nudge was a combination of placement, availability and position nudge. The second nudge was an informational nudge. The goal was to see whether these nudges have an impact on eating behaviour by analysing the fruit consumption and the sales numbers of food in the restaurant. It could be shown that the first nudge had a significant positive

impact on fruit consumption and the consumption of vegan food and that the second nudge had a significant positive impact on consumption of vegetarian food. This longitudinal field study has weaknesses due to restrictions in data collection set by the company and due to home-office of many employees during the Covid-19 pandemic. Due to mandatory remote work for many employees this study mostly examined the behaviour of blue collar workers. Study results are discussed in the light of the presented theories in relation to nudging.

1. Introduction

There are a lot of potential benefits to consuming a healthy diet throughout one's life. But increased production and consumption of processed food, following urbanisation and lifestyle changes have led to a shift in dietary patterns in large parts of the world. Foods high in energy, fats, sugars and salt are consumed a lot more than they used to be and at the same time many people do not eat enough fruits, vegetables and whole grains (Ng et al., 2014). This happens despite the fact that all evidence suggests that vegetables and fruits provide greater benefits because of their low dietary sugar and high content of protein and fibre (Slavin & Lloyd, 2012). This fact and multiple other researches on health related topics have shown that most people do not make the decisions that are best for their health. They smoke, drink too much alcohol, eat unhealthy, do not engage in sport etc. This is where *nudging* can help. Nudging refers to strategic changes in the environment in order to alter people's behaviour in a predictable way, without denying options or significantly changing economic incentives (Bucher et al., 2016).

A co-worker restaurant is a perfect place for nudging because people are in a hurry most of the time and people in a hurry tend to use heuristics to skip or speed along their decision processes. In the case of the company (that wants to stay anonymous) in this study, most people have just about half an hour to get there, make a choice of what to eat, get the food, eat it and a lot of them enjoy chatting with colleagues. Smokers also have to find time to smoke afterwards or before. In these stressful situations people tend to use heuristics, which are mental shortcuts people use to make decisions more efficiently and more quickly. But sometimes heuristics are not right for the job or are applied in a way that leads to faulty judgements, like choosing unhealthy food most of the time (Aronson, Wilson & Akert, 2013).

2. Theoretical background

2.1 What is nudging?

The idea of nudging originally comes from Richard H. Thaler and Cass R. Sunstein. They argue that choice architects are everywhere. A choice architect is someone who has the responsibility for organizing the context in which people make decisions. People in many different situations are choice architects whether they know it or not: People that are in charge of designing new forms that employees must fill out in order to get a health care plan, parents describing possible careers to their children and every salesperson is a choice architect. In choice as well as in traditional architecture there is no such thing as neutral design. There is always a default setting (Thaler & Sunstein, 2008).

According to older literature like Marteau, Ogilvie, Roland, Suhrcke & Kelly (2011), there is no precise, operational definition of nudging and nudging is at best a fuzzy set intended to draw attention to the role of social and physical environments in shaping our behaviour. However, Hollands et al. (2013) tried to find a universally applicable definition and encourage other researchers to use their definition. They state that nudges are:

> "Interventions that involve altering the properties or placement of objects or stimuli within micro-environments with the intention of changing health-related behaviour. Such interventions are implemented within the same micro-environment as that in which the target behaviour is performed, typically require minimal conscious engagement, can in principle influence the behaviour of many people simultaneously, and are not targeted or tailored to specific individuals*"* (p. 3).

Bucher et al. (2016) gave a definition that complements the one above:

> "Nudging or 'choice architecture' refers to strategic changes in the environment that are anticipated to alter people's behaviour in a predictable way, without forbidding any options or significantly changing their economic incentives. Nudging strategies may be used to promote healthy eating behaviour" (p. 2252).

So as seen above, usual definitions of nudging exclude legislation, regulation and interventions altering economic incentives. According to Marteau et al. (2011) aside from these there are numerous approaches to alter environments to make certain behaviours occur more likely. Nudging builds on psychological and sociological theories over a century old, that show how environments shape and constrain human behaviour, often far more than we would like to believe. The novelty of nudging lies in two features:

1. It is based on behavioural economics and social psychology to explain why people behave in ways that deviate from rational decisions as defined by classical economics.
2. It is embedded in libertarian paternalism, a political philosophy in which people's choices are actively guided in their best interests while the liberty to behave differently remains.

2.2 Why use nudging?

Nudging is appealing because it proposes a set of seemingly simple, low cost solutions that do not require sanctification by legislation and can be applied to a wide array of problems arising from human behaviour. The absence of legislation is especially appealing to those governments that want a smaller role for the state in shaping their citizens' behaviour. Nudging and shaping environments works, can be extremely effective and has been done for a

long time. Sadly it has mostly been used to the detriment of health, e.g. seducing people to buy unhealthy food and in addition it has also been used to encourage behaviour that is bad for the environment. Another example that affects environment and health simultaneously would be that a lot of supermarkets are planned and built in order that going there by car is a very attractive and easy option. In most first world countries packaged foods are readily available, presented to stimulate our automatic, affective system, producing a lot of plastic waste. Advertising has also played a big role in seducing people to rather listen to their often short sighted gut feeling (Marteau et al., 2011).

There has been a shift in recent years towards addressing wider, population-level factors instead of targeting individuals in regard to changing eating behaviours. Information campaigns in Europe regarding information to enable consumers to make better food choices have been a success in creating awareness amongst consumers, but there has only been modest success in actual behaviour and lifestyle changes and health indicators in the sample populations like reduction of weight (Bucher et al., 2016).

An important aspect about individualised behaviour change is that it is ineffective unless it becomes habit forming. In order to become that it requires support and reinforcement through structural or environmental change in order that the new behaviour is sustained. Most interventions have the basic assumption that people make conscious and reasoned food choices, most of the time. But this paradigm has been questioned due to the limited impact of information-based campaigns in achieving lasting behaviour change. Current paradigms also place the burden and responsibility for all food choices on the individuals, because according to these paradigms every person is free to make healthy choices once he or she is informed (Bucher et al., 2016).

Food choices and dietary habits are based on reflective and elaborate decision making as well as routines that require very little active decision making. Presentation within a meal environment can influence decisions within that environment. The meal environment consists of the room, the people, the food, the atmosphere and the management system (Bucher et al., 2016). The term *choice architecture* is often interchangeably used with other terms: nudging, libertarian paternalism and behavioural economics. But choice architecture is a subset of non-regulatory behavioural interventions, whereas nudging "has been defined as any aspect of the choice architecture that alters people's behaviour in a predictable way without forbidding any options or significantly changing their economic incentives (15)" (Bucher et al., 2016, p. 2253). Nudging interventions can for example consist of provision of information, changes to

physical environment, changes to the default policy and the use of social norms and salience (Bucher et al., 2016). Within a food environment, this can mean a number of interventions which will be discussed later in greater detail.

In their systematic review Bucher et al. (2016) showed that sixteen of eighteen studies concluded that positional changes had a significant influence on food choice. The two studies that did not find a significant effect only used very small manipulations, like manipulating the product order of snacks on a computer screen. A problem with reviews can be the lack of unity in definitions and inconsistency in detail of the manipulation description. The eighteen studies included in the review did not consistently describe the choice architecture intervention that was being assessed (e.g. whether the nudge was a change in distance or in product positioning) (Bucher et al., 2016).

This study follows the suggestion by Bucher et al. (2016) and other authors like Hollands et al. (2013) to use standardised keywords and vocabulary adopting the terminologies suggested by Hollands et al. (2013) to classify choice architecture interventions more clearly. This could help this field of research, especially reviews and meta-analyses. Bucher et al. (2016) argue that research has by now sufficiently shown the importance of choice architecture and that food retailers influence consumption by organising and displaying their products. So the persons in charge of food organisation and design for places where food is consumed need to be aware of their responsibility to organise these "foodscapes" in an optimal way, e.g. in order to stimulate consumption of healthy foods and to reduce the consumption of unhealthy foods. This means that products such as fruits and vegetables which are low-energy and nutrient-dense should be placed in easily accessible and prominent positions which is particularly applicable in large self-serving settings such as canteens in schools, workplaces or residences for the elderly (Bucher et al., 2016).

The aforementioned study by Hollands et al. (2013) focuses on interventions that involve small scale environments or micro-environments with the intention to help people with healthier behaviour. The authors consider micro-environments to be environments where people gather for a specific purpose e.g. to consume food or be physically active. Former studies have shown that placing unhealthier food further away from customers and changing sizes, e.g. of plates can influence the types and amounts of food selected and consumed. Another example suggests that opening and closing speed of elevator doors may increase the likelihood of people using the stairs instead of the elevator. It was proposed that this kind of interventions require little engagement of the conscious to be effective. They mainly work

through automatic or non-conscious psychological processes and are less dependent on the recipients' literacy, numeracy or self-regulatory skills. They also argue that nudges should exclude the use of economic instruments like taxes or subsidies (Hollands et al., 2013).

The paternalistic aspect of the term 'libertarian paternalism' lies in the belief that influencing people in order to make their lives longer, healthier and better is legitimate for choice architects. It can be argued that this is legitimate since a lot of studies have shown that people tend to make really bad decisions in certain situations. In addition, no one is safe from making bad decisions, even the wisest and most conscious among us. This is because we cannot always pay full attention to every detail, our brain is under a never ending bombardment of complex information in our everyday lives: sights, sounds, smells, other people, stress, time pressure etc. Since our brains do not have unlimited cognitive abilities and computing power to deal with everything at once it needs to fall back on patterns, heuristics, biases and stereotypes. We also do not always have complete self-control, for example when we are famished (Thaler & Sunstein, 2008).

Thaler & Sunstein (2008) argue that libertarian paternalism is a relatively weak and nonintrusive type of paternalism since choices are not blocked and do not come with big drawbacks. If people want to indulge in unhealthy behaviour, they still can. If they want to choose a health care plan that is not as beneficial as others would be, they still can. The reason it is still paternalism is because behind these decisions that people make there are choice architects that self-consciously attempt to move people in directions that will improve their lives. A nudge is any aspect of choice architecture that can alter the behaviour of people in a predictable way, making it interesting for governments as well as the private sector. Private companies that want to make money and do good at the same time can use nudges to do it (Thaler & Sunstein, 2008), as the company in this study wants to.

They further argue that those who reject paternalism altogether tend to claim that humans do a great job at making choices or at least better than anyone else would do. Even many people who have not studied economics seem to be at least implicitly committed to the idea of *homo economicus*, also called *economic man*. It is the notion that humans think and choose unfailingly well:

"If you look at economics textbooks, you will learn that homo economicus can think like Albert Einstein, store as much memory as IBM's Big Blue, and exercise the willpower of Mahatma Gandhi" (Thaler & Sunstein, 2008, p. 7).

But people really are not like that, they need a calculator to compute complex divisions and sometimes even easy ones. They forget birthdays, appointments etc. They engage in risk-related behaviour like smoking, drinking and unhealthy eating which produce more than five hundred thousand premature deaths p.a. in the US alone (Thaler & Sunstein, 2008). This shows that people choices regarding these activities cannot reasonably be claimed to be the best decisions for their well-being. As Kirchler & Hoelzl (2018) point out, people simply do not always have the time, motivation or ability to process all the information and analyse the entire situation. And in other cases their preferences may change with time or even emotions or instead of looking for extra information people often simply do what they have done in the past or can even behave inconsistently regarding their goals.

