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AUTOMATICITY IN DECISION-MAKING AND FOOD CONSUMPTION: A NUDGE INTERVENTION IN A HOSPITAL

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INDEX

List of Figures

1. Human all too Human

2. Behavioural Economics and Choice Architecture

3. Automatic and Mindless Food Choices

4. Nudging Healthy Food Choices in the Lunchroom of a Hospital

List of Tables

1. Human all too Human

2. Behavioural Economics and Choice Architecture

5. Nudging Healthy Food Choices in the Lunchroom of a Hospital

Introduction

The literature analysed for the present project derives from several fields of academic research, primarily from behavioural economics, social psychology and consumer psychology. Further evidence has been gathered from studies in health psychology and neuroscience. This choice reflects the aim to provide a sophisticated and comprehensive account. Nowadays, behavioural economists, psychologists and neuroscientists all agree that human behaviour is the product of an array of unconscious and automatic interacting mental forces (Simon, 1955; Tversky and Kahneman, 1974; Zajonc, 1984; Damasio, 1994; Bargh, 1994, 2002; Gigerenzer and Todd, 1999; Kahneman, 2003; Bargh and Morsella, 2008; Kahneman, 2011). Many mechanisms that guide behaviour and choices only occur at a perceptual or preconscious level, influencing successive rational and deliberate considerations: the acknowledgment of such condition reversed the past paradigm that posited the supremacy of conscious thought in human behaviour and decision-making.

Eating out of home is largely part of our contemporary lifestyle. While this environment should provide quality nutrition, research demonstrates how eating out of home is connected to higher calorie intake (Prentice and Jebb, 2004), deficient nutritional consumption (Kearney et al., 2001; O'Dwyer et al., 2005), and greater serving sizes (Diliberti et al., 2004; Ledikwe et al., 2005). A major challenge for public health is to support the population in reducing the calorie level of their meals and promote the consumption of fruit and vegetables (FAO, 2004). After years of information campaigns, regulations, policies and education to tackle the issue of unhealthy dietary behaviour, the public health sector has understood that changing the food environment in which choices take place, can be a more promising strategy to promote appropriate food choices (Appleton et al., 2016).

The question of the impact of unconscious phenomena on behaviour is especially relevant for a discussion in the domain of food consumption and explains why classic communication campaigns on healthy eating and dietary advice are not effective to tackle the growing rate of overweight and obesity (see Peter et al., 2006, 2007; Roberto and Brownell, 2012; Roberto and Kawachi, 2014). Most factors that drive food choices cannot be explained with the classic theories of rational reasoning; on the contrary, many elements that guide food consumption are to be found in the environmental features, which affect behaviour more than rational considerations (see Wansink,

2004, 2006, 2010; Dayan and Bar-Hillel, 2011, Hanks et al., 2012). The existence of automatic processes of which we are largely unaware of is especially relevant when it comes to food choices: automatic responses often lead to poor food choices and excessive calorie intake (e.g. Painter et al., 2002; Wansink, 2004; Cohen and Babey, 2012). Understanding the true nature of how people make their choices in relation to nutrition and the effect of automatic responses to contextual cues is crucial. Therefore, one of the aims of this research project is to investigate this topic by merging the fields of behavioural economics and social psychology, providing prime research evidence to form a comprehensive account of the issue.

While internal variables are difficult to study and predict, it seems more promising to consider the variety of contextual, external and more easily detectable variables that interact with the person in a particular context. Choice architecture is a recent field born out of studies in psychology and behavioural economics, which introduced the concept of nudging (Thaler and Sunstein, 2008). Nudges are minor alterations in environment that - thanks to the knowledge of cognitive and behavioural processes that affect choices - are functional to steer people's behaviour in a certain direction. The purpose of choice architecture is to equip people with improved environmental conditions that support them to act following to the best behaviour (Wansink, 2010).

Health promotion is a key component of health policies, in the recognition that lifestyles are a primary cause of many chronic conditions. In the past, the approach to health promotion was to rationally motivate subjects to change behaviours, trying to influence their values, attitudes, or beliefs. Rather than focusing on individual behavioural change, this research project broadens the focus by targeting environmental features. The present project pertains to the domain of health promotion, which benefits not only individual well-being, but also the healthcare systems that demand increased efficiency and sustainability as they are burdened by rising operational costs.

Choice architecture interventions have been widely implemented across nations and in a variety of policy settings. In Italy to date, no nudging interventions have been ever conducted in a hospital lunchroom. Thus, the research idea of this dissertation project is the implementation and evaluation of a nudge intervention by replicating similar research conducted abroad and adapting it to the context. The literature could take advantage from the replication of choice architecture initiatives on broader populations and in additional cultural contexts, which is another purpose of the present research project. More specifically, the purpose of the empirical research is to promote healthy food items in the lunchroom of Milan's main public hospital, Ospedale Maggiore Niguarda Cà

Granda. The ultimate goal is to create a successful intervention that might be replicated and extended to the employees of the regional healthcare system.

Summary of the dissertation structure

The dissertation has been structured into four main chapters.

Chapter 1 is dedicated to a broad illustration of how human nature is characterised by the constant work of unconscious, irrational, emotional, automatic, uncontrollable mental processes, elucidating the rupture from the past conception in which consciousness was seen as the prime guiding capacity of human behaviour and decision-making. Particularly, the section dedicated to priming stresses the sensitivity and automatic responsiveness of human behaviour in relation to environmental stimuli.

Chapter 2 focuses on behavioural economics and nudging, the theoretical building blocks upon which the research project is based. First, the core findings of behavioural economics are discussed to deepen the analysis commenced in the previous chapter. Secondly, the nudging approach is presented, and an extensive section has been dedicated to the growing use of nudging as a policy tool, focusing on its application in the domain of health. The limits of nudging and the ethical debate that surrounds this discipline is also discussed to provide a critical evaluation and evade the adoption of an unquestioning stance.

Chapter 3 narrows down the focus on nutrition behaviour. The chapter provides prime research evidence on the automatic mechanisms involved in eating behaviour, and on the environmental stimuli that trigger and shape our responses. Two specific sections discuss the nudges employed in the research (i.e. salience and labelling) to elucidate to the reader the research evidence available in this domain, its validity and possible applications. Finally, a brief section on habit points out the importance in terms of behavioural impact of this form of automaticity, whose effect need to be considered in the creation of any behavioural intervention.

Finally, chapter 4 has been structured in two main sections. First, the context of the research is presented, to highlight the necessity of an intervention in the domain of nutrition by reporting data on the prevalence of overweight and obesity in Italy and Lombardy; and by illustrating the Workers Health Promotion program within which the present study has been activated. The rest of the chapter is devoted to the illustration of the study, from its early development to the presentation of the data and the discussion of the findings.

1. Human all too human

1.1. Human beings, impeccable rational agents?

The word conscious derives from Latin *conscientia* that derives from *conscire,* which means to be aware, to know (i.e. 'scire'). Historically, the notion of being 'conscious' referred to actions of self-imposed maturity, as consciousness was considered the unique, distinguishing factor between man and animals, asserting our species' superiority. During the Enlightenment, human behaviour took a historical turn in its conception, as the theory of rationality and reasonableness became the description and prescription for human behaviour. The rational reasoning model is the product of a historical period in which cognitive processes where assumed to be logical, mathematical processes, while undeliberate, emotive processes were discarded as secondary impulses (e.g. Descartes' cogito; John Locke's "mind first" cosmology). Disenchantment, domination of factuality, objectivity, calculability, discursive logic, are the sovereign standards in the Enlightenments' culture. Back in this time, the nature of the mind was considered to be entirely or mainly conscious, and the processes of thought were believed to be intentional and controllable. Philosophers (e.g. Kant), scholars, and intellectuals more broadly, have defended the view that human inference functions following the laws of statistics and probability.

In classical economics, the core theoretical principle is a conception of human decision-makers as fully rational beings. This conception is rooted in the studies of Adam Smith (1776) particularly in his masterpiece "An Inquiry into the Nature and Causes of the Wealth of Nations". Smith theorised that markets are governed by an "invisible hand" that guides and governs economic dynamics in the optimal way to allow the realisation of the highest level of utility. The economist posited that economic agents – guided by an egoistical logic of profit maximisation that chases self-interest – guarantee the attainment of the optimal level of collective wealth. Before the 1950s, the view of humans as *homo œconomicus*, guided most of the research in both psychology and economics. Classical economists employed as point of reference for their theories and models the concept of homo œconomicus, a perfectly rational decision-maker who is always able to deliver the decision that leads to the maximum level of utility that can be attained. According to this theory, this is possible thanks to the human ability to grasp all the necessary information, to

structure a stable and organized system of preferences, and to carry out the optimal evaluation. According to the *rational model of decision-making*, especially in economic decisions, choice follows a linear process of stages: (1) the recognition of the problem, (2) the evaluation of all available alternatives, (3) the evaluation of the characteristics of each alternative, and finally (4) the ultimate choice that will either confirm the solution to the problem or reject it if the problem has not been solved (Russo, 2015). This vision of humans is undeniably flawed, with inherent limits connected to the unrealistic assumption that human beings are capable of accurately interpret and evaluate all of the variables in economic decision-making. According to Evans et al. (1993) in the rational reasoning literature there are two main notions of rationality: the concept that logical reasoning is rational, and the concept that in decision-making the maximisation of expected utility is rational. Both conceptions consist of high-level cognitive processes. In a nutshell, the concept of rationality presumes that through logical arguments, people can develop valid conclusions.

In his article "Rational fools" Amartya Sen (1977) critics the foundations of economic theory, namely the assumption that people's actions are motivated by self-interest with the aim to maximize utility based on consistent choices (preferences). A person is considered rational when his choices reflect the 'most preferred' alternative. This view of human beings reduce behaviour to consistent choices for the sake of welfare maximization. Nonetheless, despite the lack of consideration of the complex web of psychological mechanisms underlying behaviour, this view has proved to be very persistent.

1.2 A new conception of human inference

The historical primacy of consciousness as the guiding virtue of human nature is also testified by the words that describe the related 'inferior' processes: 'unconscious', 'subconscious', or 'pre-conscious'. These words are all alterations of the prime human capacity, that is consciousness. In the 19th century, evolutionary theory and hypnotism both pointed to the existence of underlying, unconscious causes to human behaviour. Darwin (1872) posited in "The Expression of the Emotions in Man and Animals", the existence of an unconscious and unintentional cause behind behaviour. In this classic treatise, Darwin aimed to extend his evolutionary theory to the realm of the mind, investigating the evolution of emotions. The core insight of his work is the finding that across the world, different populations share similar facial expressions in response to the same

emotions (Figure 1). Particularly, this was found to be true also in isolated populations, where the cultural transmission and learning of emotional responses did not occur. If similar emotions can be observed in different people from different places and different races, this suggests the presence of a genetic, heritable component. Further discussion about the unconscious dimension of the mind came with Freud, who defended the unconscious as the underlying force driving human behaviour. Freuds' conception of the unconscious was principally motivational in nature, as a force to express profound wishes and needs, and to protect conscious awareness from dangerous contents. With the term unconscious, Freud referred to those actions that are not consciously intended and whose cause is not known by the person (take for instance the well-known 'Freudian slips', the errors in memory, in speech, or in the course of an action, which are interpreted as an interference from the unconscious mind). It is from his studies on hysteria (Freud and Breuer, 1985) that Freud became convinced of the presence of unconscious psychological mechanisms; however, his peculiar therapeutic perspective led him to focus primarily on abnormal behaviour and the negative effects of unconscious activity.

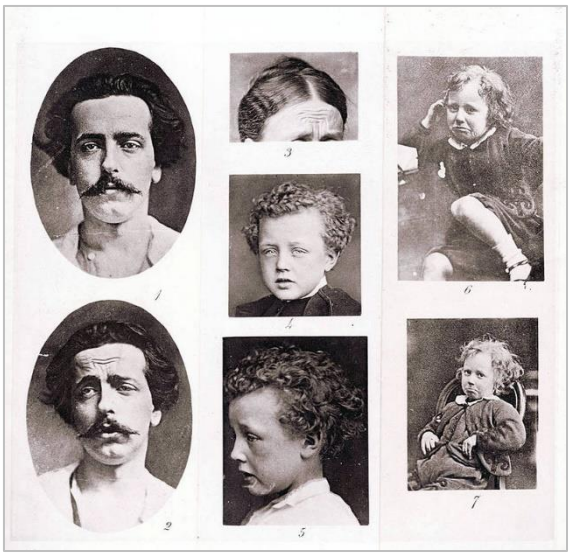


Figure 1. Images depicting the emotions of grief from Darwin, 1872.

Interestingly, from the field of economics, the work of Herbert Simon (1955) contributed to the shift of paradigm towards the recognition that human behaviour is much more automatic and less deliberative than it was thought in the past. Simon described rationality as the effective relation between the means and an end, in other words, a process to reach a specific purpose. According to the author, the rational process should involve three stages: (i) the identification of all possible options (ii) the identification of all the possible future consequences from each alternative, and (iii) the evaluation of the alternatives depending on the final objective. This is the concept of '*global rationality'* that presuppose a complete knowledge of a subject (Simon, 1947). Despite highlighting the difference between theoretical and actual behaviour, in his early work, Simon assumed this model of rationality. But later in his career, Simon's attention shifted towards the identification of a new conception of rational decision-making to integrate the previous conception

posited in classical economics (i.e. Adam Smith's rational agent), by including a series of abilities in accessing the entirety of the available information, and the attitude of cognitive elaboration that all decision-makers have. Progressively, Simon started to distance himself from the previous theory of global rationality. To attain this scope, it was no longer sufficient to employ a strictly economic perspective, which Simon integrated with the knowledge developed in psychology studies. Recognising that classical economic theory was unable to depict the actual behaviour of decision-makers, excluding a priori the irrational component of the human mind, Simon tried to identify new rules to account for the "anomalies" in human behaviour, in the attempt to make the classical model more applicable to real-life decisions. Hence, in 1955, Simon laid the basis for the Bounded Rationality Theory, introducing a novel perspective of human decision-making. The concept of *bounded rationality* underlines the cognitive limitations in computational capacity of individuals. In other words, human beings are not fully rational in their reasoning, but subject to simplifications and to a sort of 'limited rationality'. This supports an evaluative process that is not comprehensive but rather 'satisfying' in the sense of 'good enough' (Barros, 2010). Humans only possess an incomplete knowledge about the possible courses of action; a fragmentary overview of the outcomes; and construct representations guided by preferences rather than exclusively focusing on maximising utility. Simon's received the Nobel Prize for economy in 1978 for the theory of Bounded Rationality, paving the way for future research in the domain of behavioural economics. In the following decades, the Enlightenment's tenets increasingly came under attack also by the proponents of heuristics and bias, who demonstrated the automatic patterns and cognitive limitations of the human mind (e.g. Kahneman, 2011). Behavioural economics has primarily developed out of the findings of a psychology branch called behavioural decision research (Camerer et al., 2005). More recently, paramount contribution has come from the field of neuroscience, where studies on mental functioning and on the role of emotional responses demonstrated that the affective component is indispensable for human reasoning and decision-making (e.g. Damasio, 1994). Traditional economic theory can highly benefit from the new knowledge available in this field. Particularly, as Camerer et al. (2005) illustrate, there are two main inadequacies with classic decision-making theory: (a) first, the operation of the brain occurs primarily through automatic processes that are more rapid and efficient than conscious deliberation; (b) secondly, behaviour is highly influenced by complex affective responses. The operation of automatic processes and affective mechanisms occurs without the person feeling any

effort, nor being aware. These systems are crucial for everyday activities; they developed through evolution to support the deliberate, conscious processes of decision-making. As Camerer et. al (2005) stress, the cognitive and automatic/affective systems operate in interaction, however, behaviour is often interpreted as the output of exclusively conscious processes. The regions where these systems occur can be broadly identified in the brain: automatic processes occur in the posterior (occipital), upper (parietal), and side (temporal) areas of the brain; affective responses are mainly located in the amygdala; while controlled and deliberative processes are mainly concentrated in the frontal area (orbital and prefrontal cortex).

1.2.1 The meaning of 'unconscious'

> "*There is no single, definitive 'stream of consciousness', because there is no central headquarter, no cartesian theatre where 'it all comes together' for the perusal of a central meaner. Instead of such a single stream, there are multiple channels in which specialist circuits try, in parallel pandemonium, to do their various things, creating multiple drafts at they go*" (Dennett, 1992: pp. 253-4)

Dennett postulates that it is not our consciousness that drives what we think and do, but our subconscious mind. Our consciousness is a 'symptom' of a higher level of processing going on in our minds. As it is becoming clear, contemporary research reversed the previous paradigm, and for decades now, researchers have been documenting the broad range of higher mental processes that can occur unconsciously. Therefore, a first question that arises is: what do we mean by unconscious?

Modern perspectives on the unconscious mind are varied. In the field of cognitive psychology, unconscious elaboration has been associated to the elaboration of subliminal stimuli. Because subliminal stimuli have a low intensity, the mental processes they enact are simplistic and unsophisticated. In the article "Is the unconscious smart or dumb?", Loftus and Klinger (1992) conclude that the unconscious system may not be very smart for a variety of reasons: unconscious analytical skills are limited and little is achieved without conscious analysis; unconscious activities mainly serve for the performance of routinized activities; finally, unconscious processes are not reliable and does not always do what is best. Therefore, the authors conclude that "*unconscious processes are relatively inflexible in that they are applied in much the same way time after time,*

whereas procedures used for conscious learning appear to be more mutable and adaptable to different situations" (1992: p. 764).

Social psychology approaches the question from a different perspective, by focusing on the *higher mental processes* one is not aware of, instead of the *stimuli* one is not aware of. This research on the influence of unconscious mental mechanisms over behaviour, led to the view that the unconscious mind is a pervasive, efficient, and intelligent force (Bargh and Morsella, 2008). The shift in the operational definition of unconscious made by social psychology studies, revealed the true scope and relevance of the unconscious in human functioning. In this view, the unconscious is a complex set of highly functional and adaptive activities that form behavioural guidance for the individual. As Bargh and Morsella (2009) explain, the unconscious is a form of 'intelligentia', it is the leading agent that drive our behavioural catalogue of responses. Unconscious does not mean that people are unaware of stimuli, but that we cannot consciously retrieve everything we process, that would actually be quite burdening. Research on priming and automaticity (e.g. Bargh, 2001) dug deep to understand how deliberate 'higher order' processes could be initiated without conscious intent. This led to the definition of the notion of unconscious as the person's lack of awareness of the influence or effect of a triggering stimulus, but not of the triggering stimulus itself (Bargh and Morsella, 2008). This definition underlines the actual value of the unconscious in everyday life as posited by Darwin (1872), that is its adaptive quality. Evolutionary biology supports social psychology's perspective. Unconscious processes have adaptively driven human behaviour and evolution, long before the initiation of conscious elaboration abilities. The adaptive nature of humans entails that we are highly sensitive to context. As Dennett (1991) exemplifies, any child that is born in a given context, then instantly relocated to any place and culture, will rapidly adapt to the new environment and different culture, just as any other infant born there. Genetic material has provided humans with predispositions that are highly adaptive to contextual variations. For instance, one of the simplest mechanism at work behind the scenes, is the instinctive 'approach vs. withdrawal behaviours' that automatically enact responses to external stimuli (Davidson et al., 1990).

Neurologist Benjamin Libet's paradigm is consistent with the argument that behaviours are the product of unconscious mechanisms. Libet (1986) focused his research on time of intention, that is the time before a subject is aware of self-initiated actions. The surprising and seemingly contradictory discovery of the scientist is that a person's consciousness of an act comes sensibly

later the activation of brain impulses for the volitional process. In other words, through his experiment, Libet found that the impulse to act came hundreds of milliseconds before the participant's awareness and conscious intention to act (Libet et al., 1983). Participants were asked to freely decide when to move their index fingers; in the meantime, researchers measured the timing when the action was prepared in the brain, and when the person became aware of deciding to move the finger. Results revealed that the preparation of the movement in the brain activated before the participants were consciously aware of the decision to act. These findings reflect the notion that 'idea precedes action' suggesting that the unconscious mind is the source of behaviour. Libet's study has been confirmed by successive research on brain activity conducted with functional magnetic resonance (see Haynes et al., 2007; Bode et al., 2011). Following this perspective, the role of consciousness seems to be that of a 'sense maker' after the behavioural response.

1.2.2 Forms of unconscious activity

In the domain of social psychology, four categories of mental systems that are involved in non-conscious day to day behaviours, have been studied. Bargh and Morsella (2009) discuss and explore the four mental systems, illustrating them in separate points because each system has distinct qualities and operating features:

- The *perceptual system* determines impression formation, and orients attention in the environment;
- The *evaluative system* is behind immediate responses such as approach/avoidance that result from automatic assessments;
- The *motivational system* guides us towards goal attainment;
- And the *emotional system* guides our behaviour, motivation, and goal pursuit via affective responses.

The **perceptual system** is fully automatic and instantaneous: if perception was not automatic, we would fall down holes we do not see while walking, we would be more vulnerable, like when we do not perceive a low beam and we hit our heads (Heath, 2012). Evidence for the unconscious operation of the perceptual system comes primarily from cognitive neuroscience studies (e.g. see

Prinz, 2003). For instance, in their renowned study "A neurological dissociation between perceiving objects and grasping them", Goodale et al. (1991) provided evidence for the dissociation between the neural substrates for visual perception of object features (which is conscious), from the neural systems in charge of motoric control and manual skills (which is unconscious). The discovery of two diverse cortical visual pathways came from studies on patients with brain lesions: patients with dorsal lobe injuries could identify objects, but they were incapable of reaching for them; patients with lesions at the ventral-visual system instead, were not able to recognise the object, however they could still reach for it if asked to. The conclusion is that both pathways are involved in perception, but while the dorsal system (action responses) is not accessible to awareness, the ventral system (that refers to object qualities such as shape, orientation and size) is accessible to awareness. The **evaluative system** refers to the whole range of preferences and attitudes that guide individuals towards the appropriate immediate behaviours. Such behavioural responses are not 'improvised' but the product of past behaviours that served adaptive purposes. The approach vs. avoidance response is a typical example that is common to both human and animals: approach is the response towards stimuli that are perceived as desirable, while avoidance entails a defensive response towards stimuli that are perceived as negatively connotated. The **motivational system** refers to mental activities related to goal setting and pursuit. Social psychology research established goals can be unconsciously set in response to environmental stimuli to attain desired ends. These are some specific qualities that characterise such activity of the motivational system, that is the perseverance in the face of difficulties and the renewal of goal pursuit if interrupted (see Bargh et al., 2001; Chartrand and Bargh, 2002). Finally, **emotional** events can determine motivational states of which the individual is unaware and does not deliberately intend such as sadness or anger. Emotions also guide behavioural responses to positive or negative stimuli, and the memory of the episodes provide a fundamental guidance for actual and future action. The memory of emotionally relevant stimuli is processed faster and more efficiently, this information also remains longer in memory in the case it needs to be retrieved (see Kern et al., 2005; Levine and Edelstein, 2009). In the domain of the present doctoral dissertation, the most relevant theories and concepts stem from the research on the automatic activation of behaviour (priming) and to the motivational system (i.e. goal pursuit), which are relevant additions to the studies in behavioural economics and to the discipline of nudging. However, some studies in the domain of the emotional system will also be presented, as they represent a fundamental

contribution for the conceptualisation of human functioning that finally moved beyond the narrow view of humans as fully rational decision makers. First, the role of the emotional system will be briefly discussed.

1.3 The importance of Emotion for Deliberation

> "*Emerging neuroscience evidence suggests that sound and rational decision-making, depends on prior accurate emotional processing"* Bechara and Damasio (2005: p. 336)

The study of the human mind is so complex that it calls for an integration from different fields of study. Particularly, it is through the contribution of neuroscience and neuropsychology that more light is being shed on the functioning of the human brain. The aim of this section is to offer an understanding of the evolution of these studies and their influence in the study of human decision-making. In the attempt to understand how consumer decisions are made, some basic questions must be addressed about the meaning and role of emotions. Consumer Neuroscience is the academic field that applies neuroscience's insights and methodologies to the study of consumer psychology and behaviour; it focuses in decision-making, and is closely related to the fields of "decision neuroscience" and "neuroeconomics" (Ramsøy, 2014). For decades, research on consumer behaviour has been based on a rationalistic model, that posited humans as rational beings, wherein emotions were conceived as merely intervenient variables. In the recent past, it was considered unreasonable to study emotions in association to decision-making, it was unacceptable for a scientific community influenced by the cognitivist approach. Emotions, relegated to the sub-cortical area of the brain, the primitive area, were conceived as separate from the 'superior' area of the cortex (Davidson, 2012, p. 37). Today a new conceptualisation of the role of emotions has emerged. Emotions are recognized to be key elements to understand people and their decision-making process (see Damasio, 1999; Le Doux, 1996). No longer seen as 'disturbing elements', emotions are essential components of the decision-making process; which explains why people often do not act in accordance to what they declare.

Findings in the field of neurosciences allowed researchers to overcome the body-mind separation. Research on cognition demonstrates the prevalence of the emotional dimension in stimulus perception, and that our emotional responses have a deep capacity to influence the mind (Zajonc,

1984). Emotional states are tightly connected to bodily responses, and the diverse emotions determine diverse physiological changes (Bechara and Damasio, 2005). These can be measured in terms of (a) arousal, the level of activation (associated with changes in pupil size, perspiration, heart rate); (b) valence, the positive or negative direction of the response (associated to minuscule alterations in facial expressions), and (c) approach or withdrawal responses (associated to actual bodily movements that signal the person's predisposition) (in Genco et al., 2013).

Baumeister et al. (2007) proposed three ways in which emotions indirectly shape behaviour. First, unconscious emotions can promote *learning*, reinforcing mental associations after specific experiences. Secondly, emotions serve to automatically enact approach/avoidance responses, role indicated as *anticipation.* Finally, assimilated emotional experiences in memory, serve for the future selection of strategies and action selection. However, it is important to note, as Baumeister et al. (2007) highlight, that emotions are not the cause of behaviour, but rather concurring elements that shape a final behavioural outcome.

Zajonc (1984) in "The primacy of affect" was the first to recognise the primacy of emotion over cognition. Our sensorimotor and neuroanatomical structures, he argued, react to stimuli in the environment and are translated into meaningful information, triggering the cognitive process. Affective responses take place autonomously, with no awareness from the individual, and precede cognition (Zajonc, 1980). Reflecting on this, it is evident that a person is always in an emotional state of some kind, be it a mood or a condition (e.g. depression), hence emotions characterise the individual at all times. Particularly, Zajonc's (2001) great contribution is the discovery of the mere-exposure effect. This effect entails that the mere exposure of the individual to a specific stimulus is able to enhance the positive affect toward that stimulus, impacting on the formation a preference. The phenomenon has proven to be present across cultures and is most effective when the exposure to the stimulus takes place subliminally, without the person's awareness. This process supports the contention of an independence between affect and cognition, and later neurophysiological studies confirmed that affective reactions take place prior to cognition. The function of the mere-exposure effect is explained in terms of evolutionary adaptation since it offers a way of forming predispositions with little energy deployed. This mechanism allowed humans to recognise, after repeated exposures, safe stimuli and environments and dangerous ones, and to develop a primitive form of social attachment (ibid.).

1.3.1 A dual mode of human inference

Human behaviour is the product of a constant interaction between a dual mode of processing. The separation of affective and cognitive processes was delineated by Damasio (1994) in the field of neuroscience, and by Le Doux (1996) in the field of social psychology.

Antonio Damasio (1994) advanced in his "Descartes's Error: Emotion, Reason and the Human Brain" a theory that once again establish the role of emotions as essential for the good functioning of the brain. Damasio formulated the Somatic Marker Theory (see Bechara and Damasio, 2005) to explain the role of emotions and how these determine choices and behaviour. According to the theory, environmental stimuli cause the body (i.e. somatic, from the Greek 'soma', body) to respond activating physiological changes and signals in the somatosensory brain areas. This process ultimately creates what we call a feeling that is noticeable by the person. In other words, emotions function as somatic markers, that are instantly activated to answer fast and efficiently to inner or external stimuli, in order to influence subsequent decision-making, and allowing the individual to select behaviour rapidly. If somatic markers have negative valence the response will be of alarm; and if the marker's valence is positive it will serve as an incentive to continue towards a certain course of action. While confronting a life situation, somatic markers are rapidly accessed, influencing perception and decision-making, acting as a sort of 'emotional guide' that simplifies our ability to efficiently interact with the world (ibid.).