Econs (abbreviation for *economic men* used by Thaler & Sunstein (2008)) are not required to make perfect forecasts, because that is not possible, but they need to be able to make unbiased forecasts. But many studies have shown that human forecast is biased and flawed and that human decision making is not great either. One example that is crucial for nudging is the status quo bias: People tend to stick to the status quo or the default option. But Econs would not be influenced by default options. Instead they would respond to incentives. For example, decreasing the price of a healthy meal would influence the Econs decision, regardless of whether the meal would be on top or bottom of the menu. Real humans are influenced by both: incentives as well as nudges. Thaler & Sunstein (2008) argue that by properly deploying incentives and nudges we can improve people's lives and help solving a number of major problems societies face, while still keeping the freedom of everyone to choose. Despite that a lot of people who favour freedom reject any kind of paternalism. According to Thaler & Sunstein (2008) those people think in black and white: either the government chooses for the citizens in a one-size-fits-all way or the government does not intervene and choices are maximized for citizens. But there are not only two sides to this coin. The authors argue that this scepticism is based on one false assumption and two misconceptions:

The false assumption being that people tend to make the best choices for themselves almost all the time and that these decisions are automatically better than if they were made by someone else. But in the real world many consumers are like novices acting in a world full of professionals trying to sell them various things. Of course people tend to know their preferences, but unless they are an expert on every topic (which is naturally impossible) there will always be people in certain areas who are experts and simply know better.

The first misconception is that it is even possible to avoid influencing the choices people make. In many situations decisions must be made that will influence the behaviour of people whether the choice architect is aware of it or not. For example, an architect designing a building might or might not be aware that placing the elevator close to the entrance will entice people to use that elevator compared to placing it further in the back or around a corner, which will make more people use the stairs instead. Another example is that when employees get their salary every two weeks instead of once a month they tend to put more money aside because they get three pay checks per month twice a year.

The second misconception is that libertarian paternalism always goes hand in hand with coercion. But in Thaler & Sunstein's (2008) cafeteria example, which showed that simply reducing the distance between customers and healthy food and enlarging the distance between customers and unhealthy food lead to more healthy and less unhealthy food being consumed, as well as in the project that this study is based on no particular diet is forced on anyone. And could anyone really interested in people living healthier lives be in opposition to the idea of e.g. putting fruits in a more central position in order that people favour them over sweets with more fat and sugar and less vitamins, especially when the freedom of choice still remains?

2.3 Two systems – Fast and slow

Thaler & Sunstein (2008) argue that many mistakes and errors we do in our lives are due to our two systems of thinking described in Kahneman's world famous book "Thinking, Fast and Slow": The *Automatic* and the *Reflective System* (in the literature often called *System 1* and *System 2*). The Automatic System is uncontrolled, effortless, associative, fast, unconscious and skilled. It is rapid and feels instinctive. It involves reacting to sudden occurrences like hitting the breaks when you see the car in front of you stopping. You do not need to think that you need to hit the brakes to stop the car, you just react and do it. Brain scientists are able to say that this system is based in the oldest parts of our brain which we share with other animals. The Reflective System on the other hand is controlled, effortful, deductive, slow, self-aware and rule-following. It is used when calculating, learning, consciously thinking about problems big and small (Thaler & Sunstein, 2008; Kahneman, 2013). Language learning is an interesting example regarding the two systems: we speak our mother tongue using the Automatic System. When we learn a new language we need to use the Reflective System until we are fluent and are able to speak that language using the Automatic System. So essentially the Automatic System is our gut feeling. Gut feelings have their upsides and can be quite accurate, but they often lead to mistakes, like in this example by

Thaler & Sunstein (2008): “A bat and a ball cost $1.10 in total. The bat costs $1.00 more than the ball. How much does the ball cost? ___cents” (p. 23).
Most people listening to their gut instinct would say the answer is 10 cents, when it is actually 5 cents. You need to think it through to get to the right answer (Thaler & Sunstein, 2008)

Another example of how our gut feeling can work against our interests: despite wanting to live healthier we might go to the supermarket and while waiting in line at the checkout we are overwhelmed by hunger and see all the sweets displayed there to seduce us, so we buy some in the spur of the moment and regret it later (Marteau et al., 2011).

2.4 Unhealthy living

According to Marteau et al. (2011) and many other experts (WHO, 2009) the huge burden of chronic diseases like cancer, type 2 diabetes and heart diseases on public health systems would be much reduced if people did not smoke, would drink less, would eat healthier and if they were more physically active.

Shockingly, in 2014 70.7% of American adults were overweight or obese and 32.4% of American children and adolescents (ages 2–19 years) were overweight or obese. Nearly 2.7 billion adults will be overweight or obese worldwide by 2025 (Kraak, Englund, Misyak & Serrano, 2017). Newson et al. (2015) showed in an international study that across 10 countries less than 20% of consumers were satisfied with healthy menu options at restaurants. Additionally, healthy options were often linked to lower taste and satiation and higher price. This shows the need for improvement and that restaurants also need to play their role and enable customers to eat healthy, by making healthy dishes more attractive, tasteful and cheaper.

Despite most people valuing their health, they persist in living in unhealthy ways that undermine it. According to Marteau et al. (2011) this can be a deliberate act by individuals who value their health more or less at different points in time, or it can be a non-deliberate act. This gap between people’s values and their actual behaviour can be understood by using the dual process model explained above. A lot of traditional approaches promoting health depend on engaging the reflective system. They often rely on providing information and are designed to alter beliefs and attitudes, motivate people with the help of future benefits or help them in developing self-regulatory skills (Marteau et al., 2011). But as studies have shown (e.g. WHO, 2008) these approaches have only been modestly effective in changing people’s behaviour. Environmental cues, like the one example above with waiting in line at the

checkout, combined with the power of immediate and certain pleasure over less certain, larger and more distant rewards tend to make unhealthy behaviour more likely. This suggests to use another approach to change behaviour: focusing on altering environmental cues to prompt healthier behaviour (Marteau et al., 2011). In other words: to focus on engaging the Automatic system. Like in supermarkets, this approach is readily used by advertisers and retailers but is also increasingly used by health specialists (Beaglehole & Horton, 2010).

2.5 Nudging vs. Regulating

The following four examples, all based on Marteau et al. (2011), show the difference between nudging and regulating:

1. To ban smoking in public places is regulating. Reducing cues for smoking by keeping cigarettes, lighters, and ashtrays out of sight, or making non-smoking more visible through mass media campaigns communicating that the majority do not smoke and the majority of smokers want to stop is nudging.
2. Regulating the price of alcohol by changing the minimum pricing per unit or raising the minimum age for purchasing alcohol. Serving alcoholic drinks in smaller glasses or making lower alcohol consumption more visible through highlighting in mass media campaigns that the majority do not drink to excess is nudging.
3. Restricting food advertising in media directed at children or banning industrially produced trans fatty acids is regulating. Designating sections of supermarket trolleys for fruit and vegetables or making salad rather than chips the default side order is nudging.
4. Increasing duty on petrol year on year (fuel price escalator) or enforcing car drop-off exclusion zones around schools is regulating. Making stairs, not lifts, more prominent and attractive in public buildings or making cycling more visible as a means of transport is nudging.

There are various instances of using nudges to change behaviour in order to improve health outcomes. Putting yellow duct tape across the width of supermarket trolleys with a sign requesting shoppers to place fruit and vegetables in front of the line doubled fruit and vegetable purchasing (Marteau et al., 2011) and the amount of fruit bought by school children at lunchtime was increased by 70% by placing fruit by the cash register (Hanks, Just, Smith & Wansink, 2012)

Voluntary agreements can sometimes be modestly effective. For example, in the UK daily salt consumption was successfully reduced by 0.9g per person as a result of agreements by food manufacturers, but this was done by a threat of legislation (Wyness, Butris & Stanner, 2012). So as Marteau et al. (2011) argue, effective nudging may require legislation, either to implement healthy nudges (such as fruit instead of sweets at checkouts in supermarkets) or to prevent unhealthy nudges from industry (such as food advertising aimed at children, like the toys children get with the children's menu at fast food restaurants). In Finland and Japan the salt intake per person was decreased by 5g after legislation, which shows that self-regulation by the food, alcohol, and tobacco industries has historically been less effective than legislation as a means to improve population health (Cappuccio & Capewell, 2010). According to Marteau et al. (2011), nudging relates more closely to whole population approaches to disease prevention and might do indirect harm if an emphasis on nudging resulted in neglect of population level interventions that would have potentially been more effective. A number of recent reports show the importance of tackling the economic and regulatory environments in the areas of alcohol, obesity, and tobacco control. In these areas regulation and legislation are more effective than voluntary agreements with e.g. the alcohol industry (Anderson, 2009). Cecchini et al.'s review (2010) of measures to tackle obesity has shown that pricing interventions and regulation of food labelling and marketing to children are likely to produce the largest health gains in the shortest times and Thomas et al. (2008) argue that the evidence suggests increasing the price of tobacco may be more effective in reducing smoking among adults on lower incomes and in manual occupations than among those with higher incomes and nonmanual occupations, which is not true for other approaches such as printing health warnings on cigarette packets.

Marteau et al. (2011) report that nudging and similar concepts have stimulated policymakers to think about altering environments to change behaviour. Despite this, according to them, being a welcome development the evidence to support the effectiveness of nudging as a means to improve population health and reduce health inequalities is weak. This could be seen as absence of evidence as well as evidence of little or no effect. The problem is that for every nudge in the e.g. healthy direction, there are countless nudges that do the opposite: nudge people to do or consume things that are bad or not beneficial for them and instead beneficial for the industry. So nudging towards healthier behaviour may not make much impression on the scale and distribution of behaviour change needed to improve population health to the level required to reduce the burden of chronic diseases without regulation that limits the potent effects of unhealthy nudges in existing environments shaped largely by industry

(Marteau et al., 2011). Also Kraak et al. (2017) state that nudging strategies are often undermined by unhealthy food and eating environments so it should be the goal of governments and companies to instead create environments that do the opposite. Reducing obesity, number of smokers in a country, excessive meat consumption and so forth is not just better for the individuals themselves, but also for society as a whole, for unhealthy lifestyles tend to cost the whole society especially in countries with public healthcare.

Choice architecture strategies have been tested in many settings like schools, hospitals, worksites, food retail outlets and restaurants, so places where people live, learn, shop, work and play. Experimental studies have shown mixed results regarding effectiveness for several reasons: Most studies have focused on one or two strategies at a time, rather than implementing comprehensive integrated nudge interventions. Interventions were of short duration that hindered judgements about their long-term sustainability and effectiveness. Studies have had weak methodological designs. Results have depended upon the dietary-choice setting or demographic factors, such as cultural preferences or education (Kraak et al., 2017).

2.6 Shortcomings & problems of nudges

A problem with nudging can arise from irrational responses to nudges. A salad as default side dish for example can have a halo effect resulting in an underestimation of the energy content of the meal and this leading to more consumption than usual (Chandon & Wansink, 2006). Now that the person has eaten something healthy he/she might feel entitled to reward herself with a dessert leading to higher calory intake than she would have had otherwise: In one study by Chernev (2010), participants estimated on average that a hamburger contained 697 calories when it was presented alone. When it was presented with three celery sticks participants on average estimated 642 calories. Additionally, this effect was greatest among people concerned about managing their weight.

According to Kraak et al. (2017), critics argue that nudge interventions have substantial limitations when used without legislation and regulation and provide only small benefits for populations. Another shortcoming is that nudge or choice architecture strategies exclude pricing manipulations. But these are a classic feature of the conventional commercial marketing mix used to influence people's health related purchasing and consumption behaviours. Some systematic reviews have identified pricing and fiscal strategies as essential interventions to reduce socioeconomic inequities and promote healthy eating to decrease obesity (McGill et al., 2015). A limitation of nudges that provide people with food labelling

information to inform their purchases (called priming or prompting) is that competing factors such as taste, smell, cost and targeted marketing often overpower their rational thinking to choose unhealthy over the healthier food and beverage options (Smith, Goldstein & Johnson, 2013). Nudging represents only one form of choice architecture, while coercion and inducements are alternative choice architecture strategies or hard policy tools that governments could use to influence population health if they wanted to. Nevertheless, most countries have been reluctant to use legislative and regulatory tools to compel the restaurant sector to make big, important changes to use healthy default food and beverage choices for customers. Sadly, evaluations have also found limited public support for healthy zoning ordinances and the elimination of tax deductions for restaurants that advertise unhealthy food products to children (Kraak et al, 2017).