Seemingly a paradox, Damasio's (1994) research emphasized how *emotions, rather than producing irrationality, are a source of rationality*. In a laboratory study, Bechara, Damasio et al. (1997) paralleled the responses to a card game between healthy individuals versus patients that because of damages to the prefrontal cortex, were emotionally impaired. Choosing from some card decks, patients (players) could receive small rewards, large rewards, or very large losses. It turned out that brain-damaged patients returned more quickly to the risky deck even after a large loss. Further studies on patients with ventromedial prefrontal (VM) cortex lesions, revealed the loss in judgment and decision-making capacities in real-life settings, regardless of preserving a normal intellect (Bechara and Damasio, 2005). Such impairment leads to diverse issues, from financial losses, social losses of family and friends; moreover, the patients become incapable of learning from previous errors. The somatic marker hypothesis ascribes the patients' failure in carrying out effective decisions in real-life settings to a deficiency in the emotive response that promptly signals

the potential costs of an action and supports the selection of the best option (ibid.). Put simply, because emotions facilitate learning and adaptation, the loss of an emotional 'answering-system' reduced patient's tendency to learn and avoid the source of danger, leaving them more exposed to failure. Stripped of the emotional signal, patients depend on a rational cost-benefit analysis of the several and often contradictory alternatives, that implicate immediate and future outcomes. The brain damage impairs the rapidity of decision-making, as well as its appropriateness, leading to disadvantageous choices (ibid.).

Human choices are often based on unconscious processes and influences, as we are unknowingly and substantially affected by emotions and contextual elements in the choices we make. Many decisions take place almost instantly, after receiving just a fraction of all available information. A growing number of neuroscientific studies demonstrate that cognitive and emotive processes, even if different in nature, are not separated and antagonistic, but strictly connected systems. Emotion and cognition ought to be considered as two distinct but interactive cerebral structures, mediated by diverse but interactive brain systems. Le Doux (1996), in his Theory of the Double Way, proposes the existence of two afferent cerebral routes of elaboration, both involving the mediating role of the amygdala. The low road is a direct sub-cortical circuitry that allows for a rapid elaboration, while the high road is the cortical circuitry that enables a slower, more deliberate elaboration process. When stimuli in the environment reach the sensory organs, they send information in the form of electric impulses to the thalamus, which in turn sends information following the two paths of elaboration. The low road connects the amygdala to the thalamus and enables the person to quickly, automatically respond the incoming stimuli. If a stimulus has a strong emotive connotation, the information that reach the thalamus is rapidly transmitted to the amygdala, alerting the cerebral areas that control the motoric system for a quick reaction. A typical example is the reaction of fear and flight in conditions of danger. The high road instead, slower and conscious, is characterised by a more complex relation between the amygdala, the thalamus and the cerebral cortex. This second pathway delivers a slower emotional response. This theory represents a move beyond the conception of emotion as the result of a process of cognitive elaboration, paving the way to a novel understanding of emotions as biological states that guide decision-making.

1.3.2. Moving beyond the dual mode

If humans are not entirely rational, nor are they entirely irrational. The fact that the human brain is prone to heuristics (see chapter 2 for a full illustration of these mechanisms) and is limited in its deployment (i.e. ego depletion, see Baumeister et al., 1988) does not imply that humans are 'hopelessly lost'. Gigerenzer and Goldstein (1996), following the theoretical work of Simon (1947) and its notion of 'satisficing', looked at a third way to explain human inference. They developed several algorithms based on a one-reasoning mode of decision-making they labelled 'fast and frugal'. Through a computer simulation the researchers compared these algorithms with rational-reasoning procedures (such as multiple regression). In other words, they compared a fast, satisficing reasoning mode vs. a rational, slower reasoning mode. They found that the first outperformed the latter in both speed and accuracy. Particularly, the Take The Best algorithm completed as many correct inferences as the other algorithms (e.g. weighted tallying). Overall, it was judged the best performing because of the highest speed. Other simplifications of the algorithm (Take the Last and the Minimalist) made less correct inferences and only when cues values were high. In this way, the researchers proved that fast cognitive mechanisms in real-world contexts, rather than being satisficing (as Simon posited) can actually be optimal. Surpassing the concept of bounded-rationality, Gingerezer and Goldstein (1996) have shown that rather than the opposition of rational vs. irrational, human inference should not posit such a rigid separation in efficient vs. inefficient. That division in fact, does not capture that both modes can be accurate, and that the 'fast and frugal way' should not be conceived as exclusively error-prone, as it can lead to correct inferences. The existence and role of the two systems, namely of the cognitive system of thought and the irrational, unconscious, emotive system (labelled differently depending on the different disciplines and theoretical approaches), will be discussed more analytically in chapter 2.

1.4 Automaticity of behaviour in everyday life

> "*Much of everyday life - thinking, feeling, and doing - is automatic in that it is driven by current features of the environment (i.e., people, objects, behaviours of others, settings, roles, norms, etc.) as mediated by automatic cognitive processing of those features, without any mediation by conscious choice or reflection*." (Bargh, 1997: p. 2)

While there is consensus on the definition of conscious processes as deliberate, effortful and controlled mental processes, there is no single definition regarding the automatic component of unconscious activity. Recent neuropsychological research corroborated the findings of social psychology, showing that many of the brain mechanisms of the motor system, in charge of guiding action, are inaccessible to conscious thought (see Prinz, 2003). Major cognitive neuroscience studies revealed the presence of this dissociation between conscious awareness and motoric behaviour. For instance, the discovery of mirror neurons (Rizzolatti and Vozza, 2007) is evidence of the direct connection between perceptual information (in this case, visual information) and action. The existence of a mirror system in the human brain is associated with imitation, action understanding, learning, empathy, language (see Oztop et al. 2006). This system enables us to automatically understand others and act without being aware of doing so, without the conscious control of the underlying operating motor system (Bargh, 2005). Hence, conscious intention to perform an act is not the sole determinant of behaviour: to select, pursue and complete a complex goal the activation of a conscious process is not the exclusive, indispensable condition. Furthermore, environmental features and stimuli can elicit motivations and goals within us, and non-consciously guide and shape our behaviour, without us being aware of trying to attain a certain goal (see Chartrand and Bargh, 2002).

Indeed, this does not entail that consciousness does not exist or that it is of secondary importance. It simply means that the highly complex mechanisms in our exceptional human functioning can occur without conscious guidance. In the same way as we breathe, as our hearts pound, or as we walk on our legs. This leads to the question, what does consciousness serve for? As Bargh (2005: p. 58) notes: "*one can be meta-aware of one's perceptions, thoughts, and actions (monitoring) and also be aware of guiding those thoughts and actions toward a goal (control), but if this guidance can also occur without conscious awareness and intent, then these capabilities do not distinguish conscious from nonconscious processes*". Then, Bargh explains, the purpose of consciousness may

be to give us the capability of *being actively aware* (my italic) enabling us to integrate a variety of functions and to allow us to accomplish complex tasks and objectives. In other words, the evolutionary function of conscious thought could be the integration of the sophisticated array of unconscious skills.

Research on the phenomena of automatic behaviours has proliferated since the 1980s, and it appears useful in this context to elucidate the main concepts that demonstrate the role and extent of the automatic nature in human behaviour. Bargh (1994) highlights two fundamental points. The first point is that the complex processes at work in our minds, cannot be regarded as exclusively automatic or exclusively controlled and deliberate, rather they are combinations of both. There are many examples of actions that require attention, and that concurrently rely on automatic components, such as car driving or cooking a meal. A process can be deliberate and unintended at the same time. This point is important to make to avoid simplifications in the interpretation of the research results; for instance, demonstration that stereotyping is automatic does not entail that is uncontrollable. The second point is that different conditions determine different types of automatic processing responses. In this regard, it is useful to draw a broad distinction of three typologies of automaticity:

1. **Preconscious automaticity** does not require any goal or intention, but merely that a person notices a stimulus in the environment. This category includes interpretations, evaluations, and categorisations that take place prior to a conscious response, such as immediate reactions to negative stimuli, or automatic activation of an attitude.
2. **Post-conscious automaticity** involves some sort of attentional processing (e.g. the formation of an impression).
3. **Goal-dependent automaticity** is activated deliberately and intentionally (e.g. the development of a certain behaviour after repeated practice).

Since it is important for scholars to be specific about the qualities and features of automaticity to avoid confusion, Bargh (1994) decomposed the concept in four distinct qualities that he called the "**four horsemen of automaticity**": awareness, intentionality, efficiency and controllability.

1. First, *awareness* is essential for the deliberate control of thought and behaviour and for the understanding of the causes of one's reactions. There are a variety of factors that can influence behaviour without the person being aware of it, and these influences determine

subsequent action and judgement. There are three main ways in which a person may not be aware of a mental mechanism: the person may not be aware of the stimulus (as in subliminal perception); the person may not be aware of how the stimulus was mentally elaborated and categorised (e.g. as it occurs with stereotypes); or the person may not be aware of an influence on his/her mood or judgement, misattributing the causes of the reaction.

2. *Intentionality* refers to (a) the extent that actions, judgements, impressions are triggered by the environment or are under the intentional control of the individual; and (b) to the extent that actions, judgements, impressions can be intentionally interrupted and controlled by an act of will.
3. The *efficiency* of a mental process is relevant for a variety of tasks, because people trust and need their categorisations and judgments. In this sense, automaticity can be also regarded as an efficient process because it enables people to effortlessly carry out some functions (e.g. the ease of processing in perceptual fluency, see Kahneman 2003).
4. Finally, *controllability* refers to the moderation of the influence of automatic processes by the person's motivation and effort. Indeed, cognitive control can be enacted, for instance when one is aware of the formation of a stereotypical response, or of an automated consumption behaviour (e.g. the desire for eating pizza at lunch), in these cases the person can adjust its judgment/action. In other words, automatic mental processes help us in classifying, evaluating, and assigning meanings; the output of these processes is then ready to be employed by deliberate and conscious judgements and decisions, however these automatic outputs can be still modified by deliberate and controlled elaboration (i.e. they are not pre-determined outputs). Likewise, the uncontrollable nature of automatic environmental perception does not entail that it is not possible to deliberately choose when to control it.

Bargh's (1994) framework highlights the advantage and the disadvantage of having automatic mental processes. On the one hand, they are efficient as they enable to protect our limited cognitive resources by "storing" them, to manage actions and decisions that require higher attention. On the other hand, the absence or relative unawareness of the processes our mind is engaging into, leaves us susceptible of biases or misattributions in the determination of the causes of our behavioural tendencies (i.e. actions, impressions, moods, etc.). In this sense, the existence of research that also demonstrates some extent of controllability over automatic inputs and judgments is reassuring (see evidence in Bargh, 1994).

1.4.1 Automatic perception

Perceptual activity is the pathway through which environmental stimuli cause the activation of mental representations and responses. Through perception, humans identify and interpret information to understand the environment. From the previous framework (Bargh, 1994), we begin to understand that everyday actions, motivations, judgements, can become automatically activated. Two theoretical accounts are particularly relevant in this domain: the principle of ideomotor action, and the perception-behaviour link.

The principle of **ideomotor action** refers to the process of consciously thinking about an action, which activates the tendency to engage in the behaviour. Carpenter (1852) studied the reflex function of the brain and the automatic release of reflexes through ideas and coined the term 'ideomotor'; but it was James (1980) who discovered the principle. The ideomotor theory assumes that by merely thinking about a behaviour, this increases the likelihood of an action taking place. Therefore, the process is idea > action. Clearly, for a causal effect to occur, this requires that the action had previously been learned. Once such a connection has been established in the mind, actions can be immediately initiated by the idea of a sensory movement (see Stock and Stock, 2004). The ideomotor principle does not occur exclusively for the performance of simple behaviours such as grabbing an object, but also for more complex behaviours.

The ideomotor theory has been extended to consider whether simply perceiving an other's person action increases the person's likelihood to perform the same behaviour. The stream of research based on the **perception-behaviour link** concept, assume that behavioural tendencies are created by the mind when the person automatically perceives the social environment (Prinz, 1997). Perception–behaviour link research is grounded on the idea that "mental representations responsible for perception, and mental representations responsible for behaviour are intimately linked" (Djieksterhuis et al., 2005: p. 194). The perception–behaviour link influences a range of behaviours from simple movements to complex interpersonal behavioural responses. Thus, according to these studies, the "ideo" in ideomotor theory can also come from outside the mind, that is from the environment. Carver et al. (1983) conducted one of the early experiments on the perception-behaviour link. The researchers exposed the participants to the concept of hostility through a set of words, in a so-called language experiment. The participants were divided to play the role of the teacher or the learner, who received shocks from the teacher when they gave an

incorrect answer to a question. Subjects who had been exposed to hostility-related words gave longer shocks to the students than participants in the control condition.

Furthermore, perception-behaviour link studies demonstrate that perceiving the social environment is a strong determinant of behaviour, as people often engage in highly imitative behaviour. Chartrand and Bargh (1999) named 'the chameleon effect' the unconscious mimicry of others, suggesting the mechanism is involved the perception-behaviour link. There are two main varieties of automatic behaviours, one is a simpler mechanism of interpersonal mimicry, the second is a more complex process of action priming. A distinction has been made between a "low road" and a "high road" to imitation: the low road concerns the imitation of simpler observable behaviours (i.e. interpersonal mimicry of gestures or facial expressions), while the high road concerns mimicry effects intermediated by personality traits, goals, and social stereotypes (Djieksterhuis et al., 2005).

Hence, as the two previous theoretical developments illustrate (Figure 2), the source of automatic behavioural activation can be internal and intentional (i.e. as in ideomotor theory), as well as an external and unintentional (i.e. as in perception-behaviour link). In other words, these two sources of mental representation could be intended as having a top-down (internal) or a bottom-up (external) form (Hebb, 1949).

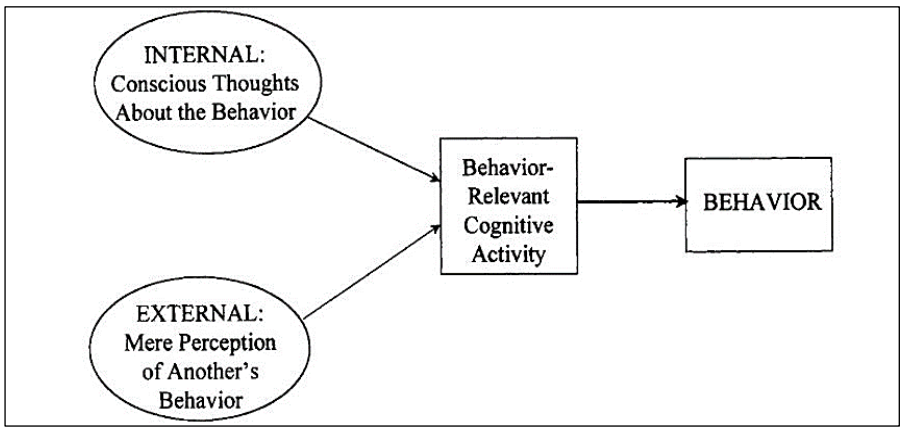


Figure 2. The internal and the external sources of automatically activated behaviour (in Bargh and Chartrand, 1999).

1.5 Priming: automatic influence of external stimuli on behaviour

Memories in our brain are not stored in an identifiable, clear area, instead they are widely distributed and interconnected by networks (Heath, 2012). These networks of connection are generated by a process named 'encoding', and each time we use a certain pathway it becomes better defined in the brain and is more likely to be employed again in the future, a process that is called 'consolidation' (ibid.). As Schacter (1992) illustrates, there are two forms of memory: explicit memory is the deliberate, intentional type of recollection of past experiences; implicit memory instead, involves the recollection of prior experiences without any conscious intent. The operation of implicit memory occurs at two levels: it registers perceived information (Tulving e Shacter, 1990), and it operates at a conceptual level (MacAndrews et al., 1987). The feature of conceptual elaboration of the information is especially relevant, and implicit memory appears to be superior than explicit memory for three main reasons: its storage capacity is higher because it holds all the procedural knowledge that we use for our lives (Heath, 2012); it lasts longer; and it works independently without the need for deliberate attention (Schacter et al. 1993). The common belief is that actively learning something should register it more strongly in the memory than implicitly 'acquiring' it, but in fact, the reverse appears to be true.

There are several manifestations of implicit memory, but the process that is most widely studied is priming, an unconscious mechanism that enables a rapid identification of environmental cues or objects. The function of priming is to improve perception: even after a single experience with an object/stimulus, this mechanism improves our ability to detect it and identifying it in the future. Indeed, priming is the result of evolutionary necessities, as it increases the speed and efficiency of people's interaction with the environment (Squire and Kandel, 2000). In fact, it has been documented that for a period of time, after the exposure to a stimulus, less neural activity is required to process that same stimulus (ibid.). As Molden (2014) illustrates, social psychologists have been particularly interested in the study of priming, initially in relation to the phenomena of social representation (stereotyping, trait perception, goals) and its role in social behaviours and judgments. Further research demonstrated that priming not only influences impressions, but also individual actions. Therefore, the focus has been set on the study of the effects of priming to determine what types of behaviours can be primed, and from what types of cues and environmental features the primes arise (Molden, 2014). Currently, research on priming expanded in a variety of

domains, from social psychology to health psychology, behavioural economics, and consumer psychology, documenting its role in a variety of domains.

Priming means that a concept in the mind is activated following the exposure to a stimulus (called 'prime'), and this in turn, influences the behavioural responses. For instance, seeing a chocolate commercial during a television break may prime the idea of eating, and the person may inexplicably decide to eat something at the next advertising break. Priming is not only unconscious, it also occurs very rapidly: the core of this mechanism is a mental process called associative activation, in which exposure to a stimulus influences associated ideas in the brain (Kahneman, 2011). Ideas and concepts can be associated by meaning (semantic priming) or by emotional valence (affective priming). In priming, each element is connected to the other: a word can evoke memories that evoke emotions, generating facial expressions or other behavioural reactions. The association that occurs through priming acts as a sort of preparation to action, in accordance with the stimulus received.

Bargh (2001) has shown how priming effects relate with the four mediational systems (i.e. perceptual, evaluative, motivational, emotional) outlined before. The automatic effects of contextual cues drive evaluation and behaviours without the person having any conscience of the effect of the stimulus (Figure 3).

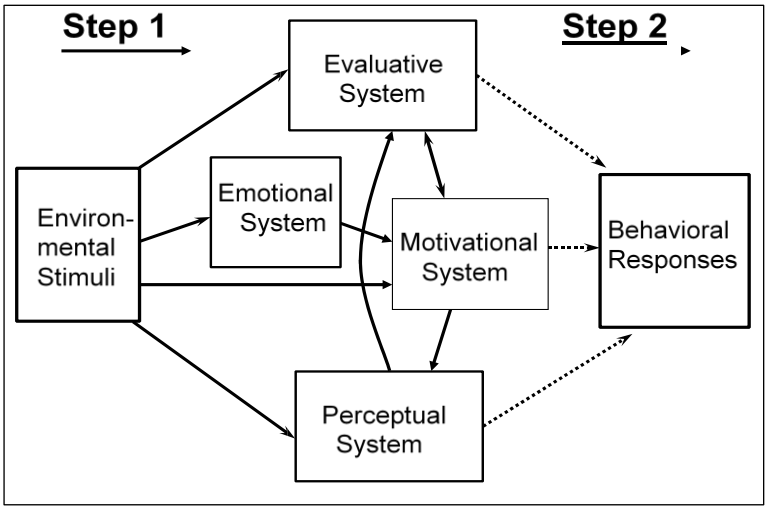


Figure 3. The unconscious behavioural guidance systems: "Step 1" - the compact arrows – concerns the automatic activation of internal information processing systems; "Step 2"- the dotted arrows – concerns the automatic influences of these systems (in Bargh, 2009).

First, in relation to the *perceptual system*, priming influences have been widely demonstrated in the domain of social behaviour. People automatically categorise other individuals in relation to

their gender, race, social role, and other traits (Bargh, 1994; Uleman et al., 1996). The typical example pertains to studies on priming and automatic stereotyping (e.g. Bargh et al. 1996). Furthermore, people are wired to perceive and unconsciously imitate others, from gestures and posture, to more complex behaviours (Bargh, 1994). In relation to the *evaluative system*, it has been found that priming automatically activates implicit attitudes and preferences.

For instance, research employing the Implicit Association Test (IAT, Greenwald et al., 1998), revealed the pervasive presence of automatic evaluations (i.e. implicit attitudes). The IAT is a response-time test based on priming, which measures the strength of association between two concepts: the more accessible a concept is the more connected in the mind the two concepts are. For instance, Connell et al. (2001) tested the priming effect on the evaluation of images of people faces with either white or black skin colour. The IAT assessed implicit preferences by asking participants to rapidly categorise stimulus words using two response keys (for instance, the faces of white or black people were associated at turn with adjectives such as good or bad). The results established the presence of implicit intergroup discrimination and biased social behaviour (ibid.).

Thirdly, in relation to the *motivational system*, research on goal pursuit established that goals can be primed, that is, unconsciously activated by cues in environment and other representations (Bargh, 1990). An extensive literature is available on goal-priming in relation to a variety of behaviours, such as rudeness or politeness (Bargh et al., 1996), competitiveness (Kay et al., 2004), honesty (Bateson et al., 2006), cleanliness (Holland et al., 2005), or greed (Vohs et al., 2006).

Finally, in relation to the *emotional system*, research found that the activation of feelings and emotional states is unconscious and automatic and can therefore be primed influencing behaviour (see Haidt, 1994; or Lerner et al., 2004). In the following paragraphs, some priming categories with be illustrated to offer some examples of the operation of this complex mechanism.

An excellent, classic experiment on priming comes from Bargh, Chen and Burrows (1996, Experiment 2), who investigated the effect of exposing participants to the concept of elderly. The researchers, in the context of a language test, exposed some participants to words related to aged people, and other participants to words unrelated to the stereotype (see Table 1). When the test was terminated, participants walked to the closest elevator and the researchers secretly recorded the time of walking down the corridor. The data revealed that the participants primed with the elderly stereotype walked slower than those in the control condition.

Phase 1 - Scrambled sentence task		**Phase 2** - Walking down the hall (13 meters)
Priming group: • forgetful • wrinkle • bingo • gray • Florida	Control words: • awkward • California • tricky	Time to walk to the elevator: • elderly condition: 8.26 sec. • control condition: 7.30 sec.

Table 1. Schema of the experiment conducted by Bargh, Chen and Burrows (1996).

Dijksterhuis and van Knippenberg (1998) replicated the study on trait or stereotype priming to investigate the effect on the performance of an intellectual task. During four experiments, they found that priming the positive stereotype of professors (i.e. the trait of intelligence) increased the performance of the participants in a general knowledge scale. In the same way, priming the negative trait of soccer hooligans (i.e. stupidity) reduced the performance of the subjects.

Kay et al. (2004) conducted five studies to explore how the exposure to certain objects can impact automatic processes in social and organisational environments. This research is especially interesting since no studies had been previously conducted to test the influence of material, physical objects on perception, highlighting the relevance of everyday circumstances. In is important to note, that objects are imbued with cultural meanings carrying implicit values and ideas. Therefore, the researchers predicted that given the established influence of semantic and person primes, it was plausible to hypothesise that the exposure to material objects could also produce an influence. Experiment 4 tested the effect of business-related objects on behaviour. Participants were instructed to complete the 'Ultimatum Game' that obliges a person to propose a division of money that the other participant can accept or reject. During the experiment, participants in the competitiveness-prime condition found on the table close to them an executive leather portfolio, an executive-style pen, and a leather briefcase. Instead, participants in the cooperation-prime condition found standard pencils, and a black backpack. The data revealed that participants became more competitive and self-interested at the sight of the business items, instead, in the presence of the standard objects cooperation increased.

A study from Bateson et al. (2006) investigated the priming effect of some images on behaviour. The experiment took place in the coffee room of a British university, where a "honesty box" was available for employees to pay for the tea/coffee they consumed. Hanging on the wall close to the

honesty box, was a suggested price list. Above the price list, the researchers posted a new image each week for ten weeks, alternating images of flowers and images of human eyes. The study charted the influence of each image on the value of payments into the honesty box each week. Over a ten-week period, the researchers found that when staff were primed by seeing eyes above the price list, they paid almost three times more than when they saw flowers (see Figure 4). In fact, in the 'eyes week' contributions were in average of 70 cents, while in the 'flowers week' contributions were in average of 15 cents. The researchers concluded that the mere idea of being watched primed participants to improve their behaviour.

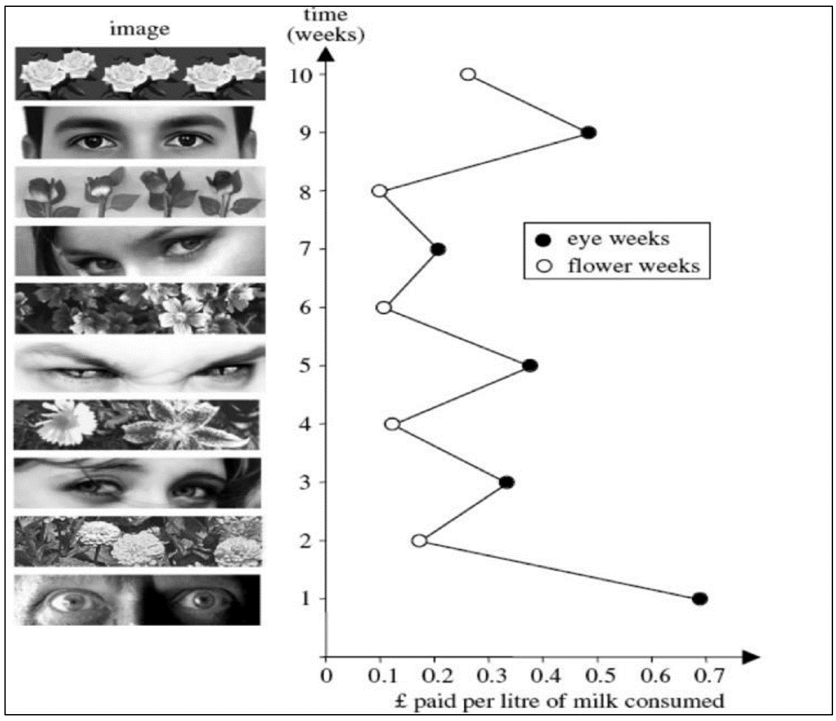


Figure 4. Pence paid per liter of milk consumed for each image type (Bateson et al., 2006).

1.5.1 Unconscious motivation and goal pursuit

The stream of research about *automatic goal pursuit*, demonstrated that individual goals can be triggered by external stimuli or manipulations. This entails that a person can pursue a goal in a social or interpersonal context, without a previous conscious intention to pursue that specific goal, nor being aware of doing so (see Bargh et al., 2001). For instance, research proved that subliminally presenting the goal of cooperation actually improved cooperative behaviour (ibid.);

in the same way, people primed with the concept of achievement, performed at higher levels on a task compared to control groups (Bargh, 2005). These findings on the unconscious ideo-motor effect of perception on action (Bargh, 2005) are difficult to accept and comprehend because of our society's fundamental belief in intentional, conscious behaviour.

It may appear that the concept of unconscious goal pursuit could be linked to behaviourism (i.e. Skinner, 1953; Watson, 1925) in its focus on the influence of the environment. However, the contemporary conceptualization of unconscious goal pursuit differs from behaviourist theory; it continues earlier studies on the involvement of cognitive processes in unconscious associative learning, and on the influence of environmental cues on behaviour (Bargh, 2006). Modern research builds on behaviourism (see Bargh and Ferguson, 2000), but moves beyond as the 'black box' is substituted by the study of a complex set of mental mechanisms such as priming, allowing researchers to investigate the processes that underlie unconscious goal pursuit.