2.7 Heuristics and other aspects of human psyche that make nudges necessary

Automatic thinking is thinking that is involuntary, nonconscious, unintentional and effortless. This automatic thinking helps people to understand new situations easier and quicker by relating them to their prior experiences. It is used when meeting new people, going to new places and handling new objects and situations. Schemas are mental structures used by people to organize their knowledge about subjects or the social world around themselves. They influence the information people notice, think about, and remember. Schemas also encompass very specific events like what to do and what happens when eating in a restaurant. So when examining our options in a new situation, or the new situation itself, we often apply schemas and previous knowledge. When there are too many schemas to choose from people often use mental shortcuts called judgemental heuristics. These are mental shortcuts people use to make decisions more efficiently and more quickly. Sometimes heuristics are inadequate for the job or applied in such a way that they lead to faulty judgements (Aronson et al., 2013).

Thaler & Sunstein (2008) argue that Econs always use their reflective system when making decisions, but humans often use their automatic system. This makes sense as it is not always possible to pause and think. In many situations we need to make quick decisions and thus use rules of thumb, because they are quick and useful. But despite them being helpful, they can lead us to systematic biases and according to Thaler & Sunstein (2008), psychologists have come to the conclusion that the three following biases and heuristics emerge from the interplay between system 1 and 2 (Thaler & Sunstein, 2008):

1. Anchoring: Anchoring and adjustment happens when people do not know the answer to a question so they commence with some anchor, a number they do know. For

example, when estimating how much money a doctor earns, person 1 will start with his/her own salary 1500€ and use this as a basis. Person 2 earns 3000€ and uses this as a basis for guessing. Those two anchors will likely result in different guesses. But anchoring also applies to other contexts like how you feel. When students were first asked “How happy are you?” and then “How often are you dating” the correlation was .11. But when they were asked the second question first the correlation was .62. Similar results were obtained when asking married couples about the last time they had sex. Anchors serve as nudges (Thaler & Sunstein, 2008).

2. Availability: The availability heuristic is about how readily examples about a risk come to mind. When people can easily think of examples they are more likely to be afraid. More vividly imagined causes of death like earthquakes or lightning strikes receive inflated probability estimates and less vivid causes like skin cancer from too much sunbathing receive lower estimates. Additionally, more recent events have more impact on us than distant ones. This can impact policies and governments (Thaler & Sunstein, 2008). For example, the fact that carbon emission by cars and industry is a big problem for the environment and global warming is by now readily available in the mind of most people, makes politicians clamour for getting more people to switch from cars to more environment friendly alternatives. At the same time, the fact that meat consumption plays a big role in global warming and environmental changes like clearing in the Amazon rainforest is not present in the minds of many people (even though a shift seems to be coming). And even if it is present, it is readily ignored by many because people in general do not easily change and do not like to change their behaviours, like eating behaviours.
3. Representativeness: When asking people to judge how likely it is that A belongs to category B, people tend to answer by asking themselves how close A is to the stereotype or image they have of B. This is especially true when people use their automatic system. A famous example of this comes from Thaler & Sunstein (2008): Subjects were told that a hypothetical person called Linda is single, outspoken, majored in philosophy, deeply concerned about issues of discrimination and social justice. Participants were then asked to rank possible futures for Linda in order of the probability of their occurrence. The essential answers in this experiment were “bank teller” and “bank teller and feminist activist”. Most participants thought that Linda was more likely to be a bank teller and active in the feminist movement than just being a bank teller. This does not make logical sense of course: It is not logically possible

for any combination of two events to be more likely than one of those events alone, since the probabilities are multiplied, not added. This error stems from the use of the aforementioned representativeness heuristic: The description of Linda seems to match a feminist bank teller far better than simply a bank teller (Thaler & Sunstein, 2008).

2.8 Further examples why people do not act like Econs

2.8.1 Optimism and overconfidence

People have a tendency to be overly optimistic and confident about themselves, this is called the "above average" effect (Thaler & Sunstein, 2008). A few examples: 94 percent of professors at a big university believed that they are better than the average professor. Almost 50 percent of marriages fail, but around the time of the wedding ceremony almost all the couples approximate there is a zero percent chance that their marriage will fail. This even applies to the ones who have already been divorced. This effect also applies when thinking about health or the risk of disease and can explain a lot of individual risk taking: students typically believe that they are far less likely to have a heart attack or get cancer when compared to their fellow students (Thaler & Sunstein, 2008). Also according to Thaler & Sunstein (2008), gay man tend to underestimate their chance of getting in contact with AIDS. Smokers, even when they are aware of the statistical risks of smoking, believe that they are less likely to be diagnosed with heart disease and lung cancer than most non-smokers.

2.8.2 Status quo bias

People have a general tendency to stick with their current situation. An almost funny example by Thaler & Sunstein (2008): when choosing a retirement savings plan, most people pick and asset allocation and then just stay with it, regardless of what changes happen in their lives. In an experiment more than half of the people made no changes at all. Many people who were single when choosing a plan picked their mothers as beneficiaries, but even when they got married they did not change their beneficiaries and still had their mothers listed as such.

2.8.3 Framing

How people perceive information depends a lot on how exactly that information is presented. E.g. when doctors give information about the mortality of an operation, the way in which they frame it may have a big influence on whether people will have the operation or not. When the doctor focuses on the number of people who survive the operation, people will feel much more comfortable with it than if doctors focused on how many people die from the

operation. Information campaigns framed in the terms of losses are also far more effective than when focusing on what you could gain (Thaler & Sunstein, 2008).

2.8.4 Confirmation bias

People tend to search for and favour information that confirms or supports their prior beliefs. They also interpret and recall information differently according to their prior beliefs and tend to ignore contrary information. This is especially true for emotionally charged issues (Nickerson, 1998). Once people are committed to their beliefs, most of them distort new information in a way that confirms them (Aronson et al., 2013).
E.g., republican voters favour Fox News over CNN and will more readily accept information broadcast by Fox News and more readily deny information broadcasted by CNN.

2.8.5 Time preferences

People tend to ascribe future gains less value than present ones and future costs are also given a lower value than current ones. Most people will go for the immediate benefit when given the choice between consuming amenities immediately or receiving a comparably larger award later (Kirchler & Hoelzl, 2018). This partly explains why many people are having a hard time committing to a diet: The discounted future gain of being thinner has to constantly compete with the seductive lure of instant gratification that e.g. a bar of chocolate can offer. Additionally, possible future costs like diseases of the cardiovascular system are also discounted, which together with the overoptimism mentioned above can lead to fatal results because they may keep people from changing to and maintaining a healthier lifestyle.

2.9 Dish of the day manipulation and gender differences

The purpose of the study by dos Santos et al. (2020) was to test the impact of a nudge strategy (the "dish of the day" strategy) and the factors associated with vegetable dish choice, during selection of food by European adolescents in a real foodservice setting. It was a cross-sectional quasi-experimental study implemented in restaurants in four European countries. 360 individuals between the age of 12–19 were allocated into control or intervention groups. They then were asked to select from meat-based, fish-based, or vegetable-based meals. All three dishes were identically presented in appearance and with the same sauce and side dishes. However, in the intervention condition, the vegetable-based option was presented as the "dish of the day". The results of a Pearson chi-square test showed that this nudging strategy did not show a difference on the choice of the vegetable-based option among adolescents tested ($p = .80$ for Denmark and France, $p = .69$ for Italy and $p = .53$ for the UK). While in a food choice

questionnaire, social norms and attitudes towards vegetable nudging were all positively associated with the choice of the vegetable-based dish, being male was negatively associated with choosing the vegetable based dish. Choice of the vegetable-based dish was thus predicted by natural dimension, social norms, gender and attitudes towards vegetable nudging. According to dos Santos et al. (2020), there are many internal and external influences on perception attitude and action, therefore consumer behaviour is highly complex with regard to food. Product attributes, individual characteristics of the consumer as well as the eating environment all play a key role in food-related decisions. Thus foodservice providers can play a potential role in facilitating healthy choices.

A study in Denmark by Kongsbak et al. (2016) found that a choice architecture approach could increase intake of healthy items and decrease consumption of other meal components among male university students through combining the order of placement in a buffet and separating the fruits and vegetables (Kongsbak et al., 2016). A recent meta-analysis has shown that nudging interventions aiming to influence fruit and vegetable choice generally have a moderately significant effect, the largest effects being from altering placement and from combined nudges (Broers et al., 2017).

Being male was negatively associated with the choice of the vegetable-based dish. Literature and research show that women usually have a higher consumption of fruits and vegetables than men (Bere et al., 2008; Krolner et al., 2011). Thus women having a higher probability of choosing the vegetable-based dish was expected. The intake of fruits and vegetables is generally lower in men because they tend to give more importance to eating meat, because of a solid relationship between perceived masculinity and meat consumption. Evidence demonstrates that female adolescents tend to have healthier food behaviour than male adolescents, for example by eating less fast food and having more meals in a family environment (dos Santos et al., 2020). Major barriers to eating more fruits, vegetables, and dairy products and eating fewer high-fat foods included a lack of sense of urgency about personal health in relation to other concerns, and taste preferences for other foods (Neumark-Sztainer et al., 1999). According to dos Santos et al. (2020) many choices in settings such as canteens are relatively low involvement choices, which means that consumers do not actively process available information about choice alternatives. Using choice architecture to reshape the setting in which consumers take their meals has therefore been increasingly pointed out as a good strategy towards healthier choices, as it can be simple, easy to implement and inexpensive while maintaining the freedom of choices (Neumark-Sztainer et al., 1999).

Although the intervention in this study aims mostly at the health aspect of the co-workers, there is an additional aspect of getting them to eat more fruits and vegetables: the excessive consumption of meat in the west (and growing meat consumption in other parts) play a big role in the problem of climate change. Ultimately, this problem will need to be solved by politicians (e.g. by making meat far more expensive and in turn making vegetables and fruits much cheaper), but until that day nudging can play a role in contributing to stop or slow down climate change.

2.10 Deliberating vs. Nudging

Lenzi (2019) states that democracies have not shown greater capacity to mitigate climate change than non-democratic regimes which has understandably led to much debate among theorists (like Shearman and Smith, 2007; Beeson (2010); and Shahar (2015)) Doubt that democracy can address climate change has been expressed by theorists favouring rule by technocratic elites or the restriction of democracy in light of the public's ignorance. The problems with the public regarding climate change are similar to the ones regarding eating habits:

> "[H]ere is substantial evidence that citizens interpret information and expertise bearing on politics generally, and climate change in particular, in highly selective and partisan ways. […] [M]any citizens do not understand science sufficiently well to distinguish reliable information from misleading claims or outright falsehoods concerning climate change. These interrelated problems have led to the emergence of 'post-truth' politics and the rise of anti-science and anti-expertise rhetoric in many democracies." (Lenzi, 2019, p.314)

According to Lenzi (2019), deliberation envisages citizens the formation of reflective and informed policy preferences and exchanging reasons under conditions of mutual acceptability. Certain attitudes are necessary for deliberation: open-mindedness, respect for others, public-spiritedness, a concern for accuracy or truth, and an interest in finding mutually justifiable reasons. But a large amount of research has shown that individuals do not generally behave in these ways. Fifty years of public opinion studies have shown that the public pays little attention to politics, has inadequate levels of political information and incoherent thinking about politics. If many citizens cannot deliberate adequately, should they even be expected to do so? Social psychology further darkens the prospect, showing that many interpret political claims and information in ways that suit their prior values (Lenzi, 2019).

Keller (2015) claims that climate scepticism might not be a result of laziness, selfishness, wilful ignorance of the science, or brainwashing by corporations and right-wing politicians. Instead it could be a result of an ordinary person doing their best to form true beliefs, within their social context and starting at a certain ideological framework. Lenzi (2019) argues against that, because according to him this interpretation is overly in favour for climate sceptics and others behaving like them. He claims that:

> "There is no evidence that people succumbing to biased cognition are in fact doing their best to form true beliefs, only to be foiled by their values. What this research shows, to the contrary, is that it is common to utilise judgement heuristics to determine the reliability of expertise, without engaging with questions of epistemic justification" (Lenzi, 2019, p. 316f).

Instead of assessing the information on its epistemic merits, many individuals select and dismiss information in accordance to what fits their vision of a good society and tend to believe what is politically convenient (Lenzi, 2019).

2.11 Types of nudges

There are many types of nudging, but this study focuses on interventions in the physical micro-environment and informational nudges. An informational nudge is providing information that serves as a nudge. Not educating, but informing inside of the environment where the decision is made (Miesler et al. 2017).

Other types would be e.g.: Social norm feedback, which is providing information of what others are doing and changing defaults, like serving pancakes without whipped cream by default to make them less fatty, but people can still ask for cream (Marteau et al., 2011).

Hollands et al. (2013) created a provisional typology of choice architecture interventions in micro-environments, by grouping the evidence that fitted their definition. The typology consists of nine types which can be aggregated into two higher level classes of interventions: 1. Changing the properties of an object and 2. Changing the placement.

PROVISIONAL TYPOLOGY OF CHOICE ARCHITECTURE INTERVENTIONS IN MICRO-ENVIRONMENTS

Intervention class	Intervention type
Primarily alter **properties** of objects or stimuli	**AMBIENCE** - alter aesthetic or atmospheric aspects of the surrounding environment
	FUNCTIONAL DESIGN - design or adapt equipment or function of the environment
	LABELLING – apply labelling or endorsement information to product or at point-of-choice
	PRESENTATION - alter sensory qualities or visual design of the product
	SIZING - change size or quantity of the product
Primarily alter **placement** of objects or stimuli	**AVAILABILITY** - add behavioural options within a given micro-environment
	PROXIMITY – make behavioural options easier (or harder) to engage with, requiring reduced (or increased) effort
Alter both **properties and placement** of objects or stimuli	**PRIMING** - place incidental cues in the environment to influence a non-conscious behavioural response
	PROMPTING – use non-personalised information to promote or raise awareness of a behaviour

Figure 1: Provisional typology of choice architecture interventions in micro-environments (Hollands et al., 2013, p.3)

As can be seen in figure 1: The property changing type consists of: Ambience (= altering aesthetic or atmospheric aspects of environment), Functional design (= design or adapt equipment or function of environment), Labelling (= applying label or information to product or at a point of choice), Presentation (= altering sensory qualities or visual design of product) and Sizing (= altering size or quantity of product).

The placement changing type consists of: Availability (= adding behavioural options within the micro-environment) and Proximity (= reducing or increasing effort to engage with an object).

And there are also those interventions that alter both placement and properties of objects or stimuli: Priming (= placing incidental cues in environment to influence a non-conscious behavioural response) and Prompting (using non-personalized information to promote or raise awareness of a behaviour).

According to the meta-analysis of Hollands et al. (2013) the two most frequently encountered types of intervention, together accounting for over 40% of study reports, involved prompting and point-of-choice labelling. They generally involved providing information e.g. about the nutritional content of food or the health benefits of climbing stairs. Other types of

interventions less reliant on the conscious engagement of the individual are not as well represented in the literature.

2.12 TIPPME

Later on, Hollands et al. (2017) developed a new tool that aims to improve researchers' ability to consistently and clearly classify and describe interventions related to nudging and choice architecture in order to enable more systematic designs, reporting and analyses and help build a cumulative basis of evidence for ways of changing a populations behaviour: typology of interventions in proximal physical micro-environments, short: TIPPME.

TIPPME focuses on micro-environments. When speaking of nudging these are settings that people use for specific purposes, like restaurants and shops. In those environments they interact directly with objects and stimuli. Macro-environments on the other hand are the higher-level systems and infrastructure that have an influence on the characteristics of micro-environments and the relationship between them, e.g., the spatial distribution of restaurants in a certain area.

Their typology focuses on interventions involving altering aspects of physical micro-environments in order to change behaviour related to health by changing characteristics of products and the places in which they are available, like restaurants, shops etc. Providing a framework for reliably classifying and describing ways in which interventions can change physical environments to have an influence on selection, purchase and consumption of health related products is the aim of TIPPME. The goal of Hollands et al. (2017) is to facilitate a synthesis of evidence about the effects of interventions for potential actors like industries and policymakers to use and to support clearer reporting of intervention content for research. They furthermore want to facilitate identification and discussion of a broader range of opportunities for interventions to be developed as well as implemented and evaluated.
Hollands et al. (2017) follow the ANGELO framework (Swinburn et al., 1999) which distinguishes between four types of environment: physical, economic, political and socio-cultural. Just as this project, they focus solely on the physical micro-environment, but it is important to remember that there is a complex interactive relationship between the four types of environment and between interventions and outcomes. For example, in the case of this study the decision of the company to implement a nudging strategy is political and due to the decision of how much money is spent on it is economic. Those two factors influence the change in the physical environment which could have been even more or even less radical

than it turned out to be. On the other hand, an informational nudge can influence social norms inside of the company which could also have an influence on the employees' families and by that on the world outside of the company.

Since physical micro-environments can be very large (neighbourhoods or even whole cities) and encompass a wide range of functions, Hollands et al. (2017) emphasize that the addition of the word "proximal" is important to this framework, because the interventions are typically implemented spatially and temporally close to where the decision is made. Furthermore they have bounded the parameters of the physical environments characterized by their typology to those that are sensorily perceptible (by seeing, smelling, hearing, touching or tasting) by the recipients of the intervention. And finally this typology excludes interventions that are meant to be interactive or tailored to certain individuals. These interactions might result from interaction with a person (e.g. a cashier) or a vending machine. The interventions in this framework are not necessarily non-interactive, but they are not designed to induce an interaction. Interventions in proximal physical micro-environments have great potential to change behaviour to help improve population health. This is due to these interventions having key advantages over other types of interventions to change behaviour. Firstly: They have the potential to shape the behaviours of all those exposed to the intervention without the need of interpersonal interaction. This follows that once they have been implemented, these interventions are minimal ongoing resource costs. Secondly: Modification of physical environments has the potential to be transferred to other locations rather consistently. In the case of this study, if the intervention is successful, the plan is to use it in the company's other stores. Thirdly: They have the potential to be equally successful across the populations to which they are applied, unlike, for example, individual-level education and counselling which can have bigger effects on certain populations. And lastly: There is evidence that this kind of intervention is publicly more accepted than economic interventions like higher taxes on unhealthy food (Hollands et al., 2017).

While TIPPME interventions may map onto the concept of choice architecture and nudging, not all of them are necessarily linked to those concepts. According to the authors it is linked to a more general and readily definable concept of physical environment and ways in which this environment can be changed in order to influence behaviour (Hollands et al., 2017).

Table 1 | Simplified version of TIPPME for changing selection, purchase and consumption of food, alcohol and tobacco.

Class	Intervention type	Intervention focus		
		Product	**Related objects**	**Wider environment**
		Interventions to influence behaviour by changing the product that is selected, purchased or consumed. The product comprises the consumable substance and its immediate or integral packaging and tableware.	Interventions to influence behaviour by changing objects that are associated with the product and typically form part of its proximal surroundings.	Interventions to influence behaviour by changing objects and stimuli that are external to the product and related objects and are not used to store, display, select, purchase or consume the product.
Placement	**Availability**			
	Add or remove (some or all) products or objects to increase, decrease, or alter their range, variety or number.	Add or remove (some or all) products to increase, decrease, or alter their range, variety or number.	Add or remove (some or all) related objects to increase, decrease, or alter their range, variety or number.	Add or remove (some or all) objects from the set of objects that comprise the wider environment, to increase, decrease, or alter their range, variety or number.
	Position			
	Alter the position, proximity or accessibility of products or objects.	Alter the position, proximity or accessibility of products.	Alter the position, proximity or accessibility of related objects.	Alter the position, proximity or accessibility of objects that comprise the wider environment.
Properties	**Functionality**			
	Alter functionality or design of products or objects to change how they work, or guide or constrain how people use or physically interact with them.	Alter functionality or design of products to change how they work, or guide or constrain how people use or physically interact with them.	Alter functionality or design of related objects to change how they work, or guide or constrain how people use or physically interact with them.	Alter functionality or design of objects that comprise the wider environment to change how they work, or guide or constrain how people use or physically interact with them.
	Presentation			
	Alter visual, tactile, auditory or olfactory properties of products, objects or stimuli.	Alter visual, tactile, auditory or olfactory properties of products.	Alter visual, tactile, auditory or olfactory properties of related objects.	Alter visual, tactile, auditory, olfactory or other atmospheric properties of objects that comprise the wider environment, or stimuli therein.
	Size			
	Alter size or shape of products or objects.	Alter size or shape of products.	Alter size or shape of related objects.	Alter size or shape of objects that comprise the wider environment.
	Information			
	Add, remove or change words, symbols, numbers or pictures that convey information about the product or object or its use.	On products, add, remove or change words, symbols, numbers or pictures that convey information about the product or its use.	On related objects, add, remove or change symbols, numbers or pictures that convey information about the product or its use.	Within the wider environment, add, remove or change words, symbols, numbers or pictures that convey information about the product or its use.

See the Supplementary Information for full version of the TIPPME typology.

Figure 2: Simplified version of TIPPME for changing selection, purchase and consumption of food, alcohol and tobacco (Hollands et al., 2017, p.3)

3. Questions and hypotheses

As mentioned in the previous section, at the time of the first nudging intervention there were actually several measures going hand in hand: The restaurant's design was overhauled and made greener. Two screens were added and before the start of the second nudge it showed quotes from co-workers talking about how they liked the new restaurant. A dish of the day nudge was also implemented by highlighting dishes each day that serve a healthy and diverse diet. But the way in which the sales information was provided by the company made it impossible to measure an impact on food consumption of this dish of the day nudge. The information was clustered and differentiation between "dishes of the day" and the other food was no longer possible.

So with the information given by the company, two topics could be tested: fruit consumption and consumption of other food. Both nudges could have an influence on both. As shown in the examples above, it is to be expected that the implemented nudges have a positive effect on fruit consumption. That is why the hypotheses regarding fruit consumption are one-sided. There are four pairs of hypotheses. The first pair regards fruit consumption. Thus follows: Hypothesis H0-1a: The more central position of the fruit baskets and the enlargement of fruit choice have no positive impact on the consumption of fruits.

Hypothesis H1-1a: The more central position of the fruit baskets and the enlargement of fruit choice have a positive impact on the consumption of fruits.

Hypothesis H0-1b: Positive health-related information has no positive impact on the consumption of fruits.

Hypothesis H1-1b: Positive health-related information has a positive impact on the consumption of fruits.

The second pair is about the other kinds of food about which information could be gathered. The results could be influenced by both nudges as well. These hypotheses are not one-sided due to the fact that the numbers of one kind of food could go up and the others down. Additionally, there could be the effect discussed above, namely that eating fruits could make people think they can now eat more unhealthy food as well because they already ate something healthy.

Hypothesis H0-2a: The more central position of the fruit baskets and the enlargement of fruit choice have no impact on the consumption of meat, sweets, salads, vegetarian or vegan food.

Hypothesis H1-2a: The more central position of the fruit baskets and the enlargement of fruit choice have an impact on the consumption of meat, sweets, salads, vegetarian or vegan food.

Hypothesis H0-2b: Positive health-related information has no impact on the consumption of meat, sweets, salads, vegetarian or vegan food.

Hypothesis H1-2b: Positive health-related information has an impact on the consumption of meat, sweets, salads, vegetarian or vegan food.