Previously, it was generally expected that the mental processes involved in goal pursuit required conscious activation. Recent discoveries revealed that under some conditions, goal themselves and goal pursuit can arise and operate unconsciously. In these cases, human behaviour may be the product of an act of "unconscious will" (Custers and Aarts, 2010). Environmental situations and stimuli can influence us by activating goals in our minds without us being aware and can operate motivating and guiding our behaviour (ibid.). This stream of research has extensive implications for our conception of consciousness and human behaviour. Investigating the mechanism of goal pursuit is relevant because of its fundamental role in several aspects of life, such as in social interaction, nutrition, and health behaviour. The reason for the existence of goal pursuit is that it supports the person to persist on a task, even if conscious attention is directed elsewhere (Gollwitzer and Bargh, 2005). By promptly and effortlessly answering to environmental triggers, automatic motivations promote a certain goal, which is particularly useful in complex social environment where deliberate attention need to focus and is a limited resource (ibid.).

Bargh (1990) developed the *auto-motive model*, which posits that once a goal has been unconsciously activated, its process will advance in the same way as when a goal is intentionally set. According to this theory, unconscious goals operate and have the same behavioural effects as when a person deliberately decides to pursue a certain goal. In order to test the theory, research has been conducted in social cognition research, using the standard method of unrelated-studies paradigm (Custers and Aarts, 2010). In this experimental design, a certain goal/concept is primed

on the participants to lead them to think about that goal/concept, which should be employed it in an apparently unrelated following task. For instance, to activate in the subjects' mind the concept of hunger, the participants could be exposed to some words related to hunger during a sentence construction task. Aarts and Dijksterhuis (2003) conducted a research on the effect of situational norms on normative behaviour (see Table 2). Situational norms are social customs or conventions that prescribe a certain behaviour when a person is in a specific environment or situation. An example is the immediate response to be silent when one enters in a library, as this environment automatically activates a mental representation and therefore a specific response. In the experiments of Aarts and Dijksterhuis (2003), the subjects looked at pictures of library environments, and the researchers assessed the effects on their behaviour. The findings showed that behaviour is automatically activated when the participants had an active goal to visit the environment. They found that participants lowered their voices when they had the goal to visit the library; participants' in the goal-library condition reliably talked less loudly than the subjects in the control condition, and in the no-goal-library condition.

Phase 1: picture description task	**Phase 2: Pronounce 10 words (record voice intensity - dB)**
library (you will visit) 'library goal' prime	library-goal prime = 83.16 dB
railway platform (you will visit) 'control goal' prime	control-goal prime = 84.48 dB
library (you will not visit) 'no-goal library' prime	no-goal library prime = 84.62 dB

Table 2. Illustration of the experiment conducted by Aarts and Dijksterhuis (2003).

However, claiming that a goal can be automatically activated is different from claiming that a goal can continue to operate without the person's awareness. Therefore, further experiments have been conducted to test for this hypothesis. For instance, in Experiment 2 from Bargh et al. (2001), participants were either unconsciously primed (or not) to cooperate with their adversary in a negotiation game, or they were openly instructed (or not) to cooperate. The study was designed in that way in order to compare conscious vs. unconscious operation of the same goal. The participants under the prime condition cooperated more than the non-primed participants; the same result was true for the participants who had been openly instructed to cooperate compared to those

who were not. Following the task completion, participants were asked to rate their level of cooperation. Self-reports of the participants in the explicit cooperation condition, correctly reported who actually cooperated more than the others. The interesting result is that for participants in the unconscious prime condition, self-reports revealed that their level of cooperation did not match (near to zero) the actual level of cooperation. This suggests that for the unconsciously set goal, participants were not aware of the operation of the goal even if they were successfully pursuing it (ibid.)

In the literature on automatic goal experiments, subjects were interrogated following the experiment to control that they were not aware of pursuing the activated goal: almost no participants revealed any knowledge; most were astonished or even sceptical, that the experimenters could have induced them to pursue a goal without their awareness (Gollwitzer and Bargh, 2005). However, to control that the results were reliable and to offer more convincing results about unconscious goal pursuit, further research employed the method of subliminal stimulation. In a subliminal form of stimulation, cues are presented with such a low intensity that it cannot reach the threshold of consciousness. In this case, it is impossible for any participant to be aware of the stimuli, yet participants are still subject to their influence. Schlaghecken and Eimer (2004) investigated if subliminal stimuli could influence participants' choices between two alternatives. Before they answered, the subjects were subliminally exposed to arrows that pointed either to the right or to the left answer, to test whether this influenced subsequent responses. The researchers found that the arrows systematically affected the responses: this establishes that also seemingly deliberate and 'free' choices are not invulnerable to unconscious stimuli and biases. In a recent experiment, Lau and Passingham (2007), using an fMRI (functional magnetic resonance imaging), investigated whether offering unconscious information influences the cognitive system. Participants were asked to judge words in terms of their meaning or their sound, based on the instructions at the beginning of each task. However, in some trials, the visual cue presented subliminally primed the person to the opposite task, to test whether this impaired performance. The data revealed that the prime increased cerebral activity that corresponded to that primed goal, impairing the conscious judgment. In other words, the cognitive system responded to the subliminal prime, and the participants were not aware of being engaged in the wrong task.

1.6 Conclusion

First, this chapter uncovered how human nature is characterised by a constant interplay of opposite mental processes of rationality vs. irrationality, maximisation vs. satisfying, deliberate vs. uncontrollable, conscious vs. unconscious, and so forth. Secondly, the discussion has been focused on automatic mechanisms, particularly priming, as it is relevant for the discussion in the following chapters. In social psychology, two paths of research reached the same conclusion that complex behavioural tendencies can be elicited and activated non-consciously: studies on the perception-behaviour link; and studies on non-conscious goal pursuit. The cerebral system has a strong adaptive function, in fact many processes and behaviours can function automatically, which means more efficiently. Humans evolved to be highly reactive to the environment and to the stimuli in their proximity. Research from different fields of inquiry, emphasized the important effects deriving from the situational activation of a mental construct, demonstrating that certain stimuli, even if presented is a subliminal manner, can have effects on behaviour. Through the mechanism of priming, simple cues can automatically activate related mental representation that is relevant for the individual to respond. The perception-behaviour link enables us to act in accordance to people around us, and the neuroscientific discovery of mirror neurons demonstrated the connection between perception and behaviour. The evolutionary past recorded in our human genes, guide our behaviour through motivation. Research on goal pursuit established the capacity of unconscious activity of both setting a goal, and of pursuing it for an extended period until the goal is attained. Research on automatic goal pursuit is particularly relevant for dietary behaviour. This stream of research demonstrates that "the entire route from goal activation and goal setting to goal completion can proceed without conscious awareness" (Djieksterhuis et al., 2005: p. 196-97). The implication of the finding that behaviour can unfold unconsciously is highly relevant if we want to influence the onset of new behaviour. To predict human behaviour seems to be quite impossible, as a multiplicity of internal and external variables interact and impact on the individual, making this task extremely challenging. Starting from this premise, rather than trying to alter people's behaviour through attempts of rational persuasion of through a strategic analysis of the predicting variables of a behaviour (e.g. attitudes, values) we will see in the following chapter how it is possible to guide and orient behaviour by working on automatic and unconscious components.

However, since behaviour often unfolds unconsciously, and it can be oriented by choice architects, does that imply that people can be manipulated? The question of the presence of automatic mechanisms that influence and guide human perception, opens an important aspect related to the vulnerability of people to external forms of manipulation. The limited human capacity for deliberate cognitive processing is determined, as illustrated in this chapter, by the presence of a variety of automatic processes that proceed without the necessity of a conscious monitoring by the individual; this condition may leave the person exposed to the conditioning and manipulation of external influences. For this reason, the opacity of nudging mechanisms has been widely criticized and discussed in the literature, as it will be illustrated extensively in the final section of the next chapter. This section will explain the arguments of the nudge-sceptics as well as the counter-arguments provided by its supporters, and a personal interpretation of the issue will be provided to explain why, despite the actual opacity of nudging, we should not be wary of those simple mechanisms that might make our lives better and improve our future.

2. Behavioural Economics and Choice Architecture

2.1 The foundations

The discoveries and the progresses outlined in chapter two, force us to rethink some beliefs, and to recognise that decision-making cannot be reduced to a logical, deductive model. Instead, decision-making is the incessant interaction between automatic and deliberate processes, between affect and cognition, emotion and reason. Behavioural economics (BE), and the acknowledgement of the fallibility of human behaviour, gave rise to a flourishing field of research with the work of Daniel Kahneman (Nobel prize for economy in 2002) and Amos Tversky, and gained further celebrity with the 2008 book of Richard Thaler and Cass Sunstein. The main merit of behavioural economics is to have shifted the focus from a decision-making process based on the principle of rationality to the actual way in which decision-making occurs in the complex everyday life of individuals.

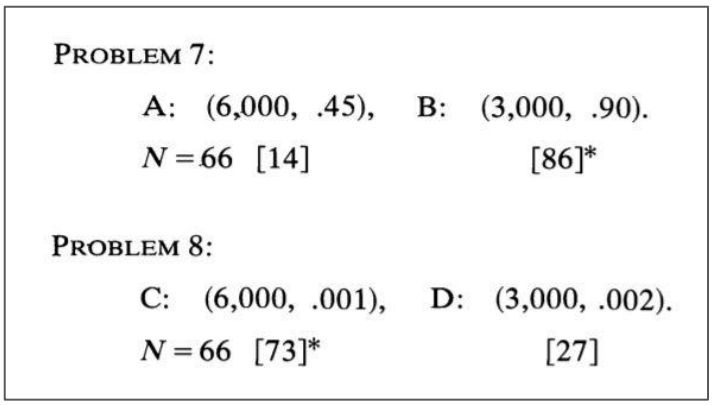
BE is a discipline of the cognitive and behavioural sciences that focus on micro-level behaviours, more particularly, BE is concerned with the study of the cognitive, social, and environmental influences on behaviour: research in this discipline has developed theories and offered many insights on human judgment and decision-making, challenging the classical economic perspective on people preferences and perception of value (Samson, 2015). Kahneman and Tversky (1979), empirically demonstrated how people systematically violate the principle of rationality, dismantling the cornerstone of economic theory. Evidence demonstrated that people have limited cognitive resources and processing abilities; that we are influenced by information stored in our memory and by stimuli in the environment; that present gains are more valued than future outcomes, and that we tend to resist change because of inertia (Kahneman, 2011). As human beings, our actions are also the outcome of emotional responses, and as social animals we are affected by social norms (Asch, 1995; Lapinsky and Rimal, 2005; Schultz et al., 2007).

The findings of BE are the foundations of the Nudge philosophy, a multidisciplinary approach developed by Richard Thaler and Cass Sunstein. The authors, in their book “Nudge” (2008) distinguish ‘Humans’, namely beings that are highly sensitive to the stimuli and features present in the environment, from ‘Econs’ theoretical beings that are always able to act rationally. Nudging

is the application of the findings of BE to individual, social, or political choices; the aim of this approach is to steer people in the directions that are possibly the less distorted from the effects of systematic errors and cognitive mistakes (heuristics). The application of effective nudges rests upon an accurate choice architecture that aims to favour individuals in making the best choices for themselves and for the society.

2.1.1 Prospect theory

Towards the end of the 1970s, two Israeli psychologists, Daniel Kahneman and Amos Tversky, noticed that when people were faced with risky choices, they systematically violated the principles of expected utility. The researchers realised the necessity to develop a new theory that described and acknowledged the existence of these violations of the classical construct. In 1979, Kahneman and Tversky published an article introducing a new model known as Prospect Theory. The theory addresses the so-called "under risk" situations, that is circumstances in which future scenarios (prospects) are involved. If the theory of expected utility is a model that tells us how rational decision-makers should behave to take the best possible decision; prospect theory gives us a model that illustrates the reasons why individuals take sub-optimal decisions. Kahneman and Tversky (1979) began their studies by considering practical case studies, based on the problems posed by the theorists of expected utility, and verifying if the core principles were respected. To exemplify, they analysed the following scenarios, as illustrated in Figure 5:



PROBLEM 7:

A: (6,000, .45), B: (3,000, .90).

$N = 66$ [14] [86]*

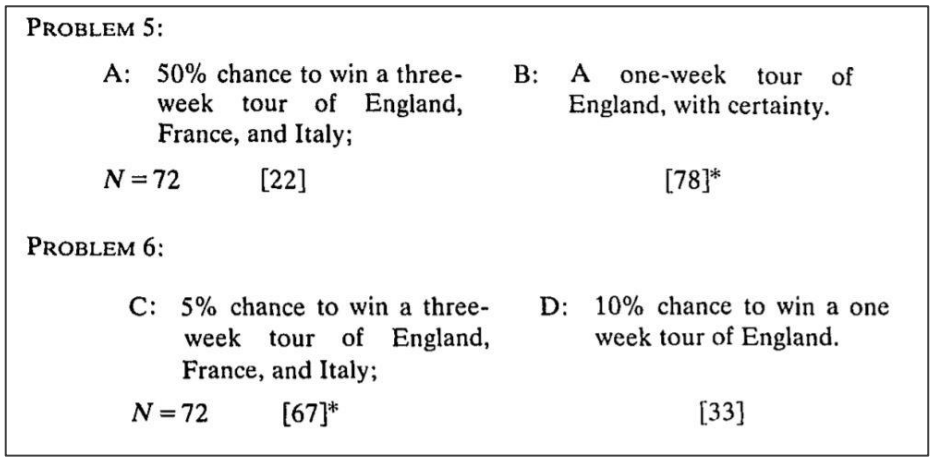
PROBLEM 8:

C: (6,000, .001), D: (3,000, .002).

$N = 66$ [73]* [27]

Figure 5. Two choice problems with monetary outcomes (Kahneman and Tversky, 1979).

In problem n.7 the probabilities of winning are substantial (45% and 90%), and logically most people choose the scenario where the chance of winning was higher. In problem n.8, the chances of winning are microscopic (.001% and .002%). In this prospect, most people chose the scenario that offered the larger gain. These problems capture a type of behaviour that is not conceived in expected utility theory. Analysing the postulates of classical expected utility theory, the researchers realised to have discovered a grave example of blindness induced by theory (Kahneman, 2011). Individuals are spurred by a cognitive mechanism to prefer an almost certain win of inferior value, instead of a double win that has a lower probability to succeed. Problem 5 and 6 (Figure 6) illustrate the issue with non-economic problems that violate expected utility theory:



PROBLEM 5:

A:	50% chance to win a three-week tour of England, France, and Italy;	B:	A one-week tour of England, with certainty.
$N = 72$	[22]		[78]*

PROBLEM 6:

C:	5% chance to win a three-week tour of England, France, and Italy;	D:	10% chance to win a one week tour of England.
$N = 72$	[67]*		[33]

Figure 6. Two choice problems with non-monetary outcomes (Kahneman and Tversky,1979).

A prospect is the combination of all the possible outcomes and of the associated probabilities. Prospect theory distinguish two phases in the decision-making process: the 'editing' phase refers to a preliminary analysis of the alternatives that leads to a simplified vision of the available prospects (i.e. alternatives); in the 'evaluation' phase the simplified versions that emerge from the editing phase are assessed and the one with the higher value is chosen (Kahneman and Tversky, 1979).

1. In the *editing* phase, the person organizes the possible alternatives and adapts them to facilitate the second phase of analysis and choice. This preliminary analysis of the prospects is mainly done unconsciously, using a variety of mental mechanisms of simplification:

- **Coding**. People represent the outcomes of a prospect in terms of gains or losses compared to their actual condition, or to some benchmark they want to reach.
- **Combination**. People combine outcomes that are equal, but that have different possibilities of being realized.
- **Segregation**. In some cases, it may be that the person has to evaluate prospects that offer both factors without risks, as well as risky factors. In these cases, the person can separate certain (riskless) elements from risky ones.

The previous mechanisms are separately applied to each prospect, while the following operations are applied to two or more prospects:

- **Cancellation**. To simplify choice, decision-makers can eliminate the components that are common to all the prospects.
- **Simplification**. People often can simplify elements of a prospect that they perceive more difficult to assess.
- **Detection** or **dominance**. Usually, decision-makers attempt to identify some relations of dominance among the alternatives and eliminate those that are less significant.

On the one hand, these processes aim to simplify choice in the successive phase of evaluation; however, it is during the editing phase that many errors arise. For instance, the sequence and the context in which the different scenarios are presented, can highly influence the selection and organisation of the alternatives, as in the case when some components are cancelled.

3. In the *evaluation* phase, the simplified versions of the prospects are confronted. The evaluation is based on two functions that people employ to make the assessment: the weighting function, and the value function. The *weighting function* highlights two core aspects related to the subjective perception of probability: the lowest probabilities are overestimated (over-weighted), while the medium and high probabilities are underestimated (under-weighted). Hence, Kahneman and Tversky (1979) proposed an asymmetric *value function* (Figure 7), concave for the gains and convex for the losses with an S shape, in which the origin of the axes represents the ‘point of reference’.

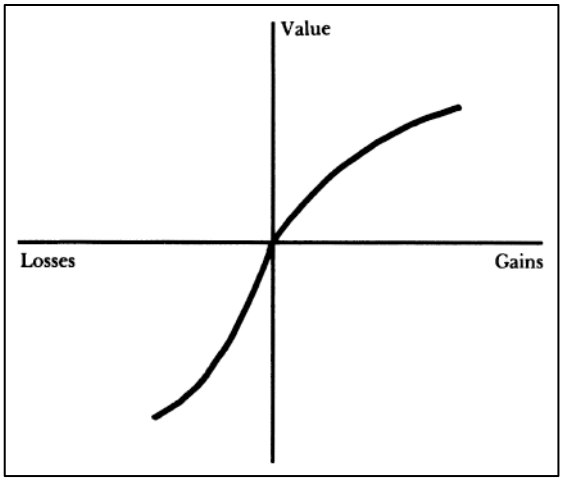


Figure 7. The value function (in Kahneman and Tversky, 1979).

The value function has three fundamental characteristics: (a) the outcomes are assessed in relation to the reference point and are organised in terms of gains or losses; (b) in both quarters (losses vs. gains) the function is characterised by a decrease in the sensitivity to change; and (c) in the quarter of the losses the function is steeper. The three features of the value function are at the base of a series of irrational behaviours, such as loss aversion, point of reference, status quo bias, and the framing effect. Since the curve is steeper in the loss quarter, people has an asymmetric perception of the outcomes that fall above or under the reference point. Losses create almost double of the pain compared to the pleasure of the gains.

2.1.2. System 1 and System 2

In the 1960s, Daniel Kahneman's psychophysical research focused on the question of how individuals objectively perceive the stimuli in the environment, and what subjective visual errors may arise in perception. In the same period, Amos Tversky's work was concerned on an exploration of Bernoulli's expected utility theory (EUT), and more specifically about how to formulate, in a mathematical way, individual choices in relation to probability and utility. Collaboration among the two commenced in the 1970s, when the researchers expanded their experiments to real-world settings. Studying the psychology of decision theory, the authors began to posit a distinction between the normative theory (i.e. what is objectively correct) and descriptive theory (i.e. the actual subjective responses of individuals). In their 1979 publication, Kahneman and Tversky transferred their discoveries to economics, arguing that EUT systematically departs from human real-world decision behaviour (see Heukelom, 2006). As illustrated in the previous

chapter, in their prominent prospect theory (i.e. descriptive theory) utility is not seen in absolute terms, rather depending on the individual subjective perception, and deviances from the normative theory are identified as errors.

Kahneman's (2011) fundamental contribution came with a novel conceptualisation of human decision-making and information processing. The Nobel prize winner built his research on the two types of cognitive processes identified by Stanovich and West (2000), called System 1 and System 2. System 1 (automatic) operates fast, automatically, with little or no effort; it generates impressions, intuitions, sensations, that are at the base of the choices of system two. System 2 (reflective), adopts these suggestions and elaborates thoughts in an ordered manner; it is in charge of the activities that require a superior cognitive effort and attention. Depending on the type of task, distinct areas of the brain are activated: the amygdala is mostly associated with emotions and automatic processes (system 2), while the pre-frontal cortex, the most evolved area of the brain, the one that mostly marks the difference between animals and humans, is associated with rationality and deliberation (system 1). On the other hand, the two systems work in interaction, it would be incorrect to locate the two systems in specific brain regions (ibid.). This distinction is a mere simplification that has the purpose of distinguishing more complex cognitive elaboration from automatic, intuitive responses. Figure 8 schematises the process and contents of System 1 and 2 (Kahneman, 2003).

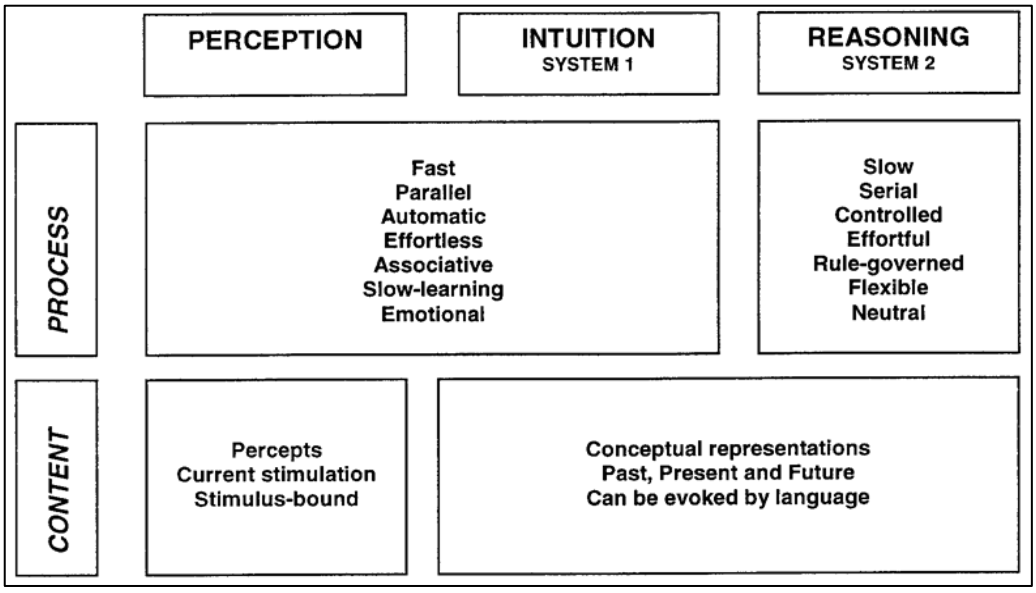


Figure 8. Summary of the operations of System 1 and System 2 (in Kahneman, 2003).

System 1. As Kahneman (2011) illustrates, the separation of functions between these two systems is efficient because it reduces to a minimum the effort and the use of energy, thereby optimising performance. System 1 is endowed with knowledge about precise situations, its short-term predictions are generally correct, and it is able to rapidly suggest the most appropriate reaction. However, since System 1 performs automatically and cannot be deactivated, it is prone to committing errors, namely judgmental bias. In fact, among its functions, through an associative process, System 1 creates a representation of reality, to identify what is considered normal or usual, and what falls out of normality (ibid.). Morewedge and Kahneman (2010) identified System 1 with the automatic processes of associative memory, and explain its operation based on the priming paradigm which established the existence of links of reciprocal activation that connect verbal representations, ideas, emotions, goals, and behaviour. The authors illustrated three aspects of associative memory (i.e. associative coherence, attribute substitution, and processing fluency) that generate the judgment biases of System 1. First, *associative coherence* refers to the pattern of automatic activation in memory, which is the base for a coherent interpretation of reality. In this process, a stimulus induces a coherent and self-reinforcing pattern of associations in memory (ibid.). For instance, this occurred in the experiment on the priming of the elderly stereotype, which activated a consistent behavioural response (see Bargh, Chen and Burrows, 1996). Another example is the image of a hairy tarantula, which evokes a coherent expression of disgust in most people. Secondly, *attribute substitution* is the process at the base of heuristic judgments, in which the response to a difficult question is substituted by a simpler, more available response. This occurs because judgement dimensions are associated with each other, thereby the evaluation of the features of an object or stimulus automatically trigger related evaluations of other dimensions (Morewedge and Kahneman, 2010). For instance, people fail to correctly estimate the slope of a mountain road when carrying a heavy backpack, because their feeling of fatigue impairs their judgment (see Proffitt, 2006). This is a prime example of failure of System 1 and 2, as the biased impression of System 1 is not corrected by System 2 (Kahneman and Morewidge, 2010). Finally, *processing fluency* occurs when System 1, exposed to certain stimuli, builds a story based on the information available in memory and on the features of the stimuli. The more this story is coherent, the more the process will be considered 'fluid', leading System 2 to endorse the conclusions without further analysis. This tendency of System 1 to evaluate only certain features and to directly lead to an overall vision has been called WYSIATI, namely 'What You See Is All There Is'

(Kahneman, 2011). Indeed, this vision is likely to be partial and not fully correct. The limit of System 1 is that it cannot be deactivated; as the person cannot deliberately decide what system to use when facing a decision. The first collection of information, their organisation, and evaluation of the most satisficing option will always be carried out by System 1 (Kahneman, 2011).

It is known that System 1 (Kahneman, 2011) is vulnerable to the biologic phenomenon of ego depletion (Baumeister at al., 1988), that is, a decrement in people's functioning and in the capability of the self (ego) to regulate behaviour. The brain consumes more glucose than other parts of the body; and factors such as intense cognitive activities, self-control, inhibiting emotional reactions, or controlling obsessive thoughts, all participate in the reduction of the levels of motivation, self-control, and attentiveness. Ego depletion refers to the limited amount of willpower that humans possess, which functions intermittently and needs to be periodically replenished (ibid.). Ego depletion may for instance lead to a lesser degree of mental clarity and attentiveness, a poorer ability to complete a task, or an increased difficulty in resisting temptation. States of depletion may for instance lead the person to fail in sticking to a diet, in becoming more irritable, or reacting more aggressively. This aspect, as previously seen in chapter two, casts serious doubts on the possibility of people of being essentially rational agents.

Baumeister et al. (1998) carried out four experiments to investigate self-control in relation to temptation (experiment 1), choice and responsibility (experiment 2), on the effects of ego depletion of performance (experiment 3), and on the interference of ego depletion with decision-making (experiment 4). The results of the four studies suggest that after completing a task, subjects demonstrated a decrement in various aspects of volition. The value of these four experiments lays especially in the demonstration of the presence of ego-depletion across different contexts, using different methods, limiting the possibility of artefacts. The existence of ego depletion, namely of a limited amount of internal resource available to the self to make choices and exert self-control, may explain the function of automatic responses (Baumeister et al, 1998). Bargh's research (e.g. Bargh et al., 2001; Bargh and Morsella, 2009) has repeatedly shown the operation of unconscious, automatic patterns that steer human behaviour; it is plausible that these mechanisms are unconscious to free individuals from the burden of constantly having to respond in a controlled manner. If consciousness (the self) is the controller, then the realm of unconsciousness seems to support the self by conserving the necessary resources for its proper functioning.

System 2. System 2 is connected to the concept of rational deliberation; if humans were exclusively endowed with this system, then decision making processes would reflect classic economic theory. In reality, System 1 tends to prevail. System 2 is the controller, in charge of commanding the impulses of System 1. The difficulty in overcoming bias and cognitive illusions in everyday life is that an incessant vigilance-mode is unpractical and would be extremely burdening for the individual. Hence, it is not always possible to avoid bias. Kahneman and Frederick (2002) propose that the monitoring activity of System 2 is generally quite lax, allowing the expression of many intuitive judgments of System 1, including some that are flawed. System 2 is also featured by Kahneman (2011) as a lazy controller: because its operations require effort and energy consumption, it is wired to be 'lazy', to not act more that the necessary, therefore man actions are often guided by the intuitive system.