There are two variables (HOLIDAYS & HOMEOFFICE) that could have a confounding effect on the results, especially regarding the first nudge. The first variable relates to the fact that typical holiday months in Austria (December, July and August) lead to less people being at work and thus less people going to the co-worker restaurant and by that having an impact

on the fruit consumption. Because the numbers for fruit consumption are absolute numbers that cannot be set in relation to something like visitors in the restaurant, since there is no record of that, those months might have to be excluded from data analysis, if they have a significant confounding impact.
The same is true for the variable HOMEOFFICE: Except for the months June to September only people whose attendance at the company was essential for the running of production, shipment etc. were allowed to come to work. The rest had to work from home.

Since the numbers about consumption of meat, sweets, salads, vegetarian food and vegan food are not absolutes but percentages, the impact of the confounding variables are not expected to be that big.

4. Method

4.1 Description of the implemented nudges following the TIPPME-framework

Following the TIPPME framework described above, these nudges have been implemented as described below.

4.1.1: 1st Nudge

Product: Regarding placement of fruits both availability and position have been altered. Before the nudge there were apples, bananas, pears and oranges. After reconstruction of the restaurant the selection was enhanced by seasonal fruits like strawberries and grapes.

Related objects: The placement of the fruit stand has been changed regarding position: It is now front and centre when you enter the room.
The presentation: Instead of a simple table with fruit baskets, the fruit stand is now arranged vertically, with baskets in a 35 degree angle, so that people see the fruits inside the baskets when entering the room. The size of the fruit cart has also been changed: it is more than double the size compared to before.

Wider environment: The wider environment has been changed drastically. Placement aspects have not been changed. The most important aspect is the change in functionality: When you enter the restaurant you are guided to pass by the fruits. Unless you are heading straight for the sweets (which are on the far right when you enter the room) you will always pass them.

The presentation has also been changed: The main colour of the room has changed from grey to green. Plastic plants have been placed on the ceiling and next to the tables. For sanitary reasons real plants could not be used although, that would have been the original plan.

4.1.2: 2nd Nudge

The 2nd Nudge was purely informational in nature. On one screen close to the main dishes, just above the coffee and tea machine there is a screen displaying information about ingredients of offered food and their health benefits, like what kind of vitamins strawberries contain etc. The second screen, close to the fruit stand, displays advice and tricks regarding health. Always in the form of: "Did you know:…?" Or "Did you know that…?" One example is: "Did you know that walking in the woods can reduce the risk of depression."
The nudges displayed here are on the topics of food, sports and environment. Focusing on what you could lose by not living healthy or healthier should be more effective (Thaler & Sunstein, 2008), but it was the company's explicit wish to only focus on positive wording, because it is much more in line of the company's culture.

4.2 The ideal study

The integral parts of a nudge that guided the manipulations in these experiments: The nudges in this experiment try to firstly, alter properties or placement of objects or stimuli in order to change health-related behaviour in a predictable way, secondly, require minimal conscious engagement, thirdly, influence many people simultaneously, fourthly, not be targeted or tailored to specific individuals and lastly, not forbid any options or significantly change their economic incentives

Due to the limitations set by the company and field research in general an ideal study design could not be realized. An ideal study would have looked like this:
Have a number of participants (computed by a G-power analysis) randomly chosen among co-workers who regularly eat at the cafeteria. These co-workers would get assigned numbers that only they know so that they can stay anonymous, but also let us allocate which survey was filled out by which anonymized person. Before the study begins have a survey on eating habits, gender and other aspects that have shown to affect health like weight and age. After the first nudge there would be a second survey, a third after the second nudge and a final one after a considerate amount of time has passed, so that impact and duration of that impact could be measured. An ideal study would also encompass a repetition of measurement over many years and since the concept is planned to be implemented at different locations a comparison between the different locations could have been made. But since testing like this takes money, a lot of planning and binds resources, the actual study that we have at hand now is considerably watered down.

4.3 The study in reality and why these nudges were used

A recent meta-analysis has shown that nudging interventions aiming to influence fruit and vegetable choice generally have a moderately significant effect, the largest effects being from altering placement and from combined nudges (Broers et al., 2017), so using a nudge altering placement and combining it with other nudges to increase fruit consumption was a rather safe bet. This first nudge (the fruit nudge) was planned from the beginning and could easily be implemented. Many possible other nudges were presented to the company and the ones that got implemented were those that the company deemed as feasible and not too expensive to implement.

The study had to deviate from the ideal study for two main reasons: The Covid-pandemic made planning of a representative study sample of people that could regularly visit the restaurant impossible, because a large part of the staff was forced to work from home due to the risk of contagion. No one could predict when these regulations could be lifted. Thus we were actually forced to only use the staff that was always present at the branch, which were mostly blue-collar workers.

The second reason was that management did not allow more costly (regarding time and money) measures of the proposed study like the repeated survey. Because there had already been two surveys regarding mental health during the pandemic they argued that they did not want to bother the staff with too many surveys. Additionally they made their reservations clear regarding sensitive information like eating habits, weight and height (which would have given us the opportunity to calculate BMI). They offered the solution to provide part of the sales numbers (see below).

A major downside of not being able to allocate numbers to people is that we cannot know whether the effects are differently effective regarding certain demographic groups. It would have been especially interesting whether this study would have replicated the gender difference regarding eating habits. Also, it could not be tested whether the dish of the day nudge had any impact, because there was no substantial data on what the dish of the day was each day.

The company wanted to have a forecast on how stable the effects of the nudges would be. Unfortunately, with the data given this was not possible with the fitting method of *forecasting*. The timespan of 12 months is too short for the calculations to work. This is true for all the hypothesis. Still, the graphs provided by the forecast modeller in SPSS will be used

to point out some interesting aspects and the ones that were not used in the text will be provided in the appendix.

4.4 Data collection procedure

Data collection happened hidden, thus unbeknown to the employees, in a store in Austria. The usage of nudging was only known by the people involved in the planning and upper management. The other employees were never informed about the fact that their cumulated eating behaviour would be analysed and there was no direct interaction between researcher and researched that could have influenced the outcome. In general, they were told by the company, that the rebuilding of the restaurant was partly to improve health and happiness among employees. (Happiness should get better by living healthier, but this was not part of this investigation).

The collected data consists of two parts. For hypothesis 1, the amount of money spent by the company on ordered fruits. This is because the company provides the fruits to the employees for free. The data collection for this hypothesis worked as follows: A co-worker from the kitchen staff kept an eye on how much fruit was left. When necessary, he would order new ones. The company did not want to make the sales numbers available and how much fruit they ordered for the whole year. They presented the numbers for (mostly) two weeks in a row for each month from 1.12.2020 to 31.12.2021. When the orders for two weeks were given, they were added up and then divided by 14 to get a comparable number across all fruit orders. The This was necessary because sometimes there would be a big order on e.g. Monday and then no more orders in that week and in other weeks there were three smaller orders. Additionally, there are people who work in the company on weekends, but less than during the week, thus it was decided with the project supervisor at the company to use timespans of 14 days, thus including the weekends and always starting with Mondays. Exceptions from the two week data were the months of December 2020 where the overall amount was sent directly to the researcher, and the months June 2021, August 2021 and November 2021 where just one week was provided each, so the sum was divided by 7 instead of 14 in these cases. Sadly no specifics were presented on how much of each fruit was ordered and for how much money, so the initial spike in fruit consumption could partly be due to different prices of season fruits. The employee who sent the data ensured that they ordered less of the “classic” fruits because they expected people to e.g. eat less apples when there are more choice options. Still, it would have been ideal to have the exact numbers. This way the effect size has to be taken with a grain of salt.

For hypothesis 2 the numbers represent the number of meals and products bought each week. The meals and products bought had to be clustered into categories in order to be able to work with them. As for the first hypothesis, the company was uncomfortable to make available all the sales numbers for the whole year, so an agreement was made: The researcher got sent the sales numbers for the calendar weeks 2, 3, 37, 38, 42 and 47 and clustered them to create a clustering schema, which was approved by the supervisor and a fellow psychology student and was sent back to the company. A co-worker there then clustered the food in the same way and sent back the clustered numbers for the whole year.

4.5 Clustering

Food (or elements of food like toppings) and drinks that could not be allocated to a group were exempted from the analysis. For example, in week 3 various types of pizza were offered ranging from vegan to topped with meat. For billing however there was no distinction made, so it is not possible to know in hindsight which type of pizza was consumed. This is why there is a variable called “MISC”, for miscellaneous.

Breakfast was included in clustering at first, but it was excluded because the data was not clear enough to work with: In the original data it only says “Frühstücksbuffet” (breakfast buffet), so there is no way of knowing what exactly was eaten by each person. Following this, all plain bread purchases have been excluded as well, because on the one hand it stands to reason that most of the consumed bread was eaten for breakfast and on the other hand bread can be eaten with spreads and toppings of all kinds.

Drinks have also been excluded because there are many ways to purchase a drink in the company and the only data that was given was the direct purchase from the cafeteria. Drinks machines belong to an external company, so there is no data about them and thus there is no way of knowing how much and which drinks actually got purchased.

During data analysis, plain side dishes were also deleted, because most of them were vegan and it distorted the data, making it seem that purely vegan dishes were more common than they actually were. Sadly there is no way to evaluate whether there were people who just ordered the side dish and nothing else in order to eat vegan. But since there are always vegan choices among the food it seems rather unlikely that many people chose to eat e.g. plain rice or noodles.

4.6 Timeline

Data was provided for the timespan between December 2020 and December 2021.

The reconstruction of the restaurant took place in April of 2021, that is why there is no data for this month. Therefore the effects of the first nudge could be measured since May 2021.

The second nudge started in September 2021.

4.7 Participants

This research is based on a covert non-participant observation. It was important for the participants not to know that the data that is depicting their behaviour is being used to evaluate the nudges, because knowing this could have influenced their behaviour. Since no personal data was collected for this study there is no real ethical dilemma here.

The participants were the people working at the company and going to that company's co-worker restaurant. There is no official number available for this research on how many people were working there at the time of data acquisition, but a rough estimate by a co-worker suggests between 100 and 500 (depending on weekday and month).

4.8 Measures

4.8.1 Independent Variables

NUDGE1: This variable is binary coded with 0 for "not implemented" and 1 for "implemented". Starting with May 2021 the first nudge was implemented, so NUDGE1 has a value of 1 for the months May till December 2021.

NUDGE2: This variable is binary coded with 0 for "not implemented" and 1 for "implemented". Starting with September 2021 the second nudge was implemented, so NUDGE2 has a value of 1 for the months September till December 2021.

4.8.2 Possible confounding variables

HOMEOFFICE: This variable is binary coded with 0 for "no compulsory remote work" and 1 for "compulsory remote work". When this variable was 1, it means that only people who needed to be on-site in order for the company to function properly were allowed in situ. Compulsory remote work was effective from December 2020 till May 2021 and from October 2021 till December 2021.

HOLIDAYS: This variable is binary coded with 0 for "not holiday main season" and 1 for "holiday main season". Holiday main seasons in Austria are in December, July and August.

4.8.3 Dependent Variables

FRUITCONSUMPTION: The absolute amount of fruit ordered in the two weeks representing the respective month, in Euros.

SALAD: The percentage of salad bought in the restaurant in the given month.

SWEETS: The percentage of sweets bought in the restaurant in the given month.

FISH: The percentage of fish bought in the restaurant in the given month.

MEAT: The percentage of meat bought in the restaurant in the given month.

VEGETARIAN: The percentage of vegetarian food bought in the restaurant in the given month.

VEGAN: The percentage of vegan food bought in the restaurant in the given month.

MISC: The percentage of miscellaneous food ordered in the given month. This is the food that could not clearly be allocated to one single group. Most of the time it was pizza, because in prizing there was no difference between e.g. vegetarian pizza or pizza with meat, so there was no usable data gathered.