2.1.3 Heuristics

In their article "Judgement under uncertainty: heuristics and biases", Kahneman and Tversky (1974) noted that "people rely on a limited number of heuristic principles which reduce the complex tasks of assessing probabilities and predicting values to simpler judgmental operations. In general, these heuristics are quite useful, but sometimes they lead to severe and systematic errors" (1974: p. 1124). Heuristics are so-called errors, that is, deviances from the normative theory. Heuristics (from Greek 'eureka', to find) are cognitive procedures that support us in finding adequate but imperfect answers. Particularly, heuristic devices are used to reduce complex tasks such as probability assessment or value prediction. Heuristics heavily rely on primary human abilities (such as recognition or imitation), but do not process all available information, functioning with simpler computations (Kahneman, 2011). In recent years, psychologists discovered that heuristics and distortions emerge from the interaction between the intuitive and the reflective system (Thaler and Sunstein, 2008). It is the failure to recognize these mental phenomena that limited the previous strand of theories that presumed the rationality of human thinking. According to the dual-mode theory of decision-making and reasoning, heuristics are attributed to the combined errors of: System 1, when automatic operations generate a faulty intuition; and System 2, when its controlled operation does not detect and correct the intuition (Morewedge e Kahneman, 2010). Primarily, heuristics have been erroneously considered to be secondary mechanisms

compared to rational decision-making. However, the studies of Kahneman, Slovic, and Tversky (1982) focused on heuristics, and revealed that while these mechanisms can occasionally lead to systematic errors and they are mostly *useful* psychological processes. Accumulating evidence demonstrates that also heuristics can perform well in inferential tasks such as judgment and categorization (see Kastikopoulus, 2009). As Kahneman (2003: p.1) recognised: "The study of biases is compatible with a view of intuitive thinking and decision-making as generally skilled and successful". Gigerenzer and Todd (1999) developed and experimented quantitative models of heuristics focusing on their faster, more frugal and accurate features, compared to standard strategies. Acknowledging the double nature of heuristics, with both functionally-efficient properties but also susceptible to systematic errors, in the domain of this doctoral dissertation, they will be conceptualized as having such hybrid nature. In fact, while recognising that these mechanisms are economically-efficient in the sense that they require little cognitive effort, and may be sometimes correct; heuristics may also lead to severe errors even in the most confident judgements. In their 1974 article, through the study of the judgment process under risky conditions, Kahneman and Tversky identified three main types of heuristics (i.e. adjustment and anchoring, availability, representativeness), and the consequent cognitive biases that heuristics generate.

First, the **anchoring and adjustment heuristic** is an error in judgement that occurs when a person is influenced by a selected starting point, affecting a wide range of evaluations such as monetary assessments, social judgements, or knowledge questions (Chapman and Johnson, 1999). In the process of anchoring and adjustment, starting from the available information, people assign a value to a certain object, and the following process of estimation departs from that first value, that acts as an anchor (Kahneman, 2011). In other words, a point of reference (the anchor) serves to make a preliminary evaluation, and that evaluation will be successively adjusted based on eventual additional information. This is a strategy that can produce over or under-estimations when quantifying information, and eventually positively or negatively influencing affective responses (Thaler and Sunstein, 2008). Epleyn and Gilovich (2010) note that there are different varieties of anchor values, which can be guided be deliberate elaboration processes (i.e. System 2), or by low-elaboration processes (such as numeric priming). However, anchoring can also be triggered by subliminal cues. Mussweiler and Englich (2005) conducted a study to test whether the subliminal exposure (priming) to an anchor could affect subsequent judgement. In Study 1, participants were divided in two groups, and were asked to estimate Germany's annual mean temperature in the time

of one minute. During this minute, each group of participants was repeatedly exposed to a subliminal prime, one group with a high anchor value (20), the other with a low anchor value (5). According with the hypothesis, the results showed that participants primed with the high anchor estimated a mean temperature of 14.89 C°, whereas the second group exposed to the low anchor reported an average temperature of 12.82 C°. This result shows that anchor values provided implicitly, outside people's awareness, can also influence numeric assessments in the same way as explicit anchor values (ibid.).

The **availability heuristic** is the tendency to estimate the frequency of an event, based on the ease we have in recalling related examples (Tversky and Kahneman, 1973). We assign a certain frequency to an event, depending on how easily our memory evokes related events. Availability heuristic is connected to the ease with which we can retrieve examples in our memory, for instance the question "Is it more likely that A or B could occur?" would be substituted in "How many examples of A and B can I easily recall?". In this way, we underestimate the occurrence of some events, while on the other hand, we may overestimate the frequency of others. This is more likely to occur with salient, dramatic events, or personal experiences that capture our attention (Kahneman, 2011). For instance, very salient events (such as an airplane disaster, or a violent robbery in our quiet neighbourhood) that produce higher emotional impact, are likely to be overestimated, while more statistically frequent events (e.g. a car crash) are underestimated (Thaler and Sunstein, 2008). Not only the feature of recency influences judgement through the availability heuristic, but also the feature of familiarity. The following study supports the idea that people judge the frequency of a class by the ease with which the relevant examples are recalled. In Study 8, Tversky and Kahneman (1973) presented to the participants a list of 39 names of famous public figures or celebrities, that are usually easier to recall. Some people were very famous (such as Richard Nixon or Elizabeth Taylor), while others were less (such as Lana Turner or William Fulbright). Four lists were created, two contained 19 famous male names and 20 less famous female names, the other two lists contained 19 famous women names and 20 less famous male names. The participants were divided in two groups, and all subjects were exposed to the listening of all the four lists. In the first group, participants were asked to write down all the names they could recall. The results from this first group showed that, on average, participants recalled 12 of the 19 famous names, and 8 of the 20 less famous names. In the second group, participants were asked to determine whether there were more man or women on the list. The results showed that

80% of these subjects judged the gender prevalence on the list based on the more famous names. Research on the availability heuristic has been further extended, demonstrating that individuals do not exclusively consider the contents they recall in making a judgment, but also consider the subjective experience of ease or difficulty with which the memory came to mind as an additional source of information for drawing inferences (e.g. see Schwartz et al., 1991).

Finally, the **representativeness heuristic** consists in classifying an object, based on its resemblance to the typical case (Kahneman, 2003). In fact, humans, to assess the probability of certain events or objects, tend to consider them in relation to a category (ibid.). For instance, if person A is considered shy and introverted, then A is more likely to be heuristically associated to a teacher, rather than a salesman. Representativeness heuristic is related to the concept of stereotypes, in which we evaluate something based on its similarities to a category, clearly leading to errors and the neglect of probabilities (Tversky and Kahneman, 1974).

Whereas anchoring and adjustment, availability, and representativeness heuristics have a more general connotation, other heuristic devices have been identified by subsequent research, which are more domain specific: for instance, the Take-the-best heuristic (Gigerenzer and Goldstein, 1996); the recognition heuristic (Goldstein and Gigerenzer, 2002); and the scarcity heuristic (Cialdini, 2008). Particularly, Finucane et al. (2000) identified the so-called **affect heuristic**. As seen in chapter 2, the first proponent of the role of automatic affective reactions in judgement and decision-making was Zajonc (1980). Later, Damasio's (1994) somatic marker hypothesis further established the role and relevance of emotive components in cognition. Finucane et al. (2000) built on these theories and expanded the study of affect for the development of a model on the role of affect in judgment, proposing that people may also use an affect heuristic in risk/benefit judgements. Evidence from two studies, confirmed the hypothesis that risk and benefit are connected in people's perceptions and therefore in their judgments. Results showed the presence of the affect heuristic and of a robust inverse relationship between the level of risk and the degree of benefit. For instance, Study 1 was specifically designed to limit the use of cognition, investigating the relationship between risk and benefit in judgements on various technologies or activities (e.g. nuclear energy, cellular phones, surfing, cigarettes). Participants made judgements based on a 7-point scale ranging from not risky at all (beneficial) to very risky (risk). The data revealed that when participants perceived an item as less dangerous, more benefits were associated to it; on the contrary, if an item was perceived as risky, the subjects tended to focus more on the

disadvantages. Particularly, reliance on the affective judgement appears to be more evident when participants were put under a condition of time pressure: the computer monitor flashed above the scale the phrase "You MUST click on the scale NOW". Data revealed that when participants lacked the opportunity to perform an analytic deliberation, they relied on affective judgements.
Far from a pretention of exhaustiveness, the following section integrates the heuristics framework by illustrating some of the most relevant biases and contextual influences involved in decision-making. The aim is two provide the reader with an overview of the broad variety of mechanisms that affect human decision-making and behaviour in ways that we are not aware of. This supports the successive argument that an accurate choice architecture can be beneficial in supporting people towards making the best choices.

2.1.4 Biases, cognitive errors, and contextual influences

As Morewedge and Kahneman (2010: p.1) clearly put it: "Judgment biases can always be described as an overweighting of some aspects of the information and underweighting or neglect of others". This occurs because people tend to assign more weight to the information that is strongly activated through mental association, while other relevant knowledge is discarded or underweighted. A variety of biases have been described in the literature, the following list illustrates some of the most relevant.

- One of the most extensive and problematic bias in decision-making is the **confirmation bias**, which refers to a process of interpretation of the information in a way that is coherent and limited to current beliefs and expectations (Nickerson, 1998). People have a natural tendency to search for information that supports preferred hypotheses or that reflect one's beliefs, and to interpret information accordingly. In the same way, information that clashes with existing beliefs or that supports alternative hypotheses is avoided. Furthermore, people tend to look for specific information that corroborate their hypotheses is a specific way, as the person is guided by an assumption that he/she holds to be true (ibid.)
- **Present bias** is a human tendency to assign more weight to the payoffs that are closer to the present time (O'Donoghue and Rabin, 1999). People tend to focus more on short-term costs, which goes at the detriment of possible long-term benefits (ibid.).

- **Inertia** is a human tendency wherein people prefer to comply to the current norm to maintain a standard behaviour or a stable state, instead of searching for a different path of action (see Kahneman, 2011). Psychologically, inertia exists because actively choosing is effortful, and can also lead to cognitive dissonance (Voyer, 2015).
- The concept of **hyperbolic discounting** illustrates the functioning of choice over time: humans tend to devalue future rewards, and to prefer immediate rewards (Frederick et al., 2002). In other words, people rationally prefer sooner, smaller rewards, rather than waiting for larger but distant rewards. This is due to the fact that projecting abstract, future outcomes is more difficult for our mind, that portrays these outcomes as less concrete (Voyer, 2015). The outcomes of many choices develop in the future, and this affects decision-making. Uncertainty about the future leads to myopic behaviours that favour early outcomes or lead to immediate temptations (Johnson et al., 2012).
- Also related to the issue of choice over time, **excess of optimism** is a cognitive error that leads people to be overly optimistic, irrationally discounting actual probabilities (Thaler and Sunstein, 2008; Kahneman, 2011). As Kahneman (2011) points out, optimism is a highly-valued, socially approved quality. But if optimism is normal, an attitude of irrational overconfidence, such as the idea of being personally immune to a certain danger, can lead people not to take preventive measures, as in the case when smokers underestimate their risks of failing ill. This phenomenon also explains why lotteries are so popular, or why 90 per cent of drivers believe they drive better than most of the people (Thaler and Sunstein, 2008). Individuals may also be overly optimistic in relation to the future, overestimating how much they will accomplish, the amount of time and money, with negative implications for investments and financial decisions (e.g. mortgages and savings).
- **Loss aversion** is a deep-seated phenomenon in human brains, wherein potential losses are perceived to be larger than gains (Kahneman et al., 1991). As Kahneman (2011) elucidates, this asymmetry has evolutionary roots, that is, organisms that focus on threats with more urgency, instead on focusing more on opportunities, have more chances to survive and reproduce. This has generated a reluctance to accept risks and an actual 'loss aversion'. Loss-aversion contributes in generating inertia, in the form of a strong attachment to what a person possesses (ibid.). Loss aversion acts as a force that leads people not to change, even when the changes are in the person's best interest (Thaler and Sunstein, 2008).

- Individuals are also subject to **framing effects**: "the large changes of preferences that are sometimes caused by inconsequential variations in the wording of a choice problem" (Kahneman, 2011: p.218). This bias in decision-making occurs when the format in which an option is presented, unreasonably influences subsequent choice or preference. Kahneman (2011) refers to this phenomenon as a perceptual illusion, and evidence showed that it can affect not only decisions, but also the way a person experiences an object. Unfortunately, since framing effects are automatic outputs of System 1 operation, they cannot be avoided, even by expertise. Framing is an automatic System 1 response, which is not eliminated, unless the person actively engages to create another frame and observe his/her contradiction (Morewedge and Kahneman, 2010). In an experiment by McNeal et al. (1982) the researchers exposed a group of students, of patients, and of expert physicians to two frames: the outcome of a surgery operation was formulated in terms of a 10% mortality chance vs. a 90% survival chance. The researchers found that the different wording elicited different preferences even among physicians, who despite their expertise, could not resist the framing effect.
- According to the **status quo distortion,** humans tend to prefer to maintain their current state, even if a change of circumstances could provide a superior condition (Samuelson and Zeckhauser, 1988). One reason behind this phenomenon is the lack of attention, people heuristically consider that switching option would be irrelevant. In the same way of loss aversion, this phenomenon causes inertia (ibid.).
- **Sunk cost fallacy** is the tendency to continue a behaviour or an endeavour as a result of previously invested resources (Arkes and Blumer, 1985). When a certain decision or commitment has been taken, people become reluctant to quit it because of the effort, the time, or the money they have invested in it. For instance, it may happen at the restaurant that we order too much food, still we feel the duty to finish our meal ending up with overeating, just because we invested our money and we feel we need to 'get it worth'.
- Finally, the **primacy effect** is a cognitive error that leads people to reach a conclusion based on the first information they acquire (Nickerson, 1998). This information acquired early in a process, is integrated in memory over time, and tends to have more weight that the information one acquires later. It seems that the common notion that 'the first impression is what matters' may have some truth. In fact, subsequent judgments often result to be partial to the opinions that the person formed early in a process of evaluation (ibid.) This effect occurs also in other

domains, as primacy and recency effects, are also called 'serial position effect' (Murdock, 1962; Glanzer and Cunitz, 1966), referring to a phenomenon in which the first and the last words of a list are easier to recall.

But cognitive errors and biases can also result from influences in the context:

- **Choice overload** refers to the presence of an excessive number of possibilities or varieties of choices, that hinder the person's ability to decide (Schwartz, 2004). While freedom of choice is essential for well-being, the presence of too many available paths is not necessarily positive, and can generate feelings of stress and of being overwhelmed (ibid.).
- In the same way, too many sources of available information in the environment, can generate a situation of **information overload**. Hence, to avoid the negative effects of being overloaded, such as time-consuming decisions, individuals are selective on the type and amount of information they access (Jacoby, 1984). An additional force that shape human actions comes from the fact of witnessing others' people actions.
- **Social influence** is particularly powerful and pervasive. Growing research evidence demonstrates that witnessing the actions of others has a powerful effect on behavior, influencing individual actions and choices (see Lapinsky and Rimal, 2005; Aarts and Dijksterhuis, 2003; Dolan et al., 2010). Particularly, two typologies of social norms have been identified (Schultz et al., 2007). Descriptive norms evidence 'how to act', that is are the standard behavioural guidelines of appropriateness from which people do not want to deviate. Injunctive norms instead, evidence what is socially approved or disapproved, in specific situations or in a specific culture (ibid.). Furthermore, in line with the research on unconscious influences, several studies found that even in situations in which subjects are aware of the stimuli, these are not identified as a causal source of behaviour (Nolan et al., 2008). Hence, people are deeply influenced by the behavior of others, and are often not aware of this.

2.2 Choice Architecture for irrational humans

In the research of economists Richard Thaler and Cass Sunstein, the difference posited by Kahneman and Tversky, amid the normative theory (objective) and the descriptive theory (subjective) continues. In the 2008 book "Nudge: Improving Decisions about Health, Wealth, and Happiness", Thaler and Sunstein introduced the idea of choice architecture and nudging, drawing on the previous findings in behavioural economics. According to Thaler and Sunstein "*A choice architect has the responsibility for organising the context in which people make decisions*" (2008: p.3). Choice architecture is the act of designing the social environment to influence people's decisions through the use of nudges that stimulate the desired action or choice (Sunstein, 2013). As an architect designs the structure of a house, choice architects design situations that orientate people to specific behaviours. This also implies that many actors can unknowingly be choice architects, from the managers of a restaurant arranging the buffet, to the doctors presenting the available cures to patients, as well as policy makers that present choices to citizens (Thaler and Sunstein, 2008). People interact and act inside different contexts, and these actions can be studied. Choice architecture entails the observation of how people act in a specific setting, thereby structuring interventions that have an effect on the environment, or on people's perception, to guide their behaviour. System 1 in particular (see Kahneman, 2011), is very influenced by the features of choice architecture. However, behavioural interventions do not exclusively concentrate on system 1, but do take into account the fact that human actions and choices are often the outcome of the workings of both systems (Perry et al., 2015).

Because of an inherent cognitive laziness, individuals are prisoners of the architecture, of the frame they are facing. In front of a choice architecture, namely the peculiar formulation of a context of choice, people accept it as it is displayed, without spontaneously seeking for alternatives (Thaler and Sunstein, 2008; Sunstein 2014). Rather, we try to solve the specific problem as it is presented to us. Furthermore, rather than considering all the aspects of a problem, we tend to isolate it and to focus the whole attention on it. Hence, before and after a certain choice, humans do not consider all the pros and cons, and do not reconstruct the different potential outcomes; instead, in a myopic way, we only evaluate the decisions and actions that have an immediate effect on the present situation. Thus, nudges are useful in all those situations in which the most intuitive, emotive,

automatic responses of people prevail, leading them to behave or choose in ways they wouldn't have if they were thinking rationally.

2.2.1. A gentle 'nudge'

Thaler and Sunstein originally defined a nudge as any aspect "that alters people's behaviour in a predictable way, without forbidding any options or significantly changing their economic incentives'' (2008, p. 6). However, Hausman and Welch (2010: p26) noted that the definition should be more encompassing, to move beyond the focus on economic incentives:

> "*Nudges are ways of influencing choice without limiting the choice set or making alternatives appreciably costlier in terms of time, trouble, social sanctions, and so forth. […] They are called for because of flaws in individual decision-making, and work by making use of those flaws".*

Nudges are modifications in a decision-making environment that function by means of cognitive biases; nudges prompt behaviours, beneath the level of our awareness, in order to orientate us toward the best decisions for ourselves and our society (Thaler and Sunstein, 2008). The core objective of a nudge is to "*make life simpler, safer, or easier for people to navigate*" (Sunstein, 2014: p.2), as nudges are intended to facilitate people in everyday life, and to reduce struggling in complex tasks (e.g. disclosure of financial or health-related information; the simplification of the procedure to enrol in a college).

There is a generally shared belief that people, to safeguard their well-being in the long-run, are capable to make the best decisions for themselves. According to this assumption, the government for instance should intervene at no time to direct individual choices. However, the issue arises in contexts where different options are presented (that is, most of everyday real-life situations) and the individual cannot always choose the one that best suits his/her goals. This may depend on the complexity of the available alternatives; from an excessive availability and range of choices; or because the person has no information or knowledge and is therefore incapable to take the optimal decision. In such cases, choice architects can intervene to guide people towards the most appropriate. The purpose of a choice architect is to understand people's decision-making process, and to understand how to use the systematic distortions that arise in human decision-making to implement measures aimed at assisting the person in daily choices. For instance, communication

campaigns and messages related to public health should be more 'actionable', by offering specific, simple information about how to translate the message in action, putting people in the best conditions to act (Sunstein, 2014a). The term 'actionable' signals the immense relevance of offering to people a clear and concise idea about the path of an action.

Fundamentally, Thaler and Sunstein define "good nudges" those interventions developed to influence a behaviour, that act in harmony with the interests of the final recipient that is being nudged (Hansen and Jespersen, 2015). The following list illustrates the most important and common nudges employed by choice architects, based on two key elements that affect human decisions: biases in decision-making, and contextual influences.

1. Default rules have a relevant influence on behaviour, and are present across different settings, whether explicitly or implicitly. The default setting determines how a person initially encounters a service, a policy, a choice (e.g. Johnson and Godstein, 2003). Configuring a default rules entails the identification and establishment of the standard, ideal option; the person remains free to choose otherwise, but this would require an active choice. The power of default rules is based on the fact that humans naturally tend to conform to the current option (inertia), rather than actively searching for an alternative (Keller et al., 2011). Sunstein (2014a) illustrated three main reasons that explain why such automatisms are effective. First, on consideration of the power of inertia and procrastination, as previously introduced, people often choose to maintain their status quo. Secondly, People implicitly endorse the rules, on the belief that it was created by experts with valid reasons, thus they believe it is not the case to depart from the norm. Finally, an automatic option establishes a point of reference for a decision, in the same way that the mechanism of anchoring works. Defaults are applicable to an extensive audience in their capacity to guide choice, while conserving freedom of choice, and are often considered to most prototypical tool of libertarian paternalism (Johnson et al., 2012).

2. Implementation intentions are verbal prompts (e.g. "do you plan to…?) expressed in the direction of a desired behaviour, introduced by psychologist Peter Gollwitzer (1999). In fact, eliciting people's intentions makes them more prone to activate a certain behaviour. This is a simple strategy that does not guarantee behaviour change, rather it supports the motivation to act, by eliciting an intention in the individual's mind. Furthermore, people are often automatically

guided by the environment, in these cases control on actions and thoughts may be lessened, and a simple question can guide the person by reminding an optimal option.

3. Framing is a strategy to present an information, or an object, in way that highlights the feature that the choice architect wants to be relevant (Thaler and Sunstein, 2008). In fact, the different ways in which an information is presented, can generate different effects on perception (e.g. McNeil et al., 1982; O'Connor, 1988). For instance, labelling a product as "75 % fat free" may be a better framing than a label stating "25 % fat". Framing is effective because of our tendency to take decisions in an oblivious and passive manner because system 2 does not evaluate the effects and implications of the formulation of a certain message (see Tversky and Kahneman, 1981).

4. Simplification is the tool to render programs, procedures and regulations more people-friendly, that is more intuitive, easier to navigate (Sunstein, 2014b). Unnecessary complexities often decrease the rate of participation because they create confusion to the user, and removing these obstacles hold a great potential (ibid.).

5. Social norms, as previously mentioned, are implicit rules that prescribe behaviour in certain place, situation or circumstance. The influence that the group exerts on the individual is a decisive factor in understanding its beliefs and actions (Lapinsky and Rimal, 2005). To provide effective incentives to individuals, it is therefore important to study how society affects behaviour, as human beings tend to conform to others and adopt socially acceptable behaviours to feel part of a group to conform. People often ignore the most rational or correct choices, because of the information they receive from others, by the pressure received by peers, or by the desire to avoid social disapproval (see Asch, 1995). What is most striking, is that this process is often unconscious, as individuals ignore the fact that they are complying to a norm. People interiorise a norm and continue to adhere to it, sticking to a consolidated scheme (Thaler and Sunstein, 2008). These mechanisms reveal that humans are influenced by other humans. Hence, social norms can be identified and included in an environment (e.g. in the form of posters, or by changing contextual elements) to inform people about others' behaviour, thus changing behaviour by virtue of the human natural desire to conform (Samson, 2015).

6. Disclosure refers to the release of information regarding relevant data or costs, typically by markets and the government (Sunstein, 2014b). These interventions are a form of nudge in that information is made more accessible and simple, with the aim to contrast phenomena of inattention, negligence, or incompetence (ibid.).

7. Reminders, in the form of letters, text-messages or e-mails, can be useful to counteract a variety of behaviour such as inertia and procrastination, or simply the everyday life complexities that lead to forgetfulness (see Altmann and Traxler, 2014; Sunstein, 2014b).

8. Pre-commitments are strategies in which people impose a limit or a commitment to their future behaviour, by pledging to a certain action (see Hanks et al., 2013a; Schwartz et al., 2014). This strategy contrasts procrastination and is useful to support people to explicitly commit to an action in advance, which increase their chances to actually follow that behaviour (ibid.).

9. Priming, as discussed in chapter 1, is an implicit memory effect that occurs when the exposure to a stimulus influences a person's response (see Bargh et al., 1996; Kay et al., 2004; Holland et al., 2005; Bargh, 2006; Bateson et al., 2006; Vohs et al., 2006). This non-conscious effect works by associative activation: this mechanism entails that when a person is exposed to a specific concept or object (e.g. a cake), this automatically activates in the mind associated ideas (e.g. hunger or the idea of eating). Hence, priming - the non-conscious activation of a concept in a person's mind - is powerful because it influences subsequent thinking and can trigger automatic processes (Bargh, 2006). A schema is a mental framework employed to categorize and understand the features in our world; schemes are automatically activated when we need to make a judgment (Bargh et al., 1996). Priming occurs when a past or present experience with a stimulus activates a schema making it highly accessible in the mind (ibid.). The tangible effect of priming occurs when the activated mental concept influences our judgments and behaviours. If carefully employed for virtuous purposes, choice architectures can use priming as a tool to gently activate a concept in people's mind to guide successive behaviour (Walsh and Kiviniemi, 2014). It is important to note that, priming is not effective, unless (1) the person is actually experiencing a gap between the actual feeling and the primed object, and (2) the goal is something the persons feels positively towards (Aarts et al., 2008).

10. Salience is a cognitive process related to priming. This mechanism increases the accessibility of a mental concept, which is caused by an increase in the perceived significance (i.e. salience) of an object (Kahneman, 2011). Therefore, perceptual salience is a nudge aimed to make specific features more easily recognisable. Within a complex environment, many stimuli and features can go unnoticed. Human attention automatically focuses on what is most relevant and designing the environment in order to highlight certain elements can guide people's behaviour (ibid.). Further analysis of the mechanism of salience in available at paragraph 3.2.1.

11. Incentives. Concrete financial restrictions or penalties cannot be considered nudges, because they do not preserve freedom of choice. However, small economic incentives (e.g. in the form of a lottery) may be useful to support and encourage a specific behaviour (Ly et al. 2013; Sunstein, 2014b). More generally, choice architecture can spur the individual to focus on an incentive, highlighting the benefit that follows an action or behaviour (Thaler and Sunstein, 2008).

12. Feedback is extremely important to assist people to correctly carry out, or to improve a certain behaviour. Feedback as a nudge, takes the form of a variety of systems that inform people about whether they are acting correctly or not, whether there is a problem, or informing on the nature and implications of past and future choices (Thaler and Sunstein, 2008; Sunstein, 2014b). Long-term processes in particular, are more difficult to identify (Thaler and Sunstein, 2008). For instance, a person may eat food with a high sugar content every day, before getting diabetes. In such cases, individuals can largely benefit from feedback.

13. Technology tools can also be employed to support decision tasks (Johnson et al., 2012). Nowadays, the expanding use of information and communication technology provides an opportunity for the formation of new interactive tools to assist choice tasks, such as mobile applications (Johnson et al, 2012), to steer the individual towards the most desirable behaviour.

As the previous list displays, nudges come in a wide range of forms, and are related to specific behavioural problems that occur in a specific context. To clarify the domain of action of nudges, Codagnone et al. (2014) developed a scheme to classify nudging strategies by distinguishing two dimensions: 'automatic processing vs. reflective processing' (i.e. System 1 and System 2) and 'hot affect vs. cold affect' (Figure 9).

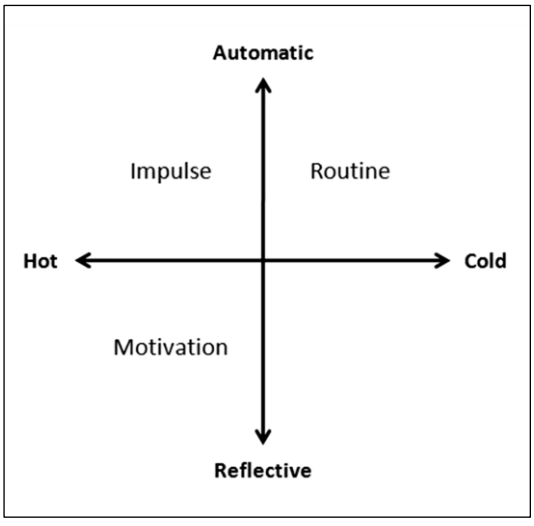


Figure 9. Classification of nudging strategies (in Codagnone et al., 2014).

First, a nudge intervention may aim to interrupt a person's automatic or impulsive behaviour and to redirect the person towards a state of more reflective processing. For instance, this may be the case of a gambler intensively absorbed in its gambling activity. Secondly, the automatic vs. cold quadrant indicate nudging strategies aimed at disrupting a person's routine, habitual behaviour, as in the case of default options. Thirdly, the intersection of hot affect and the reflective system represent those debiasing strategies based on System 2 that tackle motivation. Finally, the reflective-cold quadrant of the model represents the interventions that are not normally connected to nudging. This quadrant concerns those strategies that hit System 1 with strong emotions, with the aim of activating System 2 and elicit the necessary motivation for behaviour change. According to the authors, the model could be further improved by introducing a social vs. individual dimension, that is the distinction between nudges delivered in a social environment or in isolation. The previous discussion clearly shows that nudges have different forms, can be applied in a wide range of circumstances, can be employed for several purposes, and may focus on single responses or have more long-term effects. However, because of this variability, many authors argued that the definition of nudge is vague and possibly confusing, and that Thaler and Suntein's theory lacks a definite, clear classification and description of nudges (see Van der Heiden and Kosters, 2015). What counts as a nudge has not specific, standard, defined features. Instead, nudges are perhaps infinite, context-specific, and subject to the creativity of the choice architects. The lack of homogeneity in Thaler and Sunstein's work attracted some criticism (e.g. Hausman and Welch, 2010; Selinger and Whyte, 2011) especially in relation to some ethical aspects that will be discussed more in depth in section 2.3.5.

2.3. Choice architecture: a new tool for health policy

Equipping policy-makers with robust evidence on human cognitive and behavioural tendencies can improve the outcomes of policy interventions. Bearing in mind the patterns that characterise human natural actions, supports the design of a wide range of public policies directed to change behaviour in a variety of domains. This is especially relevant in the spheres related to everyday behaviours, such as nutrition. Interventions that stem from choice architecture employ tools that can revise and transform the environmental cues that automatically trigger behavioural responses, towards the optimal direction.

2.3.1 Nudging: Libertarian Paternalism in policy-making

The nudge philosophy is a revolutionary theory that is having relevant consequences for the definition of public policies, from fiscal plans to welfare state, environmental policies, health policies, educational policies, and more. Using the knowledge of the mechanisms of how people actually make their decisions, it is possible to put people in the optimal conditions in order to act in the way that is most advantageous for them. This is achieved by carefully designing the contexts of choice in which citizens act, in a way that is best for themselves and the society. This approach has been named '**libertarian paternalism'**. Seemingly an oxymoron, paternalism refers to the task of influencing decisions that can make our lives longer, healthier and happier, for which legitimacy is implicitly assumed by Thaler and Sunstein, (2008); while libertarian refers to the fact that while people are guided towards the performance of the optimal behaviour, maintaining their freedom to choose differently, that is to 'opt out'. Furthermore, Thaler and Sunstein (2008) maintain that choice architects aim to 'influence choices in a way that will make choosers better off, *as judged by themselves'* (2008, pp. 5–6, my italic). Nudging is designed to foster the ability of people to behave in the way they prefer (or in a way that they do not disagree with), overcoming temptations or biases that affect daily decision-making. Nudges concern decisions that would be irrational to reject, such as healthier living, more information disclosure, or guidance in case of complex decisions. The purpose of a nudge is to reflect authentically the desire and preferences of individuals, liberating them from the influences of biases, increasing autonomy and self-

empowerment (see Mills, 2013). This feature of working according to people's preferences, is what distinguish nudging from other paternalistic interventions such as regulations.

Nudges are more properly featured as a kind of 'soft-paternalism' (Sunstein, 2014a). According to Thaler and Sunstein (2003), paternalism does not necessarily involve coercion, as initiatives can be selected with the aim of improving a certain life condition or environmental feature for the well-being of the recipients of a policy, by maintaining freedom of choice. This approach promotes paternalist interventions that are legitimated by their end of promoting welfare, and by the absence of any form of coercion. Indeed, Thaler and Sunstein recognise that when public or private actors deliberately attempt to alter choices to steer people in a certain direction, there is a certain degree of paternalism. However, nudging is regarded as a weak and non-invasive form of paternalism since individual choices are not hindered nor significantly burdened. Thus, the fathers of nudging conclude that libertarian paternalism "*should be acceptable to even the most ardent libertarian*" (2003: p. 175).

Importantly, Thaler and Sunstein (2008) highlight the fact that the presence of some kind of choice architecture is unavoidable. There are so many stimuli in the environment that influence our choices that we cannot even recognise them all, and we are at all times 'pushed' but subtle contextual cues. Take the layout of a tablet, or any software that we download: they come with default features. In the same way, a department store or a supermarket predispose their products to encourage certain choices. The government also establish rules that inevitably define an upper architecture within which we live, and which influences our choices. Thus, while it is not possible to eliminate from our existence external influences or environmental cues, these can be altered by choice architects to make them more functional for our well-being. Finally, **transparency** is a core requirement of nudges: any action taken to steer people in a specific direction (e.g using a default rule or shaping the architecture of healthy food options) should not be covert (Sunstein, 2014a). Nudges must entail openness of intent, in opposition to manipulation in the sense of 'trickery'. Choice architecture must be open to public scrutiny, this is especially important in the case of public policies, in order to prevent intrusive or harmful manipulation. Importantly, when the goal of a nudge is legitimate, it is less likely to have negative ethical implications.

2.3.2. Governments around the world are nudging

> "*There has been the assumption that central government can only change people's behaviour through rules and regulations. Our government will be a much smarter one, shunning the bureaucratic levers of the past and finding intelligent ways to encourage, support and enable people to make better choices for themselves*" (Coalition Commitment, 2010).

According to Marteau et al. (2011: p. 228) "[…] *the appeal of nudging* [for government] *is self-evident: it proposes a set of seemingly simple, low cost solutions that do not require legislation and can be applied to a wide array of problems arising from our behaviour*". Furthermore, "*the absence of legislation holds particular appeal for governments and others wanting a smaller role for the state in shaping the behaviour of its citizens*" (ibid.). Chetty (2015) examined three reasons why the application of behavioural economics (BE) can be a valuable contribution for the improvement of public policy. In the first place, BE and nudge theory offer innovative tools to influence behaviour increasing the set of potential outcomes to be attained through policies. Secondly, findings in BE can inform the development of the policies by virtue of the new evidence about phenomena such as loss aversion, inertia, and default effects. Finally, novel welfare implications can be generated from the studies on behavioural biases, which can produce discrepancies in the perception of welfare amid the policy maker's perspective, and the perspective of the citizen.

The use of nudges is becoming an international phenomenon, this strategy has been implemented worldwide by governments in the United States, in the United Kingdom, in Denmark, France, Germany, and many other countries. In 2010, the Organisation for Economic Cooperation and Development (OECD, 2010) issued a report that recommends numerous initiatives inspired from the results in behavioural economics. Nudging is promising since it supports and promotes a wide range of objectives. Institutions and governmental agencies can do a lot to render policies simpler, to conform their interventions to meet what is most intuitive and automatic for people.

Cass Sunstein served as Administrator of the Office of Information and Regulatory Affairs at the White House, from 2009 to 2012, during the Obama administration. OIRA is in charge of the supervision and implementation of governmental policies, and of the evaluation of draft regulations. The range of regulations varies widely, from the field of air quality, financial stability,

agriculture, energy, immigration, health care, and more. During Sunstein's three-year mandate, several new regulations have been introduced, and many nudges have been employed as regulatory tool. For instance, the Green Button is a link that gives access to families to personal data related to energy consumption: users receive detailed information on prices and consumption allowing them to save money, and this intervention generated a reduction between 8-22 per cent in energy consumption levels (Sunstein, 2014a). A second application concerns smoking, which is the first cause of death in the US. To contrast the issue, price incentives have a marginal impact. Thus, the Smoking Prevention and Tobacco Control Act is a 2009 law that imposed new and more dramatic warnings on cigarette packages. Enlarged and simplified shocking images were selected to directly stimulate a reaction of system one. These warnings are based on the nudge salience, and do not impede people to buy cigarettes, preserving freedom of choice (ibid.). Richard Thaler has also supported former First Lady Michelle Obama in her nudge campaign for childhood obesity.

After Cass Sunstein's mandate, governmental agencies continue to be advised to apply BE principles to improve policy outcomes, also for its low operational costs (Ly and Soman, 2013). In 2014, the Obama administration established the Social and Behavioral Sciences Team (SBST), an agency in charge of applying behavioural science insights in federal programs (White House, 2016). The USDA created the Cornell Center for Behavioral Economics in Child Nutrition Program, to lead and disseminate behavioural economics research for child nutrition (Guthrie, 2010); while the Federal Trade Commission employs BE for policy analysis, and the Department of Energy is trying to establish its behavioural science team. In 2015, Barack Obama concluded: "*Adopting the insights of behavioural science will help bring our government into the 21st century in a wide range of ways - from delivering services more efficiently and effectively; to accelerating the transition to a clean energy economy; to helping workers find better jobs, gain access to educational opportunity, and lead longer, healthier lives*" (The White House, 2015).

The nudge theory seduced not only former President Obama, but also ex-Prime Minister David Cameron who supported the creation of a nudge unit in the UK Cabinet office. The Behavioural Insights Team (BIT) is a social purpose company partially owned by the government, in charge of the design of policies informed by behavioural economics. The team employed these findings to promote innovative important initiatives in the field of smoking, organ donation, energy efficiency, taxes, and more. Beyond the realisation of interventions based on scientific data, the team also publishes reports on its website, that are created in an accessible language, in order to

be understood by both experts and the public. The BIT follows the approach 'test, learn, adapt' and the behavioural hypotheses have been synthesized in the acronym MINDSPACE (see Table 3) a non-comprehensive checklist that captures the main influences on human behaviour (Dolan et al., 2010). The tests occur through randomised controlled trials to compare the outcomes of a strategy with the control group that did not receive the treatment, or to compare several methods (see BIT, 2012). Furthermore, to complement MINDSPACE, the BIT developed the EAST framework, which focuses on the practical application of behavioural economics principles by identifying four core principles: Easy, Simple, Attractive and Timely (BIT, 2014).

In France, the BVA group, one of the major market research and consultancy institutes worldwide, launched a nudge unit, with the aim to reinforce the efficiency of public policies. Particularly, the unit informed a successful governmental intervention to encourage taxpayers to adopt the digital service (BVA, 2016). Before the intervention, 70 per cent of French taxpayers employed the paper form, whose costs are 40 times higher. To accelerate the adoption of the online declaration form, the unit applied and tested some nudges to the email communication directed to taxpayers (reward, incentives, social norm, salience). Hence, a randomized controlled trial on 2,5 taxpayers allowed the team to identify the best intervention to be implemented in the 2015 campaign. The results were a 1.1 million online tax returns compared to the previous year. The team successfully implemented other nudges to reduce the use of the mobile phone while driving, to increase to consumption of generic medicines, the improve the well-being of civil servants, and to increase the turnout rate for the mayor election.

Finally, in Denmark, while there is not an official unit, several governmental departments are affiliated to the Danish Nudging Network, which connects researchers, policy-makers and other experts for the application of BE in public policy. The European Union has employed BE principles to inform some consumer policies; New Zealand use it for a voluntary savings plan, while Singapore used it to develop its Lifelong Income for the Elderly Plan (see appendices in Ly and Soman, 2013). The growing role assigned to behavioural economics science in public policy led the publication of the Mind, Society, and Behavior report issued by the World Bank in 2015.

MINDSPACE - Summary of the main influences	
Messenger	We are heavily influenced by who communicates information
Incentives	Our responses to incentives are shaped by predictable mental shortcuts such as strongly avoiding losses
Norms	We are strongly influenced by what others do
Defaults	We 'go with the flow' of pre-set options
Salience	Our attention is drawn to what is novel and seems relevant to us
Priming	Our acts are often influenced by subconscious cues
Affect	Our emotional associations can powerfully shape our actions
Commitment	We seek to be consistent with our public promises, and reciprocate acts
Ego	We act in ways that make us feel better about ourselves

Table 3. Summary of the main influences described in the MINDSPACE acronym (Dolan et al., 2010)

2.3.4. Application of nudges in the health sector

First, the aim of the following review is to illustrate some applications of the nudge approach across diverse settings in the health sector. There is increasing agreement in academic and institutional literature that to foster innovation in the domain of health care, interventions should be informed by findings in behavioural economics. Evidence suggests a high potential for the use of nudge interventions in this sector, as the application of a variety of experiments proved to be successful. However, the variety of nudge-type interventions imply a high variability in terms of outcome, quality, and actual behaviour change (Prepp et al., 2015). According to Voyer (2015), findings in this discipline offer a prime tool to be applied in healthcare management, particularly to address two issues: the issue that conventional messages based on persuasion have a limited effect; and the issue of the rising costs of expenditure in the healthcare sector and the mounting pressure to reform.

The Behavioural Insights Team, among its operations, employs the principles of behavioural economics to identify novel and cost-effective interventions in this domain. In collaboration with the Department of Health and the Government Digital Service, the team set out a randomised controlled trial to increase organ donation, using the nudge of **reciprocity** (BIT, 2014). Reciprocity

is a form of social norm that entails interactions between people, in other words, to respond to a person's action with another action (Samson, 2015). For one month, in the online page for the payment renewal of the car tax, people were asked whether they wanted to join the organ donor register. A number of eight different messages were selected to encourage signing up, and one million people visited the website during that month. The most successful message resulted to be the one that draws on reciprocity: 'If you needed an organ transplant, would you have one? If so, please help others' (i.e. column 'Would you?' in Figure 10). It has been estimated that 100.000 new registrations would take place per year with this message. Interestingly, the message based on a social norm, did not perform well (column 'People' in Figure 10).

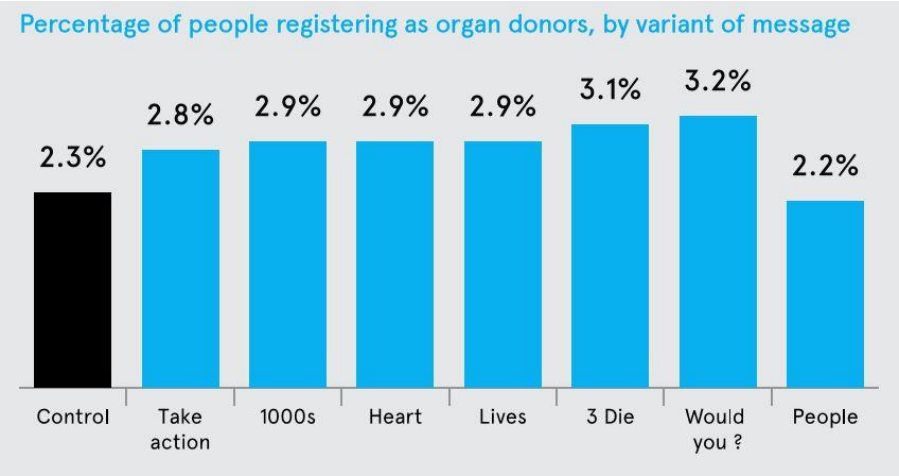


Figure 10. Reciprocity nudge to increase organ donation (in BIT, 2014: p. 33).

The BIT (2011) reports an initiative developed out of a collaboration between Nintendo DS and Bayer Healthcare. In the UK, about 3000 diabetic children are hospitalised each year following difficulties in the regular management of their blood sugar levels, which can be challenging for both children and their parents (ibid.). The two companies jointly developed a device (i.e. **a technology tool**) that assigns points to diabetic children when they regularly make their pin-prick blood-sugar test. The points can be used on Nintendo games and children can compare their performance, making the use of the device more fun and rewarding. When taking a blood test for diabetes, the short-term pain is juxtaposed to a long-term gain. The idea here to reduce the discomfort is to create an immediate gain (salience), so the pain is reduced by distracting the

attention from the test. Also, because the game continues after the test, the pain appears smaller in the memory. The nudge is the game, and the pain is discounted.

Volpp et al. (2008) thought about a lottery, as a **financial incentive** to nudge people to lose weight. This nudge is based on people's tendency to overestimate small probabilities of winning and the strength of regret. Behavioural economics illustrated the patterns of self-destructive behaviour, such as valuing more immediate benefits and discounting delayed benefits, such as being in good health. These decision errors are the base of this experiment applied to obesity. In the study, the participants checked their weight every day, and if the weight loss objective was reached, they participated to a lottery in which they had 20 per cent chances of winning 10 dollars, and 1 per cent chances of winning 100 dollars. The subjects that did not reach the weight loss objective, also participated to the lottery, but without the chance to obtain their possible reward. These patients could only regret of not putting enough effort towards their weight loss target. The results appear to be highly effective as the patients who took part to the lottery lost 6 kilos in four months, compared to 1 ½ kilos of the control group.

Not only patients, physicians as well can benefit of choice architecture. A simple **checklist** is a method that proved to be effective. This entails the creation of a control list of the stages of a specific practice. Many complications in surgery arise because of human errors that can be easily avoided. The World Health Organisation published in 2009 a report on the efficiency and the importance of having a checklist for a higher safety in the operating room. It contains nineteen points, to be followed at each surgery, that systemically nudge the unit of doctors and nurses to prevent errors that can be fatal to patients. In the report, the WHO show evidence of several studies that succeeded in the decrease of surgical complications using the checklist, as in the reduction of in-hospital mortality, and in the reduction of overall complications. Haynes et al. (2009) examined the use of checklists in eight hospitals, located in eight different cities. The research revealed that following the introduction of the checklists, the rate of patient decease after surgery fell from 1.6% to 0.8%, while complications also fell from 11% to 7%.

Arriaga et al. (2013) conducted an experiment involving 17 operating-room teams, that performed in 106 simulations of a surgical crisis. The team were randomly assigned to a condition, involving the use or not of a checklist describing the critical processes of care to follow. All teams with the checklist available performed better, and the missed steps dropped from 23% to 6% (see Figure 11).

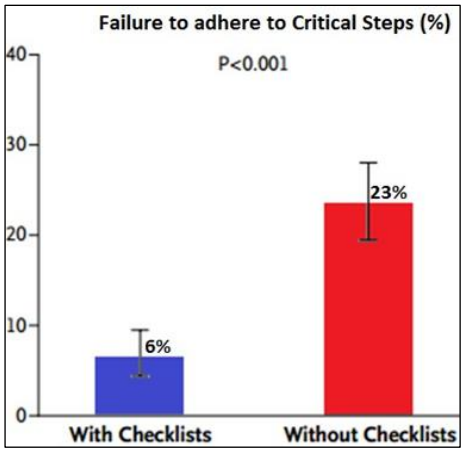


Figure 11. Checklist effectiveness. Arriaga et al., 2013.

Using **implementation intentions**, a study demonstrated that for the employees of a company that received a specific prompt to an influenza vaccination, the vaccination rate was 4,2 higher compared to the control group (Milkman et al, 2015). This low-cost intervention consisted in a simple prompt to write down date and time of the appointment and was added to a reminder mailing. The 4,2 result suggests that concrete plans play a relevant role in intention to act.

In the area of prevention, to reduce the mortality of breast cancer, mammography screening is the most effective available mechanism. To spur women in undergoing a mammography screening, Banks et al. (1995) tested the effectiveness of **framing** a message in negative or positive terms. The study illustrates that a negative frame that outlines the risks of not obtaining a mammography is more effective that a positive frame that highlights the benefits. Consistently with prospect theory, the results show that loss-frame messages can deliver higher compliance rates, in respect to messages that illustrate the benefits of prevention. O'Connor (1988) investigated the influence of probability framings on the preferences for cancer treatment options, which displayed different levels of survival probability. 154 cancer patients and 129 healthy volunteers designated their preferences for a toxic or non-toxic therapy at varying trade-offs between quantity and quality of life. The subjects were randomly assigned to 3 therapies: (1) a positive frame highlighting the probability of survival; (2) a negative frame highlighting the chances of decease; and (3) a mixed frame where probability of survival and decease were both displayed. Probability framing effects were relevant for both of the groups. When the chances to survive were below 50 per cent, preferences for the toxic treatment decreased, and this was particularly evident in the negative frame. Furthermore, in a negative frame with 0,5 of survival probability, quality of life becomes

more salient that quantity. In a related study conducted previously, McNeil et al. (1982) had found that telling patients that there is a 90 per cent chance of being alive after five years from a specific operation, people are more likely to undergo surgery, compared to when people are told that after five years, 10% of patients have passed away.

Research suggests that also **reminders** can be effective, across a variety of settings (see Cheung et al., 2009), such as improving immunisation uptake; changing the behaviour of health care providers, or to reduce missed hospital appointments by patients (Gurol-Urganci et al., 2013). To reduce missed psychiatric appointments, Sims et al (2012) tested the use of reminders in the form of text messages, resulting in a reduction of 25–28%. The outcome is particularly relevant considering that the rate of non-attendance in this field is two to three times than in the other medical specialties. Hallsworth et al. (2015) not only investigated the impact of reminders, but the importance of the content, in the domain of attendance to hospital appointments. The researchers tested the control message (the one currently employed by the NHS) with three other reminder messages (specific costs, social norms, easy call), by randomly allocating them to the appointments. The message "specific costs" proved to be the most successful, with an absolute 2.7% decrease in comparison to the control message. The authors estimated that with the adoption of the 'specific costs' reminder, replacing the 'control' message, the missed appointments per year in the NHS would drop to 5,800 less.

Probably one of the most effective nudge, **default options** consist in the identification of a predetermined choice, in which action is necessary only if the person actively chooses an alternative (opt-out). The aim is to facilitate the process of choice, by steering it toward a specific option. This intervention lays on the understanding of inertia, a phenomenon in which people tend to maintain the status quo rather than actively act to change a situation, even in the cases where this may be convenient. An emblematic experiment has been carried out by Johnson and Goldstein (2004) that tested the power of default options in the field of organ donation. The experiment confronted the percentage of organ donators in the EU regions: the core difference among nations was that some states demanded the explicit consent to donate the organs, while other states required the explicit consent if the person did not want to donate. In other words, some states did not assume the consent to donate the organs (opt-in option), while others did (opt-out options). The researchers found that with the opt-out default rule, organ donation registered almost 100 per

cent of participation; on the contrary, in nations where people had to actively choose to participate in the program, participation reached a mere 30 per cent in the best cases (see Figure 12).

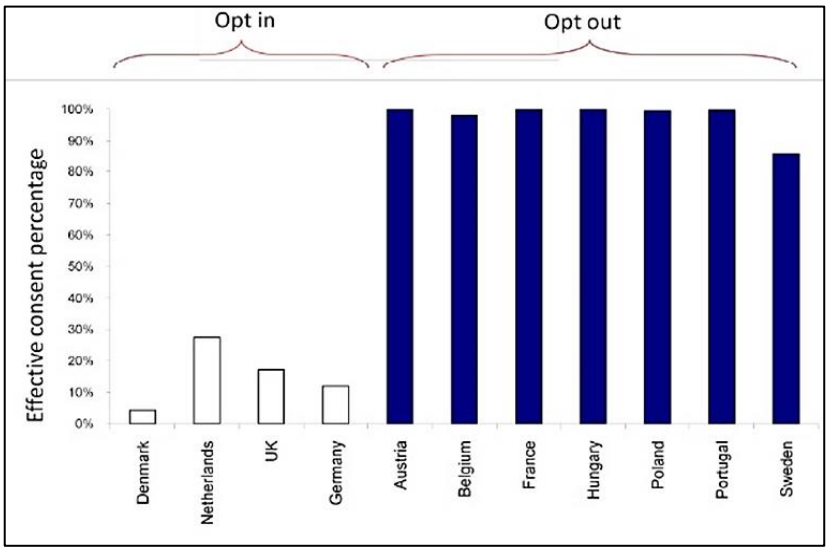


Figure 12. Impact of default option for organ donation (in Johnson and Goldstein, 2003).

In the US, Kling et al. (2012) tested the effectiveness of receiving personalised information for the Medicare Prescription Drug Plan, a governmental health insurance program for seniors (over 65). In this randomized experiment, the control group only received the link to the specific section of the Medicare website, while the treatment group received a personalised letter, widely presenting information. The intervention consisted in this small nudge, namely directly providing patients with the information through a letter, rather than leaving them searching for it. The results show a 28 per cent plan switching in the treatment group, compared to 17 per cent of the control group. Moreover, the intervention reduced the predicted consumer cost of about $100 per person a year among letter recipients.

Indeed, not all of the above case studies obtained striking results. Some nudges proved to be more effective than others, such as the use of checklists in surgery to reduce patient complications. As the BIT (2014) points out, for the future improvement in the application of BE principles, especially three issues should be addressed:

- Replication of the interventions in different settings to assess the impacts;
- Segmentation of the interventions on different populations to account for group differences, and tailoring of future interventions to increase performance;

- Complexity requires to progressively shift the focus from simpler behaviours (that are easier to measure) to develop more compound interventions.

The fundamental goal is to conduct continuous experimentation to realistically assess the impact of nudge-based initiatives. This is especially relevant in the domain of health policy. Preferably, these tests require highly specialised teams, as testified by the establishment of many governmental units around the world. Fortunately, most nudge interventions involve very low costs and small modifications or additions to existing contexts or programs, rendering it easier to incorporate them and carry out the trials.

2.3.5. Criticism to Libertarian Paternalism and Ethical Considerations

The discipline of choice architecture does not come without issues or ethical considerations. Critics to nudging are particularly intense on whether it is compatible or incompatible with personal autonomy, and whether nudging is a manipulative approach. The general concept of **personal autonomy** is subject to a heated debate in moral and political thought, and its value, content, and role in politics are questioned. Personal autonomy refers to the individual ability for self-control and autonomous deliberation, and to freedom from coercion or manipulation (Mills, 2013). A clear and definite answer to these questions, is highly difficult since the umbrella of nudging is composed of a subset of different interventions that address different issues and behaviour-changing initiatives. Thus, in the following pages, both the accounts of the 'prosecutors' and the arguments of the 'defence' will be illustrated, to conclude with an argument that calls for a more nuanced perspective.

2.3.5.1. The prosecutors: accusations to Libertarian Paternalism and nudging

Employing nudges as policy tools, has been criticised with the argument that libertarian paternalism is a contradictory notion that conceals an attempt to change people's choices in a patronising manner. The main argument against the legitimacy of nudging is that it violates freedom of choice, as individuals are not able to exert their free will, guided by an upper architecture. Some critiques went as far as invoking Big Brother-like imageries and dystopian nightmares, advocating that the inherent scope of using nudges is to patronise individuals, who are conceived as senseless and unable to make good decisions for themselves:

"*The use of public authority to change citizens' behaviours, even if the altered behaviours are better for the citizens themselves, violates spheres of privacy, integrity, and autonomy...The state ought not to patronise people, by singling out a subset of the population and treating them as if they lacked the full use of reason*" (Oliver and Brown, 2010, in Rainford, 2011: p.4).

Luc Bovens (2009) argues that nudging may not be an appropriate policy tool instrument because it may lead to a society of ''*fragmented selves''*. Bovens (2009) stresses that a same behaviour might have different outcomes, if it is performed without external influence or under the influence of some sort of choice architecture. For instance, food selection may vary if a person is eating in a lunchroom that nudges vegetables, instead of a lunchroom where no optimal behaviour is nudged. Bovens acknowledge that the individual may adopt improved eating choices, however, in his view, this external guidance impairs the development of the **moral character**. If policy makers act as nannies taking responsibility by nudging people away from negative outcomes, he argues, citizens are not prompted to learn. In this scenario, people will not be personally responsible for their own welfare, and practical common sense would be lessened because the knowledge on appropriate behaviour would rely on the intervention of experts. In other words, habituation to nudging would entail the reduction of individual control. Thus, in a long-term perspective, nudges appear problematic as an issue of infantilization arise: the adoption of a morally lazy and immature behaviour lead to a lack of commitment in the maintenance of one's willpower and self-control (ibid.). In such a scenario, Furedi (2011) see citizens as becoming prime targets for a technocratic regime, in which the government prefer problems to be solved through the design of experts (e.g. choice architects) rather than by responsible citizens. A technocratic culture entails the diminishment of phronesis (i.e. a form of wisdom in practical things, the ability to discern why and how to act virtuously) that would be outsourced to professionals, with a consequent decline in value of the public sphere by the "*behaviour management industry*" (ibid.).