5. Results

5.1 Testing for confounding variables

Since was no standard distribution in the data, Spearman's rank correlation was used to be able to test for significance. It was tested (see Table 1) whether the variables HOMEOFFICE and HOLIDAY had a confounding influence on the variable FRUITCONSUMPTION by using a Spearman's rank correlation.

Table 1

			FRUIT-CONSUMPTION	HOMEOFFICE	HOLIDAYS
	FRUIT-CONSUMPTION	Correlation Coefficient	1,000	-,205	-,512*
		Sig. (1-tailed)	.	,262	,044
		N	12	12	12
	HOMEOFFICE	Correlation Coefficient	-,205	1,000	-,250
		Sig. (1-tailed)	0,262	.	0,217
		N	12	12	12
	HOLIDAYS	Correlation Coefficient	-,512*	-,250	1,000
		Sig. (1-tailed)	,044	,217	.
		N	12	12	12
*. Correlation is significant at the 0.05 level (1-tailed).					

Testing for confounding variables with the Spearman correlation

Since when HOLIDAYS is 1, which means there was a holiday period in this month, can only lead to less fruits being eaten and HOMEOFFICE being 1, which means that many people had to stay at home, can only lead to less fruits being eaten compared to when HOMEOFFICE was 0, both variables were tested 1-tailed in.

Table 1 shows, that HOLIDAYS had a negative significant influence on fruit consumption. A significant Spearman's rank correlation of -.512, with a p-value of .044 was found. So for testing hypothesis 1 the months with a value of 1 in HOLIDAYS were excluded. Figure 3 shows how much money was spent by the company each month (in €). After the cafeteria was closed in April the money spent on fruits and this the consumption of fruits by the staff more than doubled. During the holiday months July and August however there is a dip down. The euros spent in August were even lower than before the reconstruction. So this figure shows vividly why the holiday months had to be taken out for the other calculations with FRUITCONSUMPTION.

HOMEOFFICE on the other hand had no significant influence on FRUITCONSUMPTION.

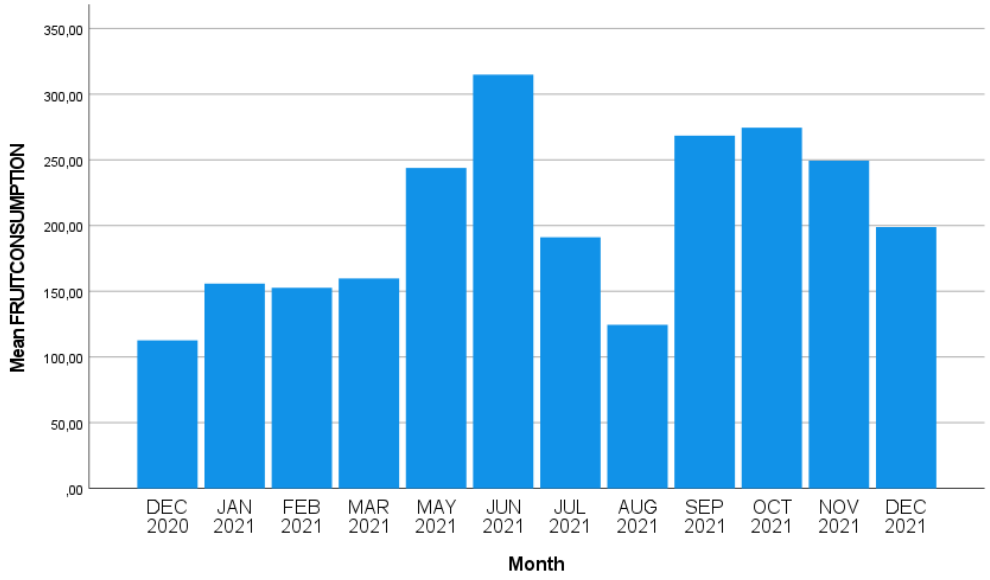


Figure 3: Bar chart showing fruit consumption per month

5.2 Descriptive statistics

Due to the structure of the data, descriptive statistics are not overly informative in the case of this study. Still, it is interesting to note that, as can be seen in Table 2, the mean of MEAT (standing for the percentage of meat consumption) was highest (32.8 percent) when compared to the other means. SALAD was lowest with 4.19 percent. Both variables also had the lowest standard deviations (0.94 for SALAD and 2 for MEAT).

Table 2

	N	Minimum	Maximum	Mean	Std. Deviation
FRUITCONSUMPTION	12	112,71	314,93	203,9092	65,25962
SALAD	12	2,93	6,23	4,1900	0,93988
SWEETS	12	15,67	30,60	22,1875	4,60579
FISH	12	0,48	15,03	11,3183	4,17271
MEAT	12	29,50	35,68	32,8175	2,01027
VEGETARIAN	12	12,16	26,35	17,4167	4,26475
VEGAN	12	3,91	18,83	9,8000	4,34229
MISC	12	0,00	4,66	2,2559	1,54900

Descriptive statistics

5.3 Hypothesis 1, NUDGE1

Hypothesis H1-1a: The more central position of the fruit baskets and the enlargement of fruit choice have a positive impact on the consumption of fruits.

A Mann-Whitney-U-Test was calculated because the sample distribution is not normally distributed, which is true for all the distributions in this work. This test was calculated to determine if there were differences in fruit consumption before and after the two nudges.

Table 3

Ranks				
	NUDGE1	N	Mean Rank	Sum of Ranks
FRUITCONSUMPTION	0	3	2,00	6,00
	1	5	6,00	30,00
	Total	8		

Test Statistics *Grouping Variable: NUDGE1*	FRUITCONSUMPTION
Mann-Whitney U	0,000
Wilcoxon W	6,000
Z	-2,236
Asymp. Sig. (2-tailed)	0,025
Exact Sig. [2*(1-tailed Sig.)]	,036[a]

a. Not corrected for ties.

Mann-Whitney-U-Test for Hypothesis 1, NUDGE1

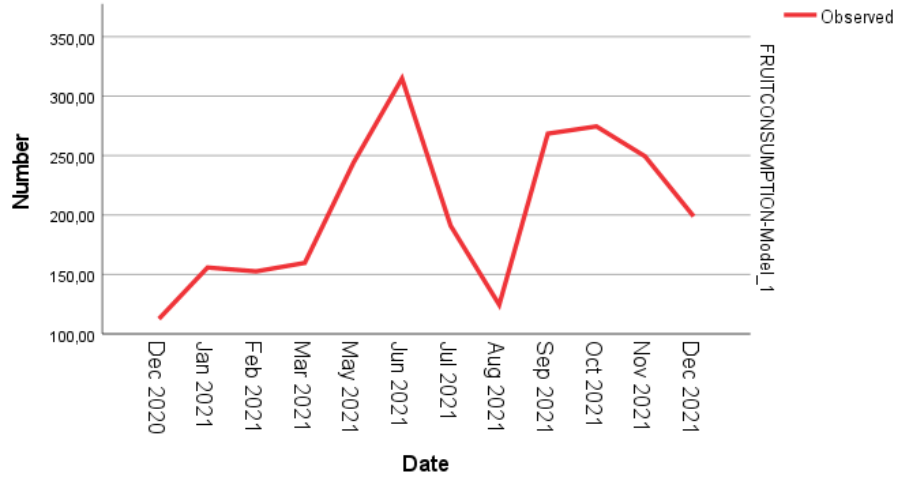
Regarding NUDGE1 the distributions differed between the groups (see Table 3). There was a statistically significant difference in fruit consumption before and after the first nudge, $U = .00$, $Z = -2.236$, $p < .036$.

Thus hypothesis H1-1a can be confirmed: The more central position of the fruit baskets and the enlargement of fruit choice have a positive influence on the consumption of fruits.

Since the numbers for this correlation are based on the amount of money spent on fruits, the effect of NUDGE1 could be inflated. So for the company the more important question is whether the effect is something that has a prolonged or indefinite impact or if it is just a temporary spike due to the rebuilding and redesign of the restaurant. This is why a forecasting computation has been tried in SPSS.

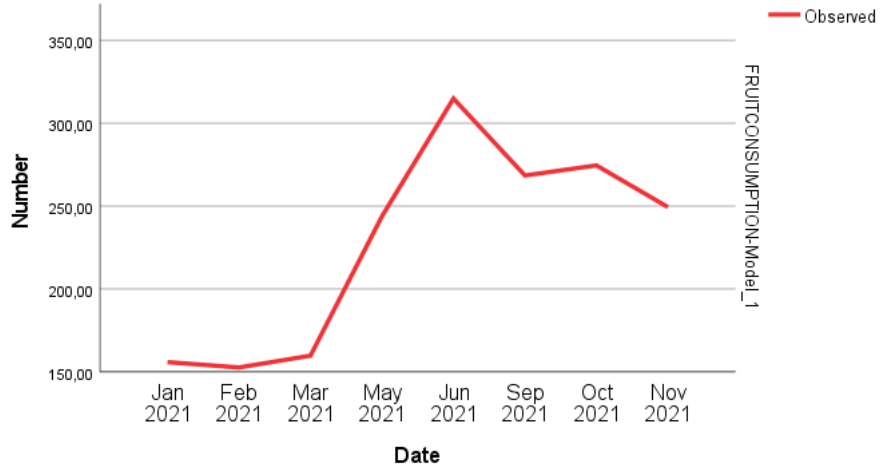
When forecasting with HOLIDAYS the graph looks like in Figure 4. A forecast was not possible though. The normalized BIC when using Expert Modeller is 8.564

Figure 4: *Failed forecast, with HOLIDAY*



When excluding the months that have an influence on the result the graph looks like in Figure 5. The normalized BIC when using Expert Modeller is 7.930. When comparing the two graphs the dent caused by the confounding variable can be seen clearly.

Figure 5: Failed forecast, without HOLIDAY



5.4 Hypothesis 1, NUDGE2

Hypothesis H1-1b: Positive information regarding the topic of health has a positive impact on the consumption of fruits.

Regarding NUDGE2 the distributions did not differ between the groups (see Table 4). There was no statistically significant difference in fruit consumption before and after the second nudge, $U = 3.000$, $Z = -1.342$, $p = .250$.

This follows that hypothesis H1-1b could not be confirmed.

Table 4

Ranks				
	NUDGE2	N	Mean Rank	Sum of Ranks
FRUIT-CONSUMPTION	0	5	3,60	18,00
	1	3	6,00	18,00
	Total	8		

Test Statistics *Grouping Variable: NUDGE2*	
	FRUITCONSUMPTION
Mann-Whitney U	3,000
Wilcoxon W	18,000
Z	-1,342
Asymp. Sig. (2-tailed)	0,180
Exact Sig. [2*(1-tailed Sig.)]	,250[a]

a. Not corrected for ties.

Mann-Whitney-U-Test for Hypothesis 1, NUDGE2

When looking at the Spearman correlations for NUDGE1 and NUDGE2 with FRUITCONSUMPTION (see Table 5) it also shows Nudge 1 to be significant. A significant Spearman's rank correlation of .845, with a p-value of .004 was found. NUDGE2 was not significant with a Spearman's rank correlation of .507 and a p-value of .100.

Table 5

			NUDGE1	NUDGE2	FRUITCONSUMPTION
	NUDGE1	Correlation Coefficient	1,000	,600	,845**
		Sig. (1-tailed)	.	,058	,004
		N	8	8	8
	NUDGE2	Correlation Coefficient	,600	1,000	,507
		Sig. (1-tailed)	,058	.	,100
		N	8	8	8
	FRUIT-CONSUMPTION	Correlation Coefficient	,845**	,507	1,000
		Sig. (1-tailed)	,004	,100	.
		N	8	8	8

**. Correlation is significant at the 0.01 level (1-tailed).

Spearman correlation between Nudges and FRUITCONSUMPTION

5.5 Hypothesis 2, NUDGE1

Hypothesis H1-2a: The more central position of the fruit baskets and the enlargement of fruit choice have an impact on the consumption of meat, sweets, salads, vegetarian or vegan food.