According to Fischer and Lots (2015) the criticism to nudging can be divided into two main categories. The first objection to nudging is based on the principles of **utilitarianism** and concerns the goals that are pursued by using nudges. Nudges that favour long-term outcomes decrease short-term utility, and this is perceived as inherently wrong because individuals should be left free to act to maximise their utility, whereas nudges reduce utility. The second objection to nudging is that they interfere with **individual autonomy**, that is, in the possibility to behave accordingly to an autonomous pondering of reasons and preferences. This objection is rooted in Kantian ethics and

focuses on the way that nudges influence the individual, by a manipulation that interfere with independency and autonomy. In other words, we could say that the first category of objection concerns the reduction of the "freedom to act", while the second category of objection concerns the restriction of the "freedom of will" (ibid.).

The vision of Schnellenbach (2012) pertains to the first category of objections, as he maintains that even though nudges can differ in the amount and type of costs sustained, they lead to the behaviour desired by the state. For Schnellenbach, nudges are not so different from other economic policy tools (e.g. taxes) that influence a person's decision-making. The argument of Hausman and Welch (2010) falls in the second category. According to them, under a condition of choice architecture, one's control over mental deliberation is reduced, as preferences reflect the ones of the choice architects, reducing individual autonomy. Hausman and Welch (2010) suggest that since choice architecture functions optimally when individuals are not aware of being influenced, Thaler and Sunstein exaggerate with the identification of nudges as non-intrusive and choice-preserving. While it is true that the individuals maintain the same set of choices, it may not be acceptable to everybody, especially to those more concerned about preserving individual freedom (ibid.) What emerge from these critiques is that the debate on the ethical implications of nudging is also a debate on the very idea of man, freedom, and liberty of choice. The different authors that question the legitimacy of nudges from a perspective of Kantian ethics or utilitarianism are fundamentally concerned about the preservation of **individual freedom** (Fischer and Lots, 2015). Julian Nida-Rümelin (2005, in Fisher and Lots, 2015) notes that failing to perform behaviours that prevent future negative consequences (such as saving money or eating healthy) does not entail that people act irrationally. People may not necessarily experience remorse when faced with the negative consequences of their behaviour and prefer to value short-term utility to enjoy the present instead. Accordingly, Van der Heijden and Kosters (2015) highlight that the implicit nature of nudging draws critiques about a lack of transparency and accountability, as individuals are prompted to choose and act differently from what they would normally do. Moreover, the notion of good is subjective, and that the evaluations of choice architects may be susceptible to bias and personal motives (ibid.). Rizzo and Whitman (2008) also contest the alleged superiority of choice architects in their task of selecting the best behaviours to promote. Choice architects, they argue, select the appropriate values for ideal decision-makers, without any assurance that these predictions are actually in line with the desires of the final users.

Goodwin (2012) is opposed to the use of nudging in the United Kingdom's politics, arguing that this approach in not in line with the government's aspiration to endorse the values of freedom and empowerment. In his article, he claims that the notion that nudges are liberty preserving is incorrect and due to a reductionist definition of freedom employed by libertarians. Goodwin believes that libertarians cannot fully and deeply understand the concept of freedom and of the possible threats to it, since they focus exclusively on negative freedom, that is the liberty from external interference from others. Instead, by embracing a broader conception of positive freedom, one can see the importance of the process of self-realisation and empowerment that also derives from overcoming life difficulties. Positive freedom value internal factors, that is, the individual resources to fulfil one's potential. In other words, while negative liberty refers to freedom as absence of obstacles, constraints or intrusion of others, positive liberty entails the presence of control and self-determination. In fact, as Goodwin points out, libertarians base their case in the Lockean tradition of natural rights and self-ownership, rather than in Kantian conception of respect for autonomy. Thus, the incapacity of the nudging approach to take into account these factors reduces their concept of empowerment.

2.3.5.2. The account of the defence

A tenacious tenet in the critics' arguments has been the claim that nudging works by manipulating choices, which is in contrast with the ideals of freedom of choice and public dialogue of a democratic society. Hence, this claim directly challenges the legitimacy of nudging in public policy-making. Thaler and Sunstein (2008) point out that people's choices are consistently manipulated by more invasive measures, such as marketing or regulation, therefore nudging should be an acceptable approach. As Van der Heiden and Kosters (2015) also note, criticism to the alleged coercive nature of nudging, can be applied to other typical governmental interventions (e.g. bans and regulations); and in any case, government is always acting on behalf of the citizens. To guarantee that the influence of nudges in modifying behaviour is not manipulative, Thaler and Sunstein (2008) maintain that designed interventions must be inexpensive, **transparent** in their aims, and above all, intended to assist people in acting accordingly to their interest. Nudge interventions designed to steer behaviours in directions that improve health conditions (e.g. obesity, alcohol consumption, smoking, etc.) or societal issues (e.g. littering and waste), should be put into context and recognized as justifiable, provided that its objectives reflect the preferences

of the general population and follow **Rawls' Publicity Principle**. Rawls emphasised a society in which institutions are governed by fairness to citizens, and fair policies are those that aim to maximise the general utility and well-being of the members of the society (Rawls, 1971). This conception reflects the idea of a system of collaboration aimed at a mutual advantage: social collaboration produces benefits for its members but requires obligations and costs in terms of obedience to the laws of the State. In other words, people are conceived as free and equal human beings, able to autonomously determine their ends; at the same time, the member of the society while enjoying the benefits also need to sustain some costs, reconciling the public and private interests (see Bloom, 1975). The principle of publicity is a feature of fairness. The idea behind publicity is that in the public political sphere nothing shall be kept hidden, and that the workings of the state should be open to public scrutiny (Rawls, 1971).

A second tenet of the account of the defence, is that because a neutral design is illusory, some sort of architecture and influence is always present and unavoidable, so "[…] *the anti-nudge position is unhelpful – a literal nonstarter*" (Thaler and Sunstein, 2008: p. 11). Hausman and Welch (2010) also admit that **choice architecture is inescapable** and cannot be regarded as morally problematic in itself. The inherent nature of being a choice architect in a context, makes it impossible not to influence behaviours, thus the sole solution is to recognize this and take responsibility, and to use nudges that reflect the values of Libertarian Paternalism (Thaler and Sunstein, 2008). Thus, nudging should be more appropriately considered as an additional 'tool in the box' for governmental strategies. Cass Sunstein (2015) in his article "Nudging and Choice Architecture: Ethical Considerations" elaborates a thorough answer to the diverse ethical objections. Below, the main points are illustrated:

1. The first point is that <u>choice architecture is inescapable and cannot be avoided</u>: 'invisible hands' exist everywhere in the marketing of products at the supermarkets, in stores and restaurants, in the design of a website, in the rules of the government. This entails that the objection to nudging on the moral grounds that it influences people is pointless, as anyhow individuals are constantly subject to a variety of influences and environmental cues in their daily lives.
2. Moral discourses about issues such as manipulation and autonomy that take <u>abstract drifts</u> lead to confusion and to no concrete progress. Nudging can be applied in a variety of

domains, and each domain requires a specific ethical analysis rather than a general discourse.

3. In relation to autonomy, rather than hindering it, much nudging strategies actually support autonomy, enabling individuals to dedicate their attention to their daily relevant concerns. Additionally, when a nudge corrects a behavioural bias it supports a person's autonomy. However, Sunstein acknowledge that an ideal choice architecture requires active choosing. Therefore, nudges such as default rules might interfere with autonomy, especially if they do not reflect people's actual preferences, or in the case where because of inertia, people may not reject a detrimental default. At the same time, default rules may be superior than active choosing, when people prefer not to choose for a variety of reasons. In these cases, a default rule acts on their behalf and in any case, it does not deprive people of the possibility to choose if they eventually desire to reject the default. To account for these issues, a reflection on autonomy in relation to default rules must be carried out in the planning of each context-specific intervention.
4. As Sunstein (ibid.) notes, ethical criticism about manipulative strategies are especially relevant and a topic that merits careful attention. Sunstein answers to the critics that regard nudging as a form of manipulative influence that bypasses the person's rational capacity and autonomy by distorting the decision-making process. Sunstein concede that some types of framing may be considered manipulative. For instance, choice architects aware of the influence of loss aversion may implement a 'loss frame' in a campaign on excessive energy consumption, emphasizing the great loss from not using energy conservative systems. The use of loss aversion may be manipulative in the sense that it does not target people's deliberative reasoning process, but rather triggers a negative emotional state. This conduct is a form of manipulation, but it would be extreme to condemn it for this reason, as it is important to bear in mind that most nudges serve educational purposes (e.g. think about health warnings, or social norms against smoking or littering). Some degree of manipulation in inevitably involved when a nudge targets emotions or people's intuitive thinking (System 1). But such an accusation should then be made to charities that try to obtain funds through heart breaking campaigns; or to our family and friends when they emphasize the losses or dangers that can derive from a certain behaviour by concealing their point with a smile. Thus, as Sunstein (2015: p. 40) puts it: "It should be emphasized

that any action by government, including nudging, must meet a burden of justification. But when nudges fall within the periphery of the concept, when they have legitimate purposes, when they would be effective, and when they do not diverge from the kinds of influences that are common and unobjectionable in ordinary life, the burden of justification can often be met".

Finally, in his 2013 paper, Mills directly answers to Goodwin's (2012) concerns about nudging and empowerment. He notes that to promote empowerment choice architects need to reflect people's rational desires and authentic choices. As long as individuals are supported to pursue their real objectives by eliminating sources of bias (internal or external), then nudging might actually promote self-mastery and empowerment. One of the tenets of nudging is to maintain and protect freedom to choose, hence, insofar this method is not employed in contrast to authenticity it respects the concept of autonomy.

2.3.5.3. A nuanced perspective

It is legitimate to question and severely scrutinize an approach that attempts to influence individual behaviour, especially through interventions that direct behaviour unconsciously. It is the role of researchers and experts to inform public policies and make sure that they are carried out appropriately without infringing individual freedom. Because nudging is a new tool in the box for policy-making, these critiques are necessary and beneficial in that they support the monitoring of governmental action. However, the question is complex, as nudging is applied to an array of different issues, from savings plans, tobacco use, organ donation, to health behaviour. Each of these domains require caution in the definition of an intervention. However, some critiques seem to be merely exercises of critical thinking that often reach excessively radical drifts. For instance, the devaluation of the public sphere and the reduction of the ability to morally identify the best behaviour, such as posited by Bovens (2009) in the argument on the 'fragmented selves', seems quite an exaggeration. Moreover, many discourses are based upon ethical abstractions, using examples that have very little to do with reality. For instance, Hausman and Welch (2010, p. 130) exemplify:

> "*Suppose, for the purposes of argument, that subliminal messages were highly effective in influencing behaviour. So, the government might, for example, be able to increase the frequency with which people brush their teeth by requiring that the message, "Brush your teeth!" be flashed briefly during prime-time television programs. Influencing behaviour in this way may be a greater threat to liberty, broadly conceived, than punishing drivers who do not wear seat belts, because it threatens people's control over their own evaluations and deliberation and is so open to abuse. The unhappily coerced driver wearing her seat belt has chosen to do so, albeit from a limited choice set, unlike the hypothetical case of a person who brushes his teeth under the influence of a subliminal message*".

This example illustrates the point. Hausman and Welch (2010) introduce their case by openly admitting that it is made exclusively for the sake of the argument. First, since choice architecture interventions can take a variety of forms, therefore the ethical objection must be tailored on that concrete, specific form, to avoid abstractions and worthless confusion. Nudging people towards eating more salads at lunch or to quit smoking, is different from nudging interventions that automatically enrol people in some sort of economic scheme. While the latter may be more questionable and require context-specific observations, the first follows basic common sense. If our human, instinctive, irrational nature gets in the way of us eating properly, or lead us to litter around, or to 'smoke our lungs off', in these cases I believe a little nudge in the right direction should be welcomed. Nudges should be rather intended as forms of support to guide humans in the situations in which reflective thinking may be poor. This does not imply that we would be prevented to enjoy some junk food, rebelling against the optimal choice. It merely means that in some contexts, the environment will support people in carrying out the best behaviour. Nudges do not impose: for instance, if a starving person with a craving desire enters in a lunchroom, which has been structured to display the healthier meal options first, he/she will still be able to identify the options that most suit him/her in that moment, by selecting a rewarding calorie dense lunch.

Secondly, there may not always be something troubling with paternalism. In my opinion, paternalistic policies such as the obligation to wear the seat belt, or the prohibition to smoke in public restaurants, are justifiable even though they infringe individual liberty. If our societies are characterised by some paternalistic commitments, such as respecting speed limits while driving, it is perhaps because experience led us to the need of establishing them. Thus, a mistake that Thaler and Sunstein may have committed, could be the excessive underscoring of the fact that nudge-type

paternalism is still libertarian. This argument implicitly suggest that paternalism has a negative connotation, paving the way to all the defenders of individual autonomy 'at all costs' for the sake of avoiding a dystopian society.

Furthermore, in a long-term perspective, rather than an infantilisation and "*de-responsibilisation*" (see Bovens, 2009; Selinger, 2011) a potential phenomenon of responsibilisation of the citizens might take place. Speaking ideally, in a long-term perspective, living in a nudge-based society where all cafeterias adopt a choice architecture that favour healthy food, where all the nations have a default rule to organ donation, and say, where all public spaces nudge against smoking… Then people might develop a habituation for a series of good practices. Humans often act out of habit, through an automatic repetition of past behaviour with little regard to their current goals. Habits are behavioural responses cued by the environment, that are activated in daily life, in response to time pressure, ego-depletion, distraction, and so forth (Wood and Neal, 2009). Habits are learned and stored through repetition and experience and persist even in the absence of conscious motivation (see Neal et al. 2006; Riet, 2011). Thus, rather than infantilised individuals there might be a potential for the development of a higher degree of individual responsibility. In the same way that parents teach their children the behaviours and practices that are good for them, supporting the development of appropriate habits, choice architects can guide people towards the best path. Nudge interventions may promote habit formation, as the repetition of an action due to the constant exposure to a nudge may lead to learning outcomes (Neal et al., 2006). However, this discourse is also an abstraction and a merely hypothetical scenario: it is improbable that nudging will become so widespread to incorporate most of the environments and decision-making settings of our societies. The application of BE and choice architecture in public policy is still in its infancy, interventions have been modest, and claims of patronising interventions (e.g. such as dubbing the UK a 'nudgeocracy', see Whitehead et al., 2012) are excessive in the context of real-world implementation. More importantly, as also Mills (2013) points put, nudging is not so robust to be considered a tool able to bring about genuine transformation in society. In fact, nudges do not establish nor meaningfully alter existing moral or social norms. Nudges can play a small role in tackling many societal issues and support policy-makers in the design of policies.

As Guala and Mittone (2015) point out, choice architects attempt to eliminate biases from behaviours that not only impact on the individual, but also create externalities. For instance, it is established that unhealthy food consumption has negative effects on individual health, but this has

also an impact on a larger societal scale. Negative externalities that derive from poor nutritional behaviour are not simple to quantify, since a variety of interwoven elements come into play. Overweight and obesity can lead to different health conditions, forcing the person to seek medical support and treatment. The issue here is clearly that the costs of a person's poor dietary choices determines costs to the health cate system. A study conducted by Atella et al. (2014) shows that the cost of obesity in Italy is in line with the estimates of studies conducted in other countries (e.g. Tsai et al. 2011; Cawley et al., 2012; Bahia et al., 2012), showing that total health expenditure for overweight individuals is about 4% higher than the expenditure for normal weight individuals; whereas for obese, severely obese and very severely obese, the spending increases, respectively, 18%, 40% and 51% compared to normal weight. Furthermore, the study measured what are the diseases related to obesity and how they affect the total health expenditure: most of the costs can be attributed to three widespread chronic diseases: hypertension, type 2 diabetes and cardiovascular disease. Overall, at the net of the hospital expenditure, in Italy only obesity has an impact of around 2.5 billion euros a year.

Furthermore, indirect costs (due to premature deaths, reduced work productivity and relative lower income), even if they are more difficult to quantify in financial terms, must also be considered among the costs attributable to obesity (reference). For instance, illness may force the person to be absent from work or go on disability, which means a lower productivity of the workforce. Premature death also has a cost in terms of hospital care, as well as costs in terms of reduced well-being and psychological pain from the family's part deriving from the loss of a loved one, which can have enduring effects on the individuals (e.g. take for instance the premature loss of a parent that has young children). Obesity determines a faster process of aging of the human organism: Fontaine et al. (2003), showed that the reduction of life of a severely obese young male can reach 22% of his life expectancy, equivalent to a premature death of about 13 years. According to Sassi (2010), overweight increases the risk of premature death by about 30% for every 15 kg of additional body weight, due to the development of chronic diseases and a wide range of tumors. Other intangible costs include for instance lower academic performance, job discrimination, psychosocial problems and poor quality of life. For instance, obese children are more exposed to psychosocial problems, as they are prone to social stigmatization and exclusion, resulting in lower self-esteem, a greater risk of abandoning school, lower academic performance, reduced occupational stability and lower income (Gortmaker et al., 1993).

According to Guala and Mittone (2015) the existence of these externalities, explain why nudges should be more properly justified from a political, rather than a welfaristic standpoint. The authors argue that preferences should not be such a matter of concern, as a fundamental reason why nudges should be in place is that they help to prevent future negative consequences that will affect our children and the children of others. A political justification of nudging is closely connected to a moral perspective: nudges are necessary because the consequences of irresponsible behaviour are often, because of social ties or ethic principles, shared by others. This is the case of children that once adults, have to economically support and take care of their parents that did not save and have lost their fortune, or that lay ill in hospital after years of heavy smoking: the children of these parents are likely to feel morally obliged to look after them. In the author's (ibid.) example, let's say that Europe in one decade will be plagued by an obesity epidemic. As previously explained, an initially private behaviour of many citizens could turn into a monumental social problem; and because the European mentality is that everybody is entitled to cures as public healthcare is a strongly established institution, people would feel that it is a moral duty to cure and support all those who are ill. In this scenario, nudges to steer people toward a healthy nutrition, could have prevented this situation, preventing the larger majority from feeling morally obliged to share the costs of other's poor nutritional choices. Hence, because nudge policies confront issues in a less intrusive manner than traditional methods, they should be accepted and employed in all the occasions that require them, to prevent future costs to be shared by the adults of the future and allowing the creation of an improved society. Therefore, the label 'libertarian paternalism' should be avoided, as it seems uncapable to express the core reasons why choice architects should be entitled to nudge people towards the optimal behaviour.

Indeed, a fault in Thaler and Sunstein's work was not to provide a clear method to develop and implement nudge strategies by choice architects. In practice, considerable interpretations must be made when designing interventions, about the impact, benefits, and ethical acceptability of a nudge. For instance, Blumenthal-Barby and Burroughs (2012) developed an ethical framework for the responsible management of different types of nudges (see Table 4), by identifying the most ethically relevant dimensions to ensure an appropriate use of each principle.

Nudge	Ethically relevant considerations
Incentives	- The amount and kind of incentives used. - Whether the incentive plan will disadvantage those most in need or result in the group that fails to meet criteria for receipt being treated unfairly (e.g., cost-shifting to those who fail, leaving those who fail by the wayside). - Whether the incentive plan will harm the patient–physician relationship (e.g., through actual or perceived monitoring). - Whether the incentive is fairly directed (e.g., at patients as opposed to or in addition to their physicians if the patients themselves are the ones who improved their health).
Defaults	- Whether people are aware of the existence of the default and whether it is fairly easy for people to opt out. - Whether the expected benefits of the default outweigh any anticipated harms, where harm is construed not just physically but also psychologically, socially, and financially. - Whether there are injustices or harms brought about to vulnerable or marginalized populations by the default (e.g., presumed consent for organ donation exploits the homeless who do not have easy opportunities to opt out/dissent) and whether attempts have been made to mitigate those effects.
Salience and affect	- Whether what is being represented saliently is true and accurate, as opposed to exaggerated or misrepresented. - Whether the use of salience and affect techniques will be perceived negatively by those it is directed toward. - Whether bypassing people's capacity for reason is done for good ends (e.g., not selfish ones) and for good reasons (e.g., people are harming themselves). - Whether there is a justification for using salience and affect instead of rational argument.
Norms and messenger	- Whether the information about what "most people are doing" is true and accurate. - Whether the use of comparisons and norms will do more good than harm because "what most people do" is often unwise. - Whether the power differentials between messenger and recipient have been considered.
Priming	- Whether it is fairly easy for people to go in a direction other than the one in which they are primed. - Whether subconscious priming is done for good and evidence-based ends. - Whether there is a justification for using subconscious priming instead of rational argument.

Table 4. Summary of ethical concerns identified per each typology of nudge (Blumenthal-Barby and Burroughs,

Finally, if a more nuanced view is required in the ethical debate on nudging, a relevant contribution can be found in the analysis carried out by Hansen and Jespersen (2015). The Danish authors argue that Thaler and Sunstein do not sufficiently address the responsibility of policy-makers in charge of intentionally designing interventions to change behaviours. Rawls' Publicity Principle is deficient in that it does not guarantee legitimacy in the manipulation of people's choices. Hence, after reviewing both sides of the dispute, they propose a third way to conceptualise choice architecture and nudging. The authors develop a distinction among transparent and non-transparent nudges, namely between non-manipulative forms to others, resulting in a framework of four main typologies of nudges. The argument of Hansen and Jespersen (2015) can be summarised by

following three main points. In the first place, the authors acknowledge that the feature of intentionality in choice architecture interventions ascribe responsibility to policy-makers, an issue which is insufficiently considered by Thaler and Sunstein who minimise the question observing that nudges preserve liberty of choice. Secondly, and related to the first point, the authors contest the assumption that choice architecture is inescapable and that a neutral decision-making context does not exist, by deeming this premise "an attractive line of defence" (2015: p. 10). In fact, there is a distinction to be made between a context that influences behaviour accidentally and a context designed to intentionally influence behaviour. Overlooking such a distinction means to discard the concept of responsibility. In the third place, the authors argue that the characterisation of nudging as a manipulation of choice is a simplification since nudges are not necessarily about influencing choice. Hansen and Jespersen (2015) distinguish two typologies of nudge, that both aim at influencing the automatic, intuitive system:

- **Type 1** nudges are meant to influence those behaviours that are guided by the automatic system, and do not involve any reflective thinking. An example is the manipulation of plate or utensils size in a lunchroom, or footprints to guide people towards recycle bins.
- **Type 2** nudges are meant to impact on attention and deliberate choices by influencing the automatic system. An example would be framing, or Amsterdam's fly in the urinal to direct deliberate attention.

Evidently, while type 1 nudges involve only the intuitive system and no deliberation or choice, type 2 nudges concern behaviours that involve deliberation, judgement, and choice. Thus, it is plausible to conclude that it is imprecise to state that nudges always entail a manipulation of choice. Furthermore, to account for the ethical dimension of nudges, the researchers adopt an epistemic dimension to evaluate when a nudge involves a manipulation:

- **Transparent nudges** are such when the person can easily identify the intention behind, and the aims that are pursued.
- **Non-transparent nudges** are those in which the person is not able to recognize the intention or the expected behavioural change.

Given the definition of type 1 vs. type 2 nudges, and transparent vs. non-transparent nudges, it is possible to create a matrix (Table 5) to guide responsible choice architects in the development of the interventions:

	Transparent	Non-transparent
System 2	Transparent, facilitation of choice	Manipulation of choice
System 1	Transparent influence and manipulation of behaviour	Non-transparent, manipulation of behaviour

Table 5. Summary of typologies of nudges in Hansen and Jespersen, 2015.

Finally, Figure 13 illustrates the combination of the four dimensions and positions a variety of nudges available in the literature in the four axes. Indeed, there may be some grey areas and difficulties in precisely locating all the nudges due to their peculiar nature, however the matrix proves to be a useful tool for future guidance.

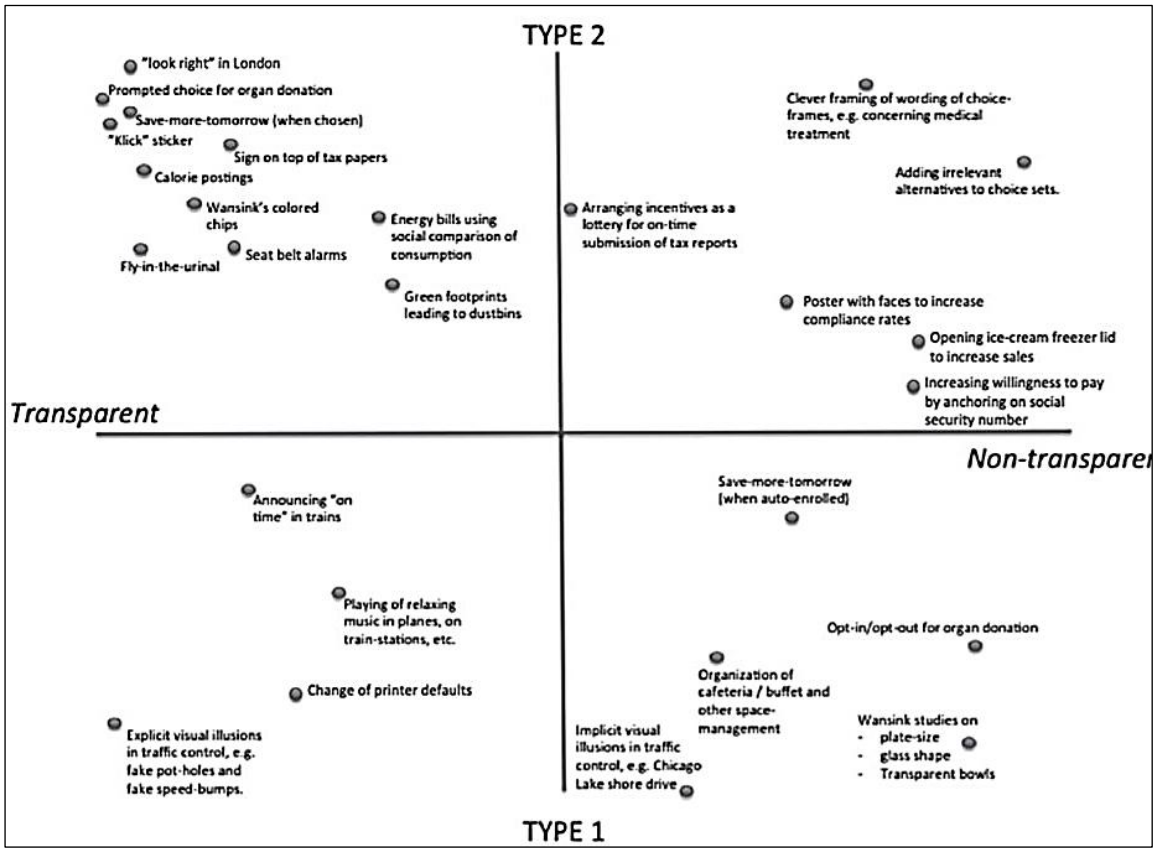


Figure 13. The four nudge dimensions (in Hansen and Jespersen, 2015).

2.4 Conclusions

Even today, it is tempting to consider humans as rational and reasonable beings, who logically plan the most functional actions for their interests. Indeed, human beings are greatly skilled and capable of monumental achievements, think about the advances in physics or technology, or to the cultural production. However, as this chapter proposed, human behaviour is also susceptible of cognitive errors, to the interference of emotions, and of a series of biases that influence perception, judgement, and decision-making.

The next chapter analyses the issue from the perspective of nutrition behaviour. If we assumed that humans were perfectly rational, with limitless cognitive abilities, then conveying calorie information and offering nutrition education would do the job. Instead, many of the daily decisions only consider the reward of the moment, leading to weight gain, which can determine obesity, and a series of related health issues. Truly understanding the nature of human decisions is crucial for interventions in the domain of nutrition, and the sole available option to avoid failure.

3. Automatic and Mindless Food Choices

3.1 Environmental Cues and Food Consumption

> "*Only a limited number of choices are based on conscious information processing strategies. The rest of the variance left to explain is caused by unconscious effects of all kinds of subtle cues in the environment*" (Djieksterhuis et al., 2005: p. 200).

As the previous chapters illustrated, studies in behavioural economics, psychology, neuroscience, consistently demonstrated that human beings often act irrationally, as our choices are also the product of automatic, unconscious processes. Since we cannot fully control our perceptual processes, this entails that we cannot ignore environmental factors, which we are evolutionarily wired to respond to. The motor neurons in our brains automatically transmit information from our senses, enabling us to quickly respond to contextual stimuli, without the need of lingering in conscious deliberation (Libet et al., 1991). When people rely on heuristic reasoning, we function more efficiently, liberating our limited cognitive capacity from the burden of answering to the innumerable stimuli and information around us.

How does these findings relate to eating behaviour? Automaticity is a crucial component of human behaviour, and it appears to be deeply involved in food choices. For instance, a striking paper reported how rapidly consumers can make value-based choices about which product they prefer with above chance accuracy. In study 1, Milosavljevic et al. (2011), first ranked the participant's preferences among 50 snacks and candies, and consequently exposed the subjects with a sequence of random pairs of images of two snacks/candies, each of the duration of 20 milliseconds. The results, obtained through a measure of Minimum Reaction Times (MRT), showed that the subjects were capable of indicating which snacks they preferred from each pair in less than 1/3 of a second (313 ms) and their answers, compared to the previous ranking, were correct in more than 50% of the times (i.e. more than chance). In study 3 and 4, the researchers provided additional computational time to verify the changes in choice accuracy, and the results improved to 73 %, with the average decision being taken in less than half of a second (404 ms). This paper demonstrates that to conduct simple cognitive computations in relation to a food product, consumers are surprisingly fast in identifying their preferred option. The latter study demonstrates

that people can rapidly carry out food choices, without the need for systematic considerations. When such a fast decision-making occurs, people rely on heuristic strategies, such as familiar objects and features like shapes, colours, logos, brands (Cohen and Babey, 2012). Research on eating behaviour amply demonstrates that food consumption decisions often take place automatically, as people eat without carrying out rational considerations regarding the quality or the quantity of food to consume (Wansink, 2004). Classic accounts of consumer behaviour and choice that are rooted in cognitive psychology and posited a conscious elaboration of information when people choose and evaluate an item (see Chaiken, 1980; Petty et al., 1983). Contemporary psychology is now aware that people's choices are often made unconsciously, and that consumer behaviour is particularly predisposed to the influence of environmental cues. For instance, when grocery shopping in a supermarket, many products that end up in our basket are the product of a transitory moment of awareness (e.g. "Oh yes, I need tuna") and often our minds are occupied by other thoughts, such as tomorrow's meeting or our evening date, so much of our buying behaviour may rely on automatic mechanisms and habit. Indeed, the weighting of pros and cons is often required, especially when a product is expensive or important for us, yet at the same time, we are automatically and unconsciously perceiving the environmental stimuli around us. As Cohen and Babey (2012) elucidate, automatic responses often lead to poor food choices and excessive calorie intake. Particularly, because people are inherently cognitively limited, we often cannot recognise or resist the influence of contextual food cues. The situation is worsened by the myriad of opportunities to eat, snack, or drink, offered in the environment. In our consumerist societies, the offer of palatable food is spread everywhere, in almost any context, and this encourages repeated decisions about *what*, *when*, and *how much* to eat (my italic). The situation is worsened by the fact that commonly, when people eat, they do not do it out of genuine hunger. In a study to investigate the correlation between hunger and food consumption, Mattes (1990) invited the subjects to write a food diary to take note of their level on hunger during different times of the day. The study revealed a lack of correlation between actual hunger and eating behaviour. In fact, people ate even when their level of hunger was low. This leads to the conclusion that people eat also without necessarily experiencing hunger, and another research suggested that people often stop eating only when they feel physically full but also physically uncomfortable (Poothullil, 2002).

As Chance et al. (2014) elucidate, making healthy food choices is particularly difficult, as many factors challenge the individual. These choices forcibly generate compromises between present

benefits that are certain and immediate, and future potential costs that are indeterminate and distant. Actively choosing to prevent future costs is difficult, because System 1 responds to immediate pleasure generating a sensation of craving. To maintain one's healthy purposes, System 2 needs to be engaged, and an act of self-control makes the decision-making process more effortful (ibid.). It is typically when a person is hungry or in a condition of depletion (Baumeister et al., 1998) that System 1 prevails on conscious deliberation. Many behaviours are often impulsive or guided by the heat-of-the-moment. Present-biased preference is the propensity to assign greater weight to the temporary fulfilment of a desire, discounting future costs and benefits (see Ainsle, 1975; Frederick et. al., 2002; O'Donohogue and Rabin, 2000). For instance, when one recognises the necessity to diet for a certain period, the deliberate intention may periodically fail when self-control issues, hunger, or attractive food lead the person towards indulgence, violating one's own desired behaviour. In this way, a person 'forgets' to behave accordingly to self-interest, guided by the lure of a momentary gratification. The environmental availability of unhealthy, calorie-dense, tasty food is likely to influence the person towards the fulfilment of an immediate pleasure, and the optimism bias worsens the situation (Buehler et al., 1994). This bias can lead the person towards false predictions that entail an underestimation of the present costs and an overestimation of one's future ability to control behaviour (ibid.). This occurs for instance when we say that we will begin our healthy diet from 'tomorrow'. The consumption of unhealthy food carries a considerable cost when this behaviour is regularly repeated. Thus, because the long-term consequences of poor food decisions are treated as negligible, people are inclined to undervalue these costs because they fail to aggregate the episodes of consumption, by considering each episode as separate (Kyrby and Guastello, 2001). Finally, the habitual nature of food decisions is a fundamental element to bear in mind: when a frequent action has become encoded in memory and represents a context-specific response, it can be triggered automatically by the environment (Wood and Neal, 2007 and 2009). This might be a barrier especially for those who are habituated to consume unhealthy food options.

Before the 1960s, it was commonly acknowledged that food intake regulation occurred through physical indicators of satiation, which gave the indication of 'feeling full'. In the last decades, researchers challenged this assumption, by identifying a set of variables that influence individual consumption, ranging from cultural features (e.g. Rozin, 1996), social influence (e.g. Herman et al., 2003), environmental cues (e.g. Wansink, 2004), and the toxic impact of the food industry (e.g.

Brownell and Horgen, 2004). Leaving the domain of scientific literature, people on the other hand, tend to explain their food consumption levels based on personal assumptions, with some focusing on internal factors such as hunger regulation, while others pay attention to portions, and still others explain behaviour in terms of self-control or free will. In these cases, people ignore any kind of social, cultural or environmental influence. Given the frequency of food-related decision-making, it is paramount to: (1) investigate and understand how these decisions occur by taking into account the intrinsic nature of cognitive limitation and the presence of automatic processes; and (2) to develop effective strategies to be implemented to promote and support people towards healthy nutrition behaviours. For researchers, it is crucial to redirect attention on the environmental processes that impact food consumption, to raise the profile of research and deepen the knowledge in this domain. This entails offering crucial information for health professionals, to highlight how minor structural changes in the environment can support the reduction of the unknowing (and often unwilling) overconsumption of food. The following section is based on the studies conducted by Brian Wansink, an academic who provided outstanding research in the investigation of the relation between eating behaviour and environmental cues.

3.1.1. Wansink's studies on eating behaviour and environmental cues

How does the food environment influence consumption, and how is it possible to nudge people towards the optimal choice for their personal well-being? Eating behaviour is a unique context characterised by specific features, as people respond to food cues in manners that are different from other environmental cues. It is important to dig into this specificity and to debunk myths such as 'people know the quantity of food they want to consume' or 'people know when they are satiated' (Wansink et al., 2009). Since the 1960s, academics have been busy classifying a variety of relevant factors linked with food consumption. Wansink in particular, focused on the development of explanatory models of the drivers and variables that impact on food intake volume. While *food choice* decisions determine which food we select, *food volume* decisions determine the amount of food we consume (my italic). Wansink (2004) devoted his studies to look at the environmental influences (such as plate size and shape, package size, variety, or the influence of others) on the less researched area of food consumption volume.

Wansink (2004) divides the environment (see Figure 14) in two spheres: the eating environment includes elements that are independent from the food itself, such as the atmosphere, social interaction, and so on; the food environment instead, includes the elements directly related to the way food is offered, such as its salience, structure, package or portion size. Both environments influence consumption choices and consumption volume; and the two spheres also contribute indirectly by conveying consumption norms and hindering consumption monitoring.

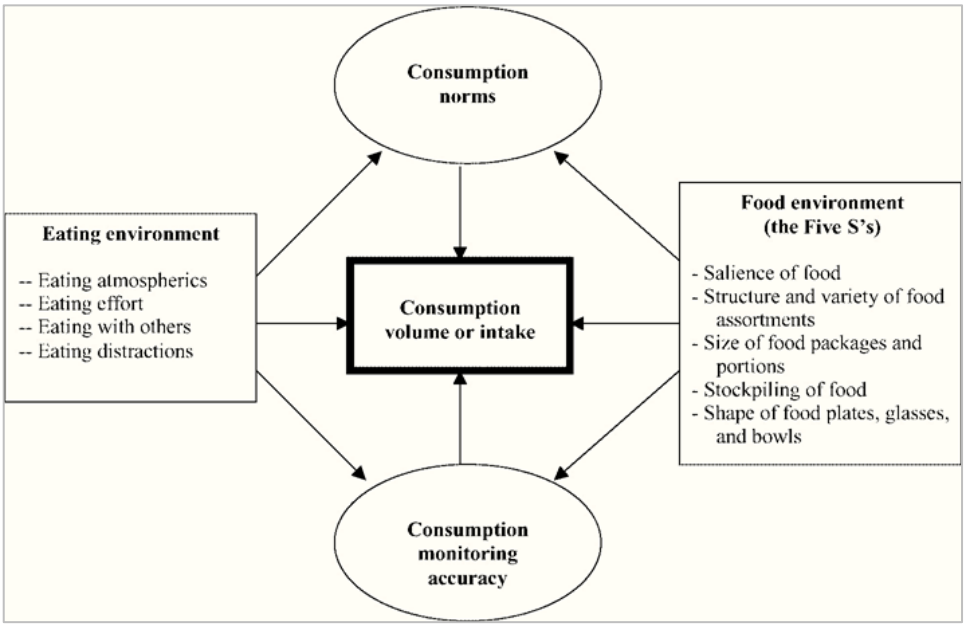


Figure 14. Antecedents and mediators of food consumption volume, in Wansink (2004).

3.1.1.1. The mediators of consumption: consumption norms and consumption monitoring

> "*Consumption norms and consumption monitoring partially mediate or explain why many seemingly unrelated environmental factors consistently influence eating behaviour in predictable ways*" (Wansink, 2004: p. 458)

According to Wansink (2010), environmental features have a relevant effect on food-related behaviours because they influence consumption norms and decrease consumption monitoring. Individuals often engage in "mindless eating" (Wansink, 2006), an unconscious process in which people are not aware of the effects of the environment on the quantity consumed of food or beverage. Wansink highlighted two ways in which environmental cues influence consumption, as

schematised in Figure 15: one way is by suggesting the amount of food that is appropriate to consume; the second way is by altering our perception of satiety. The concept of *consumption norms* refers to the fact that the environment around us, tell us how much it is accepted and appropriate to eat (see Blundell et al., 2010). During meals in different settings, our behaviour towards consumption can change, take for instance a meal consumed with a large group of friends, or a formal business meal consumed with a client. But the serving size of a restaurant dish, the use of large portions in grocery stores, or the use of large cooking utensils at home, can also implicitly influence our perception and thereby determine the quantity of food consumed (see Wansink and van Ittersum, 2007). As Wansink (2010) illustrates, all these factors offer a normative benchmark that the person is drawn to conform to. What is more problematic is the fact that the environmental norms that subtly influence the person's consumption norm in a specific situation, may be perceived automatically and unconsciously. Research amply demonstrates that environmental cues outside of conscious awareness can have an impact on behavior (Bargh & Chartrand, 1999), on goal pursuit (Bargh, Gollwitzer, Lee-Chai, Barndollar, & Troetschel, 2001), and on self-regulation (Papies and Hamstra, 2010). As previously pointed out, people mostly do not recognize that environmental features hold an influence upon behaviour, and even if they are made aware of them, they do not accept that such insignificant elements may be influencing them (see Pronin et al., 2007; Wansink and Sobal, 2007).

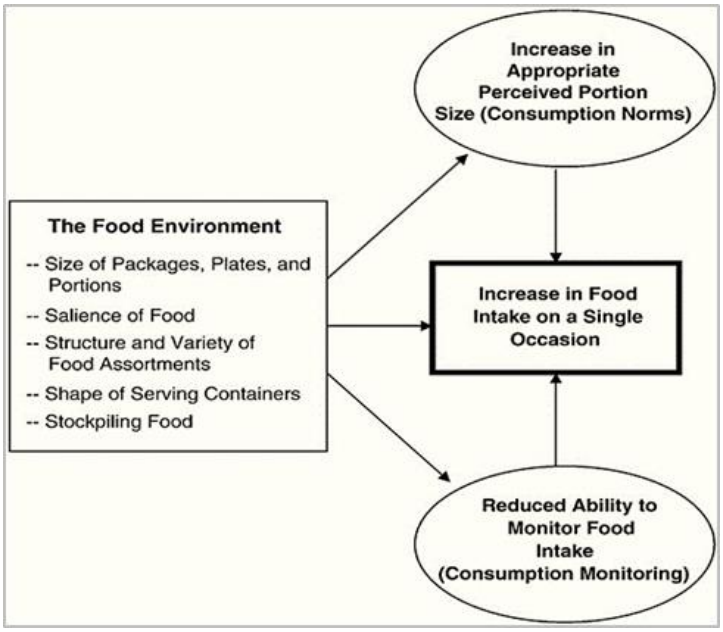


Figure 15. Selected environmental antecedents of consumption volume, in Wansink, 2010.

The concept of *consumption monitoring* refers to the difficulty in estimating the correct number of calories that one is consuming, and in monitoring when one is actually satiated. Generally, eating is a multifaceted behaviour that is difficult to control, and people are particularly biased in contexts with large consumption norms. For instance, Chandon and Wansink (2007) showed that people of all weights, and even dietitians and nurses, are imprecise when it comes to estimate the calories of larger portions, leading to unintended overconsumption. A further bias occurs with the so-called 'health halos' where labels deceptively indicate products as 'healthy' or 'low-fat' leading people to consume these products (Wansink and Chandon, 2006).

To illustrate, I will take the case of portion and package size. Individual perception is influenced by large plates, bowls, glasses, or utensils, increasing food intake. It is established in literature that the size of a package, or the size of portion servings at home and out-of-home settings have a considerable influence on consumption (see for instance Edelman et. al., 1986; Rolls et al., 2003). Interestingly, portion and package size also influence consumption in the case of unpleasant food, as in the experiment of Wansink and Kim (2004). When the researchers offered medium or large-size buckets of 14-day-old popcorn to moviegoers, the subjects ate 33.6% more popcorn from the larger buckets regardless of the dubious taste of the product (Wansink and Kim, 2004). According to Wansink (2004), this detrimental effect (for our BMI) is due to the fact that portion sizes suggest consumption norms (see Fig. 15). Furthermore, serving containers truly create perceptual illusions; this occurs, once again, because these tools implicitly suggest to the person the amount of food that ought to be served and consumed (i.e. consumption norm). In a well-known experiment (Wansink et al., 2005), 54 subjects were assigned to two conditions: (1) subjects who ate from normal soup bowls, and (2) subjects who ate from self-refilling bowls (biased visual cue condition). Participants of the latter condition ate up to 73% more soup than participants eating from a normal bowl. However, these subjects had no perception of consuming more soup, and did not perceive themselves as more satiated. These findings support the assumption that a serving container offers a consumption norm, lessening self-monitoring. Therefore, the presence of accurate visual cues can be a relevant factor for the prevention of unintended overeating.

3.1.1.2. Food intake and the lack of awareness of external influences

Wansink et al. (2008) examined in two laboratory studies the extent to which people recognised the influence of external cues on their behaviour. In study 1, 122 undergraduate female students were paired to watch television together, and some pizza pieces were offered. To control for their hunger level, participants were asked how many hours were passed since their last meal. At the end of the session, subjects were asked to respond to the question "which factor or factors led you to eat as much as you did, and not more or less?". Out of 122 participants, only 3 stated that they were influenced by the quantity of pizza consumed by the other person. Instead, they reported reasons such as hunger, or imminence in time with the other meals. While study 1 was based on the spontaneous ability of the students to report the elements that influenced their food intake, study 2 employed a survey format. Twenty of the participant's responses in study 1 were selected, and added to a questionnaire aimed to explore to what extent students (75 sbj) assigned to the list of specific factors an influence on their food intake. Factors were rated on a 7-point scale (1 no influence, 7 a lot of influence). Before the task of eating, participants were told about the amount eaten by imaginary previous participants, which varied from 4 to 14 cookies. The results showed that without a clear consumption norm concerning the correct amount to eat, participants intensely increased consumption. As in study 1, the students reported that hunger/satiety and taste were the main determinants of intake; also, the subjects did not acknowledge any eventual influence of the information about the quantity consumed by previous participants.
The result of both experiments highlight that subjects did not notice the specific external influences. While failing to recognize them, the subjects generated alternative accounts for their consumption behaviour, particularly common-sense explanations such as internal states of hunger/satiety, taste, and food preferences. Indeed, these factors may be actual influences on food intake, however the fact remains that there are other elements that can influence food intake without the person being aware of it (ibid.).

There is wide consensus in literature (e.g. see Guthrie et al., 2015; Ratner and Riis, 2014) that the common approach of merely engaging in communication activities about nutrition, aimed to increase awareness or to offer information, is disappointingly unproductive in changing people's food choices. In most cases, people are not fully able to report why they made a certain choice, reporting simply that they liked a certain product, or that they were hungry, or that they chose a

specific food because it was healthier. On the contrary, they deny the possibility that environmental features may have influenced their choice (Wansink and Sobal, 2007). Furthermore, people may recognize that environmental features may hold an influence, but on others, not themselves (Pronin et al., 2007). As Wansink stresses (2010), it seems that some of the factors that influence food choices cannot be explained with the classical theories if rational reasoning. Many of the elements that guide our choices occur at a perceptual or preconscious level, and it is at this stage that the sight of food, smells, and the feeling of hunger, influence behaviour more than rational considerations. In a nutshell, "For many individuals, determining how much to eat or drink is a mundane and relatively low-involvement behaviour that is a nuisance to monitor continually and accurately" (Wansink and Sobal, 2007: p.108). This means that people instead count on environmental cues or norms to determine the food to select and the appropriate amount of food to eat. Evidence has been primarily gathered through artificial laboratory experiments; however, in order to generalize the results, these processes should be observed in real-life settings. This is what Wansink and Sobal (2007) have done, conducting two studies to investigate the process of consumption monitoring and the effect of consumption norms in natural contexts, to understand to what extent we efficiently monitor our food consumption. Study 1 provided a first investigation on the number of food-related decisions a person makes in one day, compared to the number of food decisions a person believe to make in one day. In average, the participants (139 sbj) estimated a number of 15 food and beverage decisions made per day. However, after more interrogation and further reflection from the participants, the researchers aggregated the total number of decisions and found an average of 219 decisions made in one day. The research offers evidence that people severely underestimate the number of food-related decisions, and this result is discouraging given the interests we all have in accurately monitoring our food intake. Study 2 investigated the awareness of participants of overconsuming, and of the impact of environmental cues on overconsumption. The study was based on the content-analysis of seven controlled field studies, in which 749 participants were randomly assigned either to the control group or to a treatment condition that involved exaggerated environmental cues. In the treatment group, the researchers investigated the impact of cues such as large size bowls, spoons, and glasses. In the treatment group, the average increase in consumption was 31%, nonetheless, about 73% of the subjects did not have the perception of eating more than usual. Even when the researchers explained to participants the impact of the environmental cues, 52% still denied that they had eaten more, while

31% said that if they did eat more, it happened because they were hungry. Only 2% of the participants acknowledged the plausible influence of the specific environmental cue that had been employed. It is interesting to note that participants were not aware, or not willing to admit, their susceptibility to the food environment manipulations. This is in line with research that illustrates the presence of flawed self-assessments, the bias to be overconfident, and the overestimation o personal capabilities (see Dunning 2005).

Figure 16. Wansink and Sobal (2007).

In the majority of the cases, when participants are questioned after an experiment, few identify that environmental features may have influenced their consumption behaviour. Most people fervently refute that other elements than their personal preferences influenced their behaviour, even when provided with clear evidence (Pronin et al., 2007; Wansink and Sobal, 2007; Vartanian et al., 2008). Indeed, people generally lack the capacity and the knowledge to evaluate the hidden causes that influenced their decision-making process (Wansink and Chandon, 2014). As outlined in chapter 1, the mental forces at work are mostly unavailable to our consciousness (Kahneman, 2011; Wilson and Nisbett, 1978). When humans carry out rapid decisions, they frequently create a reasonable explanation for their behaviour and choice, which may be correct at times, but not always (Wilson and Nisbett, 1978). The habitual and repetitive nature of nutrition, the speediness with which humans are able to take decisions, and the limited cognitive resources that lead to states of cognitive depletion and loss of self-control, reveal the difficulty in consistently carrying out the optimal food choices (see Levitsky, 2005; Levitsky et al., 2005). Studies also demonstrated that people on a diet, worried on having to pay scrupulous attention to their food choices, developed problems in executive control and functioning because of this burdening activity (see Bryan and Tiggeman, 2001; Vreugdenburg et al., 2003). The issue of food consumption is complex, and solutions need to be found to address human's inherent difficulty in monitoring food choices, and most importantly to eat healthily.

3.2 Nudging: using environmental cues to improve food decisions

For the aims of the present dissertation, it is important to determine the impact of nudge initiatives in the domain of nutrition. Hollands et al. (2013) grouped research evidence on choice architecture interventions aimed at altering the environment of shops, restaurants and workplaces to cue health behaviour. The result of their study evidenced that most of the research has been conducted in the domain of nutrition (70% of the studies). Arno and Thomas (2016) built on the preliminary study of Holland et al. (2013), completing a meta-analysis on the outcomes of the 42 studies identified in that paper. Their work provides one of the most comprehensive meta-analyses to form an evidence base on the impact of nudging in the domain of healthy nutritional choices. The population of the assessed studies was comprised of adults only (i.e. from 18 years to 65 years); they include both men and women; and were not focused on a subset (e.g. obese people, diabetics, etc.) but on the generic population. The results of the analysis demonstrate that globally, nudge interventions positively increase healthy nutritional behaviour. On average, nudges determine a 15.3 % increase in healthier food consumption choices, as measured by choice frequency or by total intake (Arno and Thomas, 2016). The results of the review are showed in Figure 17. Indeed, even though the review assessed a significant amount of data, the evidence would be reinforced with the addition of further experimental results. The literature could take advantage from the replication of choice architecture initiatives on broader populations and in additional cultural contexts, which is one of the contributions of this research project.

In a review on the role of contextual influences on eating behaviours, Cohen and Babey (2012) illustrate a selection of environmental cues that influence dietary choices in away-from-home food settings (i.e. restaurants, lunchrooms). These settings are especially relevant, because in these situations food choices are generally more rapid and prone to the influence of heuristic processes, as people are influenced by the variety of stimuli in the environment. Particularly, the researchers listed the set of environmental cues that are most common in the literature on out-of-home dietary behaviour: menus and signboards, menu calorie labelling, other nutritional labelling schemes, order of presentation, portion sizes, variety, pricing, accessibility, music, waitress behaviour, and health rating systems (ibid.). To illustrate, some examples of nudges developed to deal with these external variables are provided here.

Dayan and Bar-Hillel's (2011) belief that nudging interventions can be a useful tool for dealing with the growing problem of obesity, led them to study the effect of positioning in a menu. The researchers conducted two studies to investigate whether the order in which foods are presented in a menu affects people's choices.

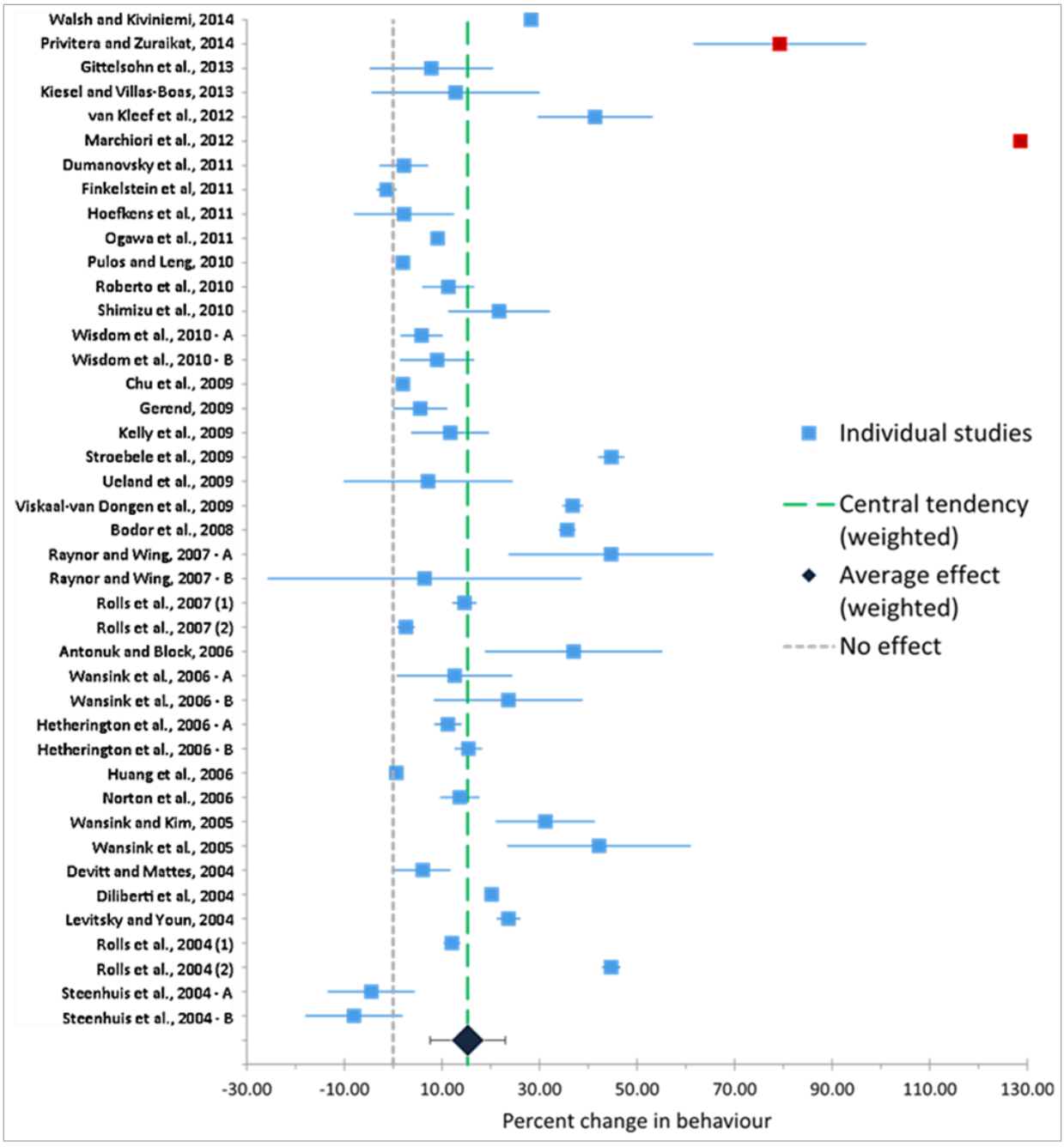


Figure 17. Meta-analysis of the impact of nudging strategies in the domain of healthy food choices (Arno and Thomas, 2016).