When looking at the Mann-Whitney-U-Tests for NUDGE1 and the variables Meat, Salad, Sweets, Fish, Vegetarian and Vegan (see Table 6) the distributions only differed significantly between the groups for Vegan. There was a statistically significant difference in consumption of vegan food before and after the first nudge, $U = 4.000$, $Z = -2.038$, $p < .042$.

Thus H1-2a could be partly confirmed:
Hypothesis H1-2a: The more central position of the fruit baskets and the enlargement of fruit choice have a positive impact on the consumption of vegan food.

Table 6

	NUDGE1	N	Mean Rank	Sum of Ranks
SALAD	0	4	5,50	22,00
	1	8	7,00	56,00
	Total	12		
SWEETS	0	4	9,00	36,00
	1	8	5,25	42,00
	Total	12		
FISH	0	4	7,50	30,00
	1	8	6,00	48,00
	Total	12		
MEAT	0	4	5,38	21,50
	1	8	7,06	56,50
	Total	12		
VEGETARIAN	0	4	6,50	26,00
	1	8	6,50	52,00
	Total	12		
VEGAN	0	4	3,50	14,00
	1	8	8,00	64,00
	Total	12		

Test Statistics (Grouping Variable: NUDGE1)	SALAD	SWEETS	FISH	MEAT	VEGETARIAN	VEGAN
Mann-Whitney U	12,000	6,000	12,000	11,500	16,000	4,000
Wilcoxon W	22,000	42,000	48,000	21,500	52,000	14,000
Z	-0,681	-1,698	-0,679	-0,766	0,000	-2,038
Asymp. Sig. (2-tailed)	0,496	0,089	0,497	0,444	1,000	0,042
Exact Sig. [2*(1-tailed Sig.)]	,570[a]	,109[a]	,570[a]	,461[a]	1,000[a]	,048[a]

a. Not corrected for ties.

Mann-Whitney-U-Test for Hypothesis 2, NUDGE1

5.6 Hypothesis 2, NUDGE2

Hypothesis H1-2b: Positive information regarding the topic of health has an impact on the consumption of meat, sweets, salads, vegetarian or vegan food.

When looking at the Mann-Whitney-U-Tests for NUDGE2 and the variables Meat, Salad, Sweets, Fish, Vegetarian and Vegan (see Table 7) the distributions differed between the groups for Vegetarian. There was a statistically significant difference in consumption of vegetarian food before and after the second nudge, $U = 4.000$, $Z = -2.038$, $p < .042$.

Thus H1-2b could be partly confirmed:
Hypothesis H1-2b: Positive information regarding the topic of health has a positive impact on the consumption of vegetarian food.

Table 7

	NUDGE2	N	Mean Rank	Sum of Ranks
SALAD	0	8	6,31	50,50
	1	4	6,88	27,50
	Total	12		
SWEETS	0	8	7,50	60,00
	1	4	4,50	18,00
	Total	12		
FISH	0	8	6,75	54,00
	1	4	6,00	24,00
	Total	12		
MEAT	0	8	6,88	55,00
	1	4	5,75	23,00
	Total	12		
VEGETARIAN	0	8	5,00	40,00
	1	4	9,50	38,00
	Total	12		
VEGAN	0	8	6,00	48,00
	1	4	7,50	30,00
	Total	12		

Test Statistics (Grouping Variable: NUDGE2)	SALAD	SWEETS	FISH	MEAT	VEGETARIAN	VEGAN
Mann-Whitney U	14,500	8,000	14,000	13,000	4,000	12,000
Wilcoxon W	50,500	18,000	24,000	23,000	40,000	48,000
Z	-0,255	-1,359	-0,340	-0,510	-2,038	-0,679
Asymp. Sig. (2-tailed)	0,799	0,174	0,734	0,610	0,042	0,497
Exact Sig. [2*(1-tailed Sig.)]	,808[a]	,214[a]	,808[a]	,683[a]	,048[a]	,570[a]

a. Not corrected for ties

Mann-Whitney-U-Test for Hypothesis 2, NUDGE2

The Spearman correlations (see Table 8) show that NUDGE1 correlates significantly with vegan food with a Spearman's rank correlation of .615 and a p-value of .033. NUDGE2 correlates significantly with vegetarian food with a Spearman's rank correlation of .615. and a p-value of .033. There is also a significant correlation between sweets and vegan food with a Spearman's rank correlation of -.685 with a p-value of .014. This will be discussed in the next chapter.

Table 8

			NUDGE1	NUDGE2	SWEETS	VEGETARIAN	VEGAN
	NUDGE1	Correlation Coefficient	1,000	0,500	-0,512	0,000	,615*
		Sig. (2-tailed)		0,098	0,089	1,000	0,033
		N	12	12	12	12	12
	NUDGE2	Correlation Coefficient	0,500	1,000	-0,410	,615*	0,205
		Sig. (2-tailed)	0,098		0,186	0,033	0,523
		N	12	12	12	12	12
	SWEETS	Correlation Coefficient	-0,512	-0,410	1,000	-0,413	-,685*
		Sig. (2-tailed)	0,089	0,186		0,183	0,014
		N	12	12	12	12	12
	VEGETARIAN	Correlation Coefficient	0,000	,615*	-0,413	1,000	-0,077
		Sig. (2-tailed)	1,000	0,033	0,183		0,812
		N	12	12	12	12	12
	VEGAN	Correlation Coefficient	,615*	0,205	-,685*	-0,077	1,000
		Sig. (2-tailed)	0,033	0,523	0,014	0,812	
		N	12	12	12	12	12
*. Correlation is significant at the 0.05 level (2-tailed).							

Significant correlations of types of food with NUDGE1 and NUDGE2

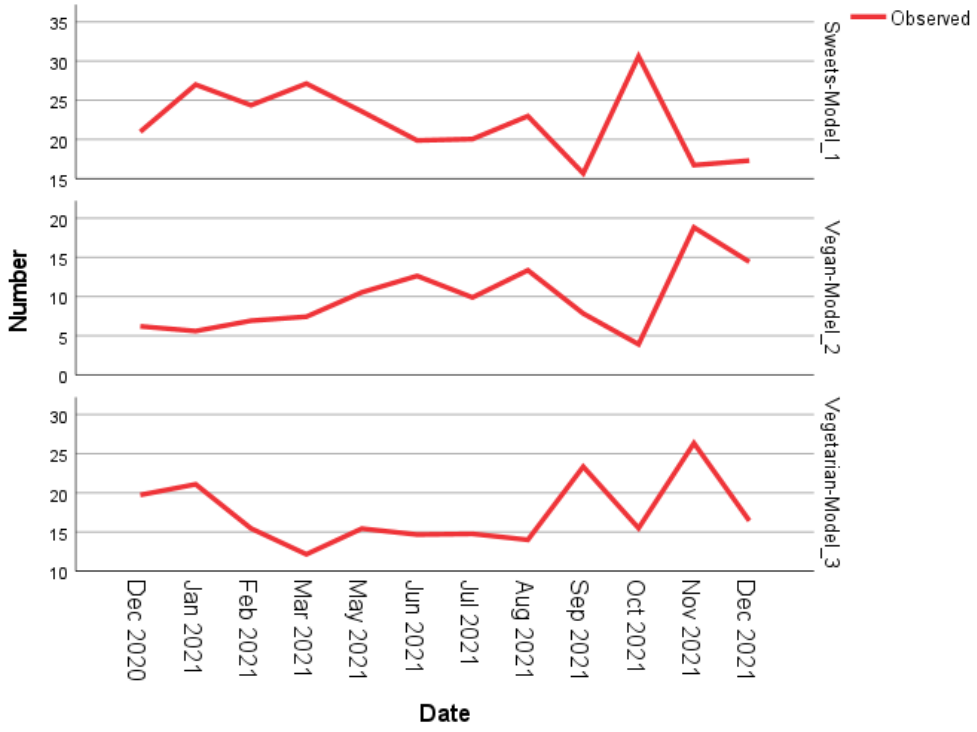
6. Discussion

6.1 Possible influences of popular and unpopular food

The present study has shown that a combination of nudges (position and availability) and an informational nudge can have a significant impact on consumption of food. The first nudge impacted the consumption of fruits and vegan food. The second nudge impacted the consumption of vegetarian food. This falls in line with previous research that could show that nudging interventions can help people eat healthier and more sustainable food. Still, since the methodology was not ideal there are aspects that need to be elaborated further.

Since the numbers in the previous chapter are not based on e.g. a questionnaire of what people ate, it would be wrong to assume that people who eat vegan eat or ate less sweets. These numbers just show that in certain months people ate more vegan and less sweets in general and the opposite was the case in other months. To exemplify this: In October people bought 114 cinnamon rolls which are usually very popular among the employees. In November though, just 23 cinnamon rolls were sold. In October the vegan nutbar was not in stock yet, but when it was introduced in November people bought the vegan nutbar 192 times, which pushes the amount of vegan food bought in November to 18.8 percent, compared to 3.9 percent in October. From just these numbers one cannot be sure whether the second nudge made people pay more attention to eating less sweets and substituting them with a vegan dessert (the nutbar), or if the nutbar would have been equally successful if it had been introduced earlier. Also, there could be a novelty effect in that a lot of people just wanted to try this new nutbar. Figure 6 shows the ups and downs in consumption of sweets, vegan food and vegetarian food between August and December 2021.

Figure 6: Failed forecast, showing the relation between vegan food and sweets



This example shows how hard it is to work with numbers from an ever changing environment where the researcher does not have much influence. The time period of a year and having just a few months to calculate the possible effects of the second nudge is not ideal.

When taking a look at the correlations in Appendix 1, one can see that fish and salad have a significant negative Spearman's rank correlation of -.606, with a p-value of .037 (2-tailed). However, this was not presented in the results section, because it might be an artifact. When looking at the monthly overview of food bought (which cannot be provided publicly due to the secrecy agreement with the company), it stands out that in May there was a spike in the consumption of salad and a small drop of sold fish. In November there was a big drop in sold fish to 0.48 percent (that is just 9 dishes of fish in two weeks) and a rise in sold salad to 5.3 percent. Since the monthly summaries are based on the numbers of just two weeks, it could be that in some of those two weeks there were dishes that were so well liked or so much disliked, that it changed the numbers considerably. In October e.g. they offered salmon lasagne which was extremely popular for a fish-dish and sold 93 times. For future research the whole months should be monitored instead of just two weeks. Additionally, monitoring the eating habits of anonymous single employees could help with clarifying the questions raised by the monthly overview.

So as mentioned above, the differences in sales numbers could also depend on and likely are influenced by how well-liked a dish is. When looking at the numbers of sweets, it stands out that donuts with apricot jam were extremely popular. In calendar week number 2, 104 of the 410 (25.4 percent) sweet items that were sold were donuts with apricot jam. In calendar week number 47, 74 of the 309 (24 percent) sweet items were donuts with apricot jam. So for future research a further focus should be on the impact of popular dishes which could be used to find out which healthy dishes are more popular.

6.2 Limitations and future research

It is recommended to the company to make a new analysis once the threat of future lockdowns is over. Comparing the sales numbers of several years before the redesign of the restaurant with the sale numbers of several years after the redesign could yield interesting insights. Once all the branches' cafeterias have been rebuilt, comparing the sales numbers of the different branches could also be interesting.

A big limitation of this study design was that there is absolutely no data on single people. Regarding fruit consumption this research can only rely on the overall fruit consumption of the month and there was no information on how much money was spent for each type of fruit. In theory it could be that the first nudge only had influence on certain types of fruits. Regarding the type of food it was only possible to compute the overall percentage of the type consumed. For example, in the month of February 30.6 percent of all food ordered was meat. But the different types of food are not mutually exclusive. A person could e.g. eat a meaty dish, a salad and something sweet, or a meaty and afterwards a veggie dish.

So for future research or for other stores it can be recommend focusing on multiple people and to analyse their eating behaviours. Members of the food staff have a special card they can pay their food with, they do not need to pay with an ATM card or cash. It might be possible to look for a big enough number of participants and give them such a card to track their food consumption. This approach is not possible for fruit consumption though, because fruits are free of charge. Here one could combine the method used in this study paired with surveys to find out who exactly got nudged regarding fruit consumption. Due to the company's wish to be very secretive about the nudging and the bureaucratic and organizational constraints and difficulties controlling for confounding variables was not possible. The effects that were shown were to a great certainty due to the nudges, since the informational campaign did not start until autumn, but which nudge yielded which effect could not be shown. More data for further analysis and depth would have been interesting.

There might also have been a different impact if the staff with higher education would have been on site. Since higher educated people tend to live healthier, the nudges could either have had a smaller (if they already lived healthier prior to the nudges) or bigger (if they would have changed their behaviour more towards healthier behaviour) impact on them. But this is not necessarily a downside of this study, since it could be helpful to companies with a smaller percentage of higher educated people.
Regarding fruit consumption, there could be another confounding variable that could not be tested due to the 13 months timespan and the limitations due to lockdowns and remote work: seasonal influences cannot be excluded. It could be that people tend to eat more fruits and lighter food in summer.

Kraak et al. (2017) stated that most studies on nudging have focused on one or two strategies at a time, rather than implementing comprehensive integrated nudge interventions and that interventions were of short duration which hindered judgements about their long-term sustainability and effectiveness. Additionally, many studies have had weak methodological designs and results depended upon the dietary-choice setting or demographic factors such as education. Even though it can be argued that the first nudge was a combination of several, the rest of this experiment could not follow Kraak et al.'s (2017) advice. In an intervention like this, a one year time span is definitely too short to see a possible long-term impact and due to the different aspirations between the company and the researcher, the methodological design is rather weak and flawed. Due to the forced remote work and the lack of possibility to assign the numbers to certain people or groups of people, it cannot be ruled out that education or cultural background had an impact on this study.

The demands that Kraak et al. (2017) and others have made are just, but it is extremely hard and requires a lot of patience, will and time to actually meet those demands in the field.

7. Literature

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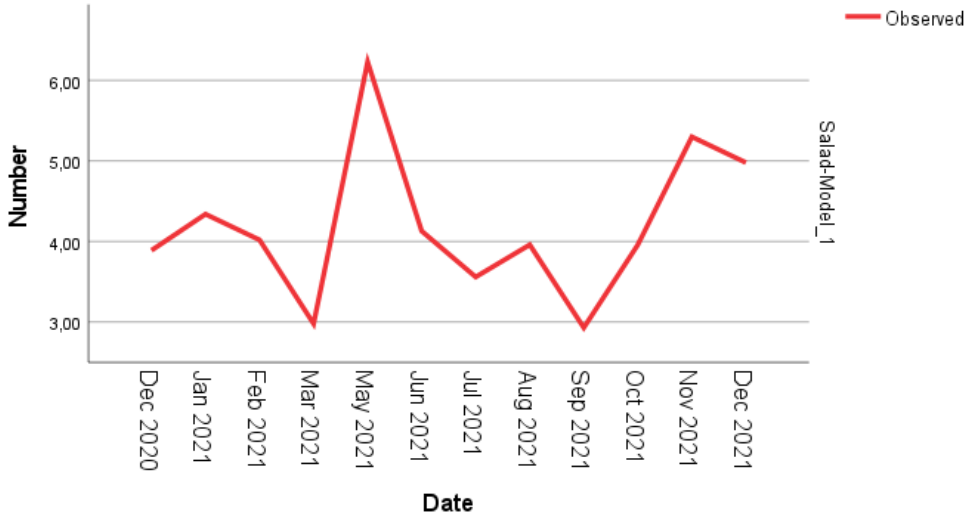
Appendix

Appendix 1

			1	2	3	4	5	6	7	8
	NUDGE1	Correlation Coefficient	1,000	,500	,205	-,512	-,205	0,231	0,000	,615*
		Sig. (2-tailed)		,98	,522	,089	,523	0,470	1,000	0,033
		N	12	12	12	12	12	12	12	12
	NUDGE2	Correlation Coefficient	,500	1,000	,077	-,410	-,102	-0,154	,615*	0,205
		Sig. (2-tailed)	,098		,812	,186	,751	0,633	0,033	0,523
		N	12	12	12	12	12	12	12	12
	SALAD	Correlation Coefficient	,205	,077	1,000	-,053	-,606*	-0,284	0,221	0,410
		Sig. (2-tailed)	,522	,812		,871	,037	0,371	0,491	0,186
		N	12	12	12	12	12	12	12	12
	SWEETS	Correlation Coefficient	-,512	-,410	-,053	1,000	-,154	-0,266	-0,413	-,685*
		Sig. (2-tailed)	,089	,186	,871		,633	0,403	0,183	0,014
		N	12	12	12	12	12	12	12	12
	FISH	Correlation Coefficient	-,205	-,102	-,606*	-,154	1,000	0,172	-0,210	-0,140
		Sig. (2-tailed)	,523	,751	,037	,633		0,594	0,513	0,665
		N	12	12	12	12	12	12	12	12
	MEAT	Correlation Coefficient	0,231	-0,154	-0,284	-0,266	0,172	1,000	-0,189	0,053
		Sig. (2-tailed)	0,470	0,633	0,371	0,403	0,594		0,556	0,871
		N	12	12	12	12	12	12	12	12
	VEGE-TARIAN	Correlation Coefficient	0,000	,615*	0,221	-0,413	-0,210	-0,189	1,000	-0,077
		Sig. (2-tailed)	1,000	0,033	0,491	0,183	0,513	0,556		0,812
		N	12	12	12	12	12	12	12	12
	VEGAN	Correlation Coefficient	,615*	0,205	0,410	-,685*	-0,140	0,053	-0,077	1,000
		Sig. (2-tailed)	0,033	0,523	0,186	0,014	0,665	0,871	0,812	
		N	12	12	12	12	12	12	12	12
*. Correlation is significant at the 0.05 level (2-tailed).										

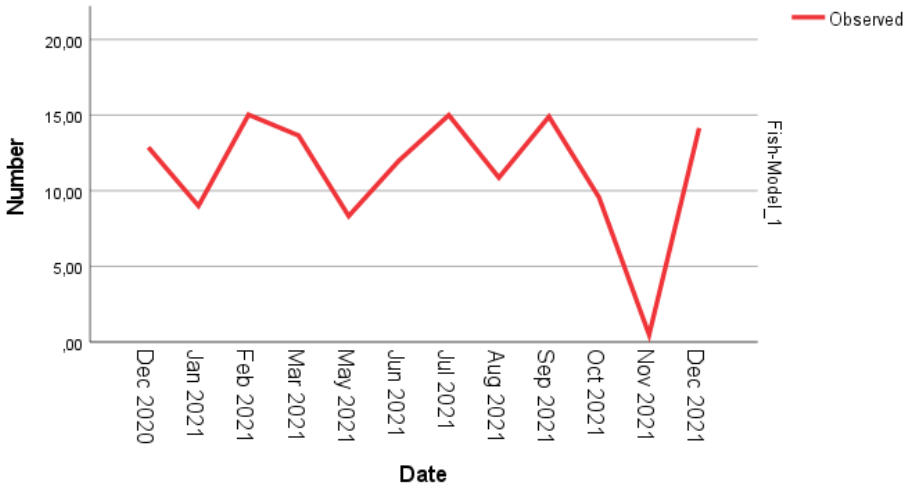
Correlationtable for variables NUDGE1, NUDGE2, SALAD, SWEETS, FISH, MEAT, VEGETARIAN and VEGAN

Appendix 2



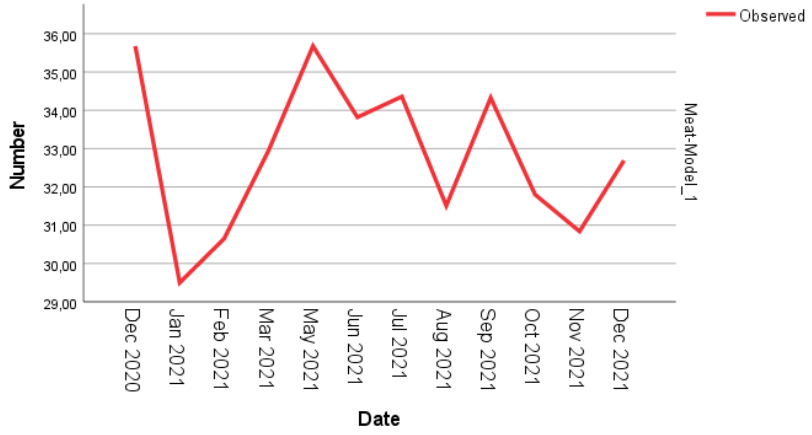
Failed forecast for salad consumption

Appendix 3



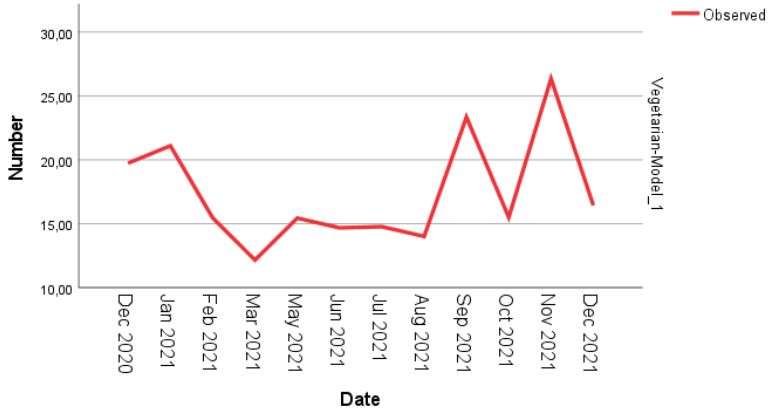
Failed forecast for fish consumption

Appendix 4



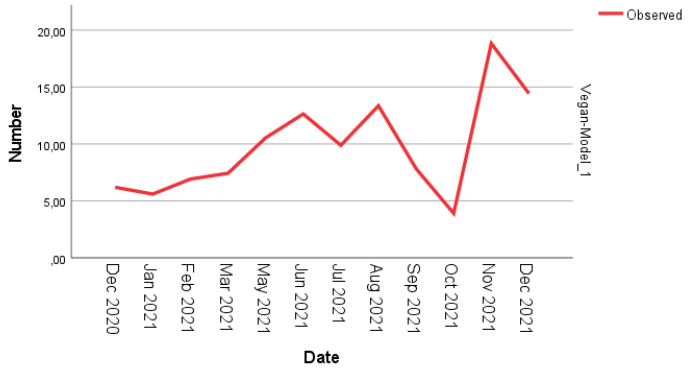
Failed forecast for meat consumption

Appendix 5



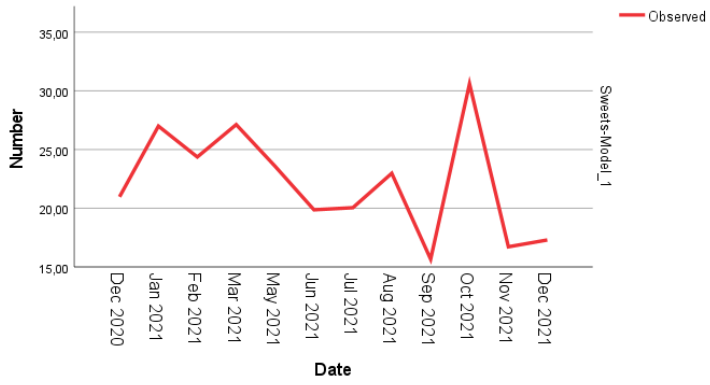
Failed forecast for vegetarian food consumption

Appendix 6



Failed forecast for vegan food consumption

Appendix 7



Failed forecast for sweets consumption