Their hypothesis posited that the options at the beginning and at the end of a menu are remembered more easily and increase the choice of these items. In study 1, based in the University campus, the menu consisted of four categories: cocktails; appetizers; alcohol free drinks; and desserts. The authors proposed four different menu versions, which differed only in the order in which the items were presented within the categories. The prices were not shown, and since the menu categories were only four, not all items covered each position in their category. However, arrangements were made so that in each menu, the first and last position of each category was always covered by a different item. Participants were given a menu and were simply asked to choose an item from each category. In study 2, the experiment involved real customers inside a café in Tel-Aviv. In this case the prices were shown, and the study was based on three categories: coffee with alcohol; soft drinks; and desserts. Two menus were presented (the original menu; and two variations) that differed only in the disposition of the items within the three categories. Only one type of menu was offered each day, and each was tested for fifteen days. In both experiments, the researchers found that the popularity of an item increased at least by 15% when it was positioned at the beginning or at the end of its category (Figures 18 and 19). The authors, through the experiment, conclude that food order in a menu affects choices. This experiment is useful for choice architects that want to guide people towards the selection of the healthier items which should be presented at the beginning or at the end of their category.

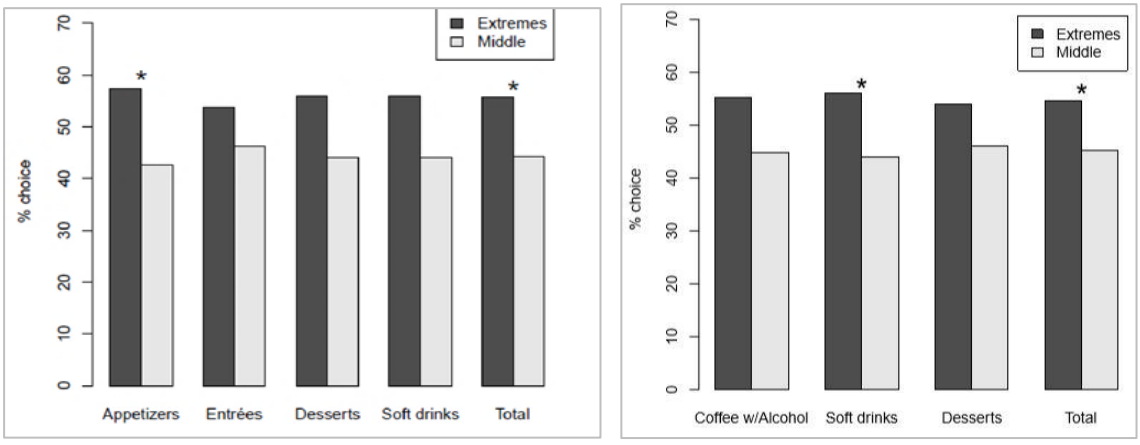


Figure 18 and Figure 19. The mean percent of choices made when an item was on the top or bottom vs. in the middle of its food category.

Another experiment investigated order effects. To understand how to guide consumers towards the healthier food options, Wansink and Hanks (2013), conducted a field experiment to investigate

how the food presentation in a buffet influences people's food selection. Two different breakfast buffet lines were arranged in opposite orders: one offered the healthiest food first (fruit, low-fat yogurt, low-fat granola), the other displayed the least healthy food first (cheesy eggs, bacon, potatoes). The results revealed that people were biased by the different presentation of food: more than 75% of diners chose the first food displayed in each line. Interestingly, another effect was observed, as people in the least healthy food first line selected more total food choices, boosting the calorie content of their plates. When eggs, bacon and potatoes were offered first, 66.2% diners also served themselves fruit, yogurt, or granola; whereas when fruit was offered first, only 39% of diners also chose eggs, potatoes, or bacon. This paper illustrate what Wansink calls the ''first foods most'' principle, as people is more likely to choose what they see first. Secondly, the food order also influenced successive choices, as people indulged selecting additional food products, particularly those products that are more appetizing. Therefore, a choice architecture intervention that simple entails the presentation of healthier food first seems to be a low-cost and potentially promising strategy.

A final example is the study conducted by Schwartz et al. (2012), whose research in a fast-food restaurant had the purpose of activating people's self-control by nudging towards the choice of smaller portions, reducing calorie intake. Evidence suggests, as previously illustrated (Wansink and Sobal, 2007), that people tend to overconsume because they eat "mindlessly"; moreover, when people rely on visual cues such as the amount of food on a plate, their perception of portion is biased. Behavioural economics tells us that environments can be altered to facilitate self-control and activate healthier behaviour. In their pilot study, Schwartz et al. (2012) noticed that customers perceived restaurant portions to be too abundant. People reported that if they were offered the option to select smaller portions, they would prefer them. Therefore, the authors conducted three experimental studies to test whether it was true that individuals would accept smaller food portions. In the experiments, the customers who ordered high calorie dishes (400+ calories) were invited to take only half a portion and informed that, by doing so, they would reduce the caloric intake by half. In study 1, during the baseline phase, when it was not explicitly proposed, only 1% of the restaurant customers spontaneously asked a reduced portion of food. Instead, in the offer phase, 33% of customers accepted a reduced portion of food. The nudge that presented customers with an opportunity to exercise self-control by reducing portion sizes was successful. In a second offer phase, researchers tested whether a discount of 25 cents for a downsized portion could also be an

effective strategy. However, the discount did not encourage customers towards portion reduction. Researchers also monitored if those who downsized their portion compensate by choosing other higher-calorie entrées. This effect did not occur, and downsizing led to a decrease in total calorie intake, approximately 100 (ibid.).

The following sections focus specifically on salience and labelling, illustrating the most prominent research experiments carried out involving alterations to the food environment. Some of these studies were conducted in laboratory, but mostly in field settings, especially lunchrooms. This evidence provided the basis for the development of the empirical study developed for the present research project.

3.2.1. Salience

To understand why salience and priming are effective nudging strategies, a fundamental concept in the domain of intuitive thinking needs first to be illustrated: the **accessibility dimension**. As Kahneman (2003) explains, a core feature of System 1 is that many intuitive thoughts and ideas arise automatically and effortlessly. The reason why some contents arise in the mind more easily is because they are more accessible. Both cognitive mechanisms and environmental cues are the determinants of the degree of accessibility of a thought or stimulus (ibid.). Some features called natural assessments (see Tversky and Kahneman, 1983) are regularly and repeatedly recorded by System 1 or by the perceptual system without any awareness nor intention from the person. In a specific environment, the term accessibility refers to diverse features in an environment, such as the objects that are present and their different attributes that can be more or less accessible. The accessibility of an object or stimulus is determined by the process of selective attention, by priming (Bargh et al., 2001; Kahneman, 2011), by physical salience (e.g. properties such as such as size, distance, brightness, variety), by similarity (e.g., Tversky and Kahneman, 1983), causal inclination (Kahneman and Varey, 1990), affective valence (e.g., Zajonc, 1980; Bargh, 1994; Slovic et al., 2002), and mood (Schwarz and Clore, 1983). Evidently, as we can realise from the previous list, there is much knowledge on the determinants of accessibility, however, a general theory of accessibility does not exist. As Kahneman (2003) points out, in the milieu of the research on decision-making, the great usefulness of the concept of accessibility compensates the absence of

a theoretical account. Considering the role of accessibility in the decision-making process of food consumption can be a starting point for the development of effective nudge interventions.

In the domain of eating behaviour, the concept of saliency refers to the accessibility (i.e. convenience, visibility) of food items and their attributes, which can influence consumption. For instance, factors such as availability and the facility of access to high-calorie products have been associated to the risk of an increase in food intake (Brownell, 2005). The mere sight or smell of food can elicit unplanned consumption (Wansink, 2004; Painter et al., 2002). Chandon and Wansink (2002) confirmed through data analysis, laboratory and field studies, that the strategy of stockpiling food products (and thereby increasing their salience) increases consumption. Another study by Cornell et al. (1989) investigated the elements that encourage food craving when people are satiated and not energy depleted. In Study 1, 40 participants were tested under conditions of either hunger or satiety. The subjects were first exposed to pizza or ice cream (the primes), and then offered more of that food to eat. The results showed that also satiated participants consumed pizza or ice cream, and that the mere sight of these palatable foods enhanced their desire for them (self-report data). Faith et al. (2007) published a leading review on different environmental strategies that involved changes to food accessibility aimed at decreasing food intake. The studies in this review generally focused on healthy food, since the consumption of fruit and vegetables (and other healthy food items) is the core of a healthy diet, and the first step towards the reduction of overweight and obesity (see chapter 4.1.). Different dimensions of accessibility were evaluated in the review: the role of access to transport to reach retailers; the degree of variety of specific foods; the extent to which a product is ready to eat; and the spatial distance to food. The authors concluded overall that in the context of this wider spatial distance, the ease of access to healthy food holds an influence on food purchases, which is likely to influence food intake and weight.

While a focus on healthy food items is fundamental, the same is true for high-calorie, unhealthy food options. Therefore, researchers investigated whether increasing the **physical distance** from unhealthy products could be a promising strategy to decrease their consumption. For instance, a study by Painter et al. (2002) involving adult employees, evaluated the influence of visibility and spatial distance on the consumption of a bowl of chocolate candies. The study involved a three-week condition: in the first week, the candy bowl was located on a visible and accessible location on the top of a desk; the second week the bowl was placed in the desk's drawer, where it was accessible but not visible; finally, the bowl was placed at a two-meters distance on a shelf, so the

subject needed to actively stand up and reach for the candy. The results demonstrate that convenience and visibility influenced consumption (Figure 20). When the candies were on the desk, participants ate 2.9 more candies compared to the participants who had the container in the drawer, and 5.6 more than the subjects whose bowls was on the shelf. Following the experiment, the subjects were asked to estimate their consumption of candies when the bowl was in each of the three placements. Interestingly, when the candy bowl was in the desk people overestimated their consumption, while they underestimated it when the bowl was inconveniently located on the shelf.

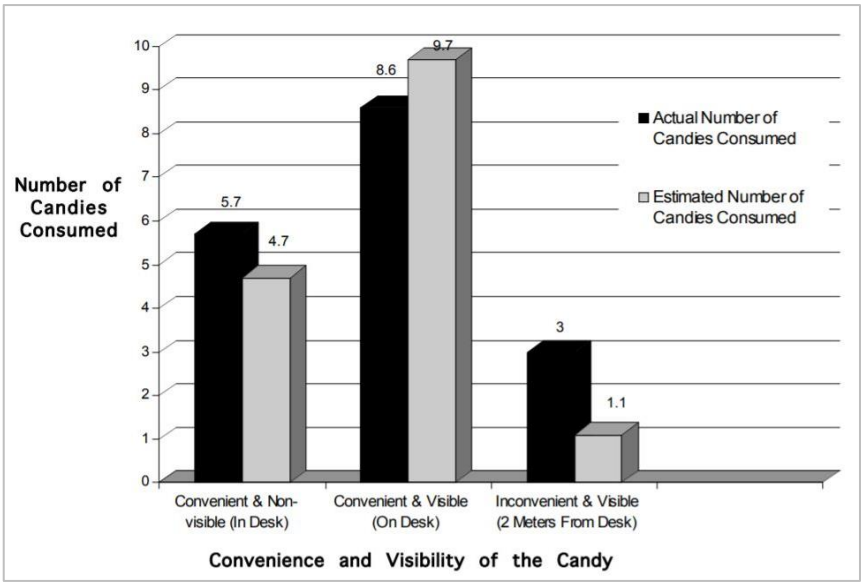


Figure 20. Differences in actual and estimated number of candy consumption among different locations of a candy container (Painter, Wansink and Hieggelke, 2002).

In another laboratory experiment, Maas et al. (2012) assessed the effects of the physical distance (i.e. accessibility) on the intake of unhealthy snacks. The researchers manipulated the accessibility of food options, by placing healthy products distant from unhealthy choices and - in accordance to the previous studies - they found that increasing the distance of unhealthy products reduced the probability that these products were selected. The visibility of food items on a "tablescape" (Sobal and Wansink, 2007) facilitates consumption because they attract attention and provide signals to eat. The salience of food increase when it is visible in a room, influencing potential consumers; at the same time no other cues that act as stopping signals to the consumption process are available (ibid.) Two main effects are responsible for the effect of distance: the physical dimension and the psychological dimension of distance (Maas et al., 2012). The physical dimension refers to spatial

distance, and it is plausible that larger distances are cognitively perceived by people as more effortful. When items are located at a greater distance rather that nearby and easy to reach, people may be less motivated to look for the object, and the probability that the person selects the item decrease. Secondly, distance may influence the consumption of unhealthy food items also because those tempting items become less salient from a psychological point of view (ibid.). Psychological distance entails a distancing between the person and the object, therefore the self perceives the object and its properties in a more abstract, less vivid way. A higher psychological distance from unhealthy products can be a tactic to facilitate a process of 'cooling down' that enables the person to avoid the temptation (Metcalfe and Mischel, 1999).

Convenience is a strong environmental factor that influences food choice: if a food item is easy to reach, if it is already prepared, or if it is easy to grab and eat, people are more likely to choose it rather than if they have to use extra time or effort to obtain it. Convenience can take many forms. Hanks et al. (2012) conducted a four-month experiment (8 control weeks and 8 experimental weeks) to test the effects of changes in convenience in a lunchroom. The cafeteria originally had two lines to purchase food; the researchers for the experiment left one of the two lines unaltered (standard line) and transformed the second line into the 'convenience line'. At the convenience line students could pay only for the healthier food options: salad, sandwiches, and fruit. The purpose of the experiment was obviously to make healthier foods choices less costly. The authors evaluated both the choice of the food items, as well as the actual intake. The researchers found that after introducing the convenience line, the number of healthier foods choices increased by 18.8%. However, there is a substantial difference between the chosen food and the food being consumed: the increase in healthier food consumption after the introduction of the convenience line was approximately 0%. On the other hand, less healthy food consumption had dropped dramatically by 27.9%. When the convenience line was introduced in the canteen, students chose a greater amount of food and increased the choice of healthier foods. However, the food chosen was not actually consumed, but mostly wasted. Convenience, therefore, seems to push people towards the choice of healthier food options, but food preferences may be responsible for actual consumption. On the bright side, providing students with healthier food, may increase the degree of familiarity with healthier food options. Furthermore, while the intervention did not lead to an increase in the

actual healthier food consumption, it led to a relevant reduction in the consumption of less healthy items.

Hanks et al. (2013b) conducted further research in high school lunchrooms to test the total makeover impact of nudge interventions that targeted fruits and vegetables. Multiple nudges (i.e. convenience, visual salience, verbal prompts) were simultaneously activated. First, one of the two serving lines was transformed into a 'healthy convenience line' for healthier sandwiches and fruits and vegetables; salad was presented in single portions in transparent plastic; and fruit was offered in a basket near the cash register. Secondly, signage was increased by the display in the menu the images of the food items in the lunch menu; the sign "Last Chance for Fruit" was added to the fruit basket; and staff employed verbal prompts to recommend fruits and vegetables. Finally, the lunch line was altered to be more attractive by placing colourful linens under the pile of trays and removing the garbage bins from the service area. Data was collected recording tray waste for each student, and researchers marked whether the target food items were 'not eaten at all', 'half eaten' or 'completely eaten'. The researchers found that with the total makeover, 13.4% of the students were more likely to select fruit, and 23% were more likely to select vegetables. More specifically, the intervention increased the probability that students consumed at least half portion of fruit by 18% and vegetables by 25%; furthermore, students were 10% more likely to consume the whole portion of fruit and 16% more likely to consume the whole portion of vegetables. Thus, the overall choice architecture successfully nudged students towards healthier food choices.

It is striking to see how small changes may unknowingly affect individual choices. Rozin et al. (2011), started from the premise that a higher accessibility of low-calorie food along with a lower accessibility of high-calorie food could lead to significant weight loss over a prolonged period. Over a three-years period, they conducted four studies in a cafeteria, ranging from different questions in relation to customers' purchasing choices. In each study, the average consumption of the food items was monitored. In study 1, the researchers investigated whether the proximity of food affects the quantity selected. They compared the selection of food items placed either at the middle of the more unavailable row, with the selection of those that were easily accessible at the edges (Figure 21).

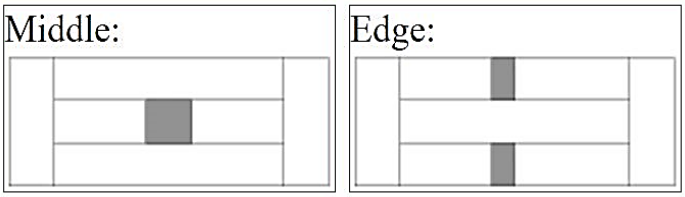


Figure 21. Layout for Study 1 (Rozin et al., 2011).

For two months, the location of eight ingredients - broccoli, cheese, chicken, cucumbers, eggs, mushrooms, olives, tomatoes - were rotated and compared in consideration of each arrangement. The researchers found that when food items were placed in the middle, they were consumed less than if the produce was divided into 2 smaller trays and placed at the central edge lines. More specifically, comparison between positions led to the conclusion that placing food in an unreachable position reduces the average choice of a product by 13.4%, compared to when the same product is placed in an easy to reach position. This result was valid for all ingredients. However, this outcome may depend on the fact that in the second arrangement, food was placed in two trays rather than in one, so customers had more opportunities to reach and select the item. Thus, study 2 (Figure 22) analysed to what extent the opportunity to reach for a food item affects the choice of the product itself. In this second experiment, a food item was placed either on a large tray in a central position or divided in two smaller trays placed at the end of the same row. The results showed that placing the same item in two smaller side trays rather than in a large and central position reduced consumption of that product by an average of 1.13%. Consequently, this result implies that the outcome of the first study did not depend on the double opportunity to select a product, but on the convenience of its positioning.

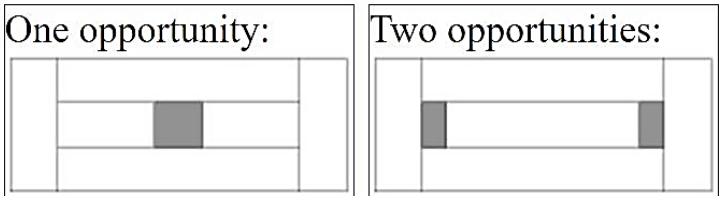


Figure 22. Layout for Study 2 (Rozin et al., 2011).

However, there is still the possibility that, having two convenient accesses and only one inconvenient access influenced the choice of food. Therefore, in Study 3 (Figure 23), food was presented to the customers with two inconvenient positions and one convenient position. The

authors found that the average consumption of all item decreased when food was placed in the middle line, compared to when it was positioned at one of the edge.

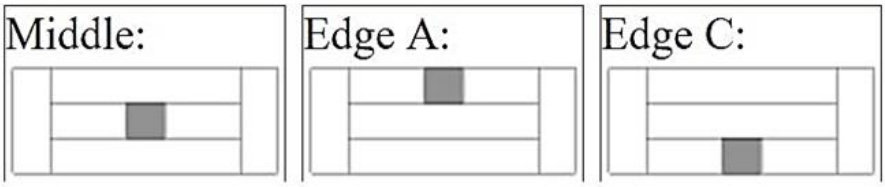


Figure 23. Layout for study 3 (Rozin et al., 2011).

The final study assumed that accessibility is not only a function of proximity. Instead of testing the influence of the diverse positioning, the group tested if the ease of use of a utensil could affect intake, specifically confronting two types of tools, spoons versus tongs. Four types of food were observed: tomatoes, artichoke hearts, cheese cubes, and mandarins. Alternatively, two categories were served with spoons and the others with tongs. All items were consumed less when the tongs were available, 16.5% in average, as these tools are likely to be less handy to use. Finally, the aim of these four experiments was to examine the influence of minimal changes in the accessibility of food in real life contexts. The results suggest that poor food accessibility decreases food consumption, an insight which may have substantial implications for people in terms of weight loss.

Finally, Van Kleef et al. (2012) verified that the effect of increasing the accessibility of healthy snacks located in a shelf near the cash registers (while maintaining the presence of unhealthy items) can be a promising strategy. First in a lab and then in a field study in a hospital canteen, the researchers tested the effect of manipulating the shelf arrangement of a counter displaying both healthy and unhealthy snacks. The display was modified by placing healthy snacks at higher shelves versus lower shelves (i.e. accessibility), while assortment (i.e. availability or variety) was changed by offering either 25% or 75% of healthy snacks. Both experiments demonstrated that a higher availability (75%) can alter consumer perception and choices increasing the selection of healthy snacks. Probably, this effect occurred because a higher availability of healthy snacks increased their attractiveness and prominence. Interestingly, both the laboratory and the field study reported that locating healthy items at the most accessible top shelf did not influence consumption choices. In fact, a decrease in the visibility of the unhealthy snacks did not decrease sales. This lack of efficacy was not expected by researchers, who hypothesized that their manipulation was

not sufficiently strong to change the perception of convenience. Overall, the study supports the proposition that increasing the availability of healthy snacks, while maintaining the possibility to choose unhealthy items, is a successful strategy to increase the selection of healthy items, pointing to the relevance of nudging interventions (ibid.).

Variety is also a property related to salience. The number of available alternatives can influence consumer choices in multiple ways and different assortment sizes have different effects on the kind of product consumers select (Sela et al., 2009). The first studies were conducted by Rolls et al. (1981) who found that when participants were presented with an assortment composed of three flavours of yogurt, they were likely to consume an average of 23% more yogurt than if they had only one flavour available. The elementary concept that a higher degree of variety of a food product can lead to an increase in the consumption volume of that product (Rolls,1986) has been demonstrated in individuals of different ages and genders (Rolls and McDermott, 1991). But actual variety is not necessarily required: in fact, increased availability is sufficient to alter consumption patterns. In 2004, Kahn and Wansink demonstrated that merely altering the structure of an assortment can lead to an increase in the perceived variety and thereby to an increase in consumption. In one study, participants received a bowl of 300 M&M candies that were offered either in seven or in ten different colours. Despite the different colours, the taste of the M&Ms is always the same, however the participants with the ten colours bowl ate up to 43% more. In a second study on variety, participants received either a bowl with an organised assortment of 300 jelly beans in six different flavours, or a bowl with a confused assortment of the same product and flavours. The participants who ate from the confused assortment reported a greater degree of variety and consumed 69% more candies (22 jelly beans vs. 13) compared to the other group. These research studies reveal that simple changes in an assortment's structure and organisation change people's perception and have an impact on consumption. As Figure 24 illustrates, one explanation for this phenomenon is that the perception of a higher variety is automatically linked by the person to a higher level of enjoyment; a second explanation is that higher variety also changes the consumption norm and therefore might suggest a different appropriate amount to consume in the given context (Kahn and Wansink, 2004; Wansink 2004).

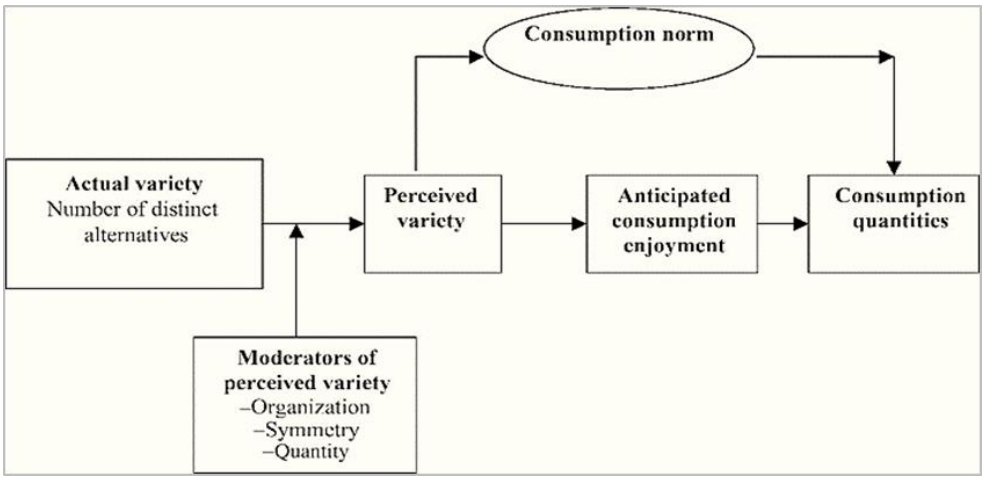


Figure 24. Influence on actual or perceived food variety on consumption volume (Wansink, 2004).

Sela et al. (2008) conducted five studies to observe the effect of assortment size on option choice, and discovered that when more healthy options were available, the selection of these products increased. In laboratory experiment 1a, the researchers presented participants with ten alternatives of ice cream, five standard ice-creams and five low-fat ice creams. The authors hypothesised that participants who chose from a wider range of alternatives, would be more likely to select the reduced-fat ice cream: as predicted, the group who chose from a larger assortment selected the low-fat ice cream more often (37 %) compared to the other group (20 %). In field experiment 1b, one group of people could choose one item among six types of fruit and six types of cookies and cakes, while the second group had a reduced set of two options from each category. As hypothesized, in the larger assortment 76 % of the participants selected a healthy fruit over the inviting alternatives, while in the smaller assortment 55 % of the participants chose fruit. These findings suggest that the ratio of availability of different food options determines what product is chosen. This insight is relevant since in most food environments the availability of unhealthy foods exceeds the volume healthy options such as fruits and vegetables, and therefore a greater availability of these options can be beneficial.

3.2.2. Labelling

The interest towards priming effects (Bargh 1994; 1996; 2005) has led many researchers to test whether healthy eating behaviour could be increased by using priming nudges. Cues can be either visual, verbal or sensational, and can be altered to nudge individuals towards a certain choice

(Forwood et al., 2015). These priming studies (see Figure 25) are varied in their design; however, they suggest the potential validity of using contextual cues as primes to improve food choices, mainly by decreasing the selection and consumption of snacks and junk foods. The literature review conducted by Wilson et al. (2016) on the use of priming to guide people towards healthier food options, shows that research is still limited but growing.

Study	Location	Prime	Outcome
Boland et al. (2013)	Laboratory	Healthy food TV ad	↓M&Ms eaten
Buckland et al. (2013)	Laboratory	An orange	↓Snacks eaten on taste test
Coelho et al. (2009)	Laboratory	Cookie odors	↓Cookies eaten
Gaillet et al. (2013)	Laboratory	Fruit odors	↑Fruit and vegetable selection
Gaillet-Torrent et al. (2014)	Laboratory	Fruit odors	↑Fruit dessert selection
Papies and Hamstra (2010)	Butcher's shop	Diet recipe poster	↓Meat snacks eaten
Papies et al. (2013)	Supermarket	Diet recipe flier	↓Unhealthy snacks purchased
van Koningsbruggen et al. (2011)	Laboratory	Healthy magazine covers	↑Healthy eating goal activation

Figure 25. Summary of studies that investigate the impact of priming on food choices, from Forwood et al., 2015.

Research has demonstrated that priming can encourage people to eat more healthily. Priming is a powerful nudge because as Wilson and Brekke (1994) explain, protecting oneself from this unconscious influence is not easy. First, the person should be aware of the influence of the prime; secondly, the person should be motivated to evade the influence; and finally, engage actively in a different response. For instance, Giner-Sorolla (2001) found that priming negative emotions such as guilt increased self-control reducing the consumption of snacks, while priming negative hedonic emotions increased the consumption of snacks. In one of the five experiments conducted by Fishbach et al. (2003), participants were primed with the goal of dieting, and this increased their choice of an apple instead of a Twix bar, however, it did not influence their deliberate intentions to sacrifice fatty, high-calorie food. Mann and Ward (2004) primed participants in a room with cues to reduce intake (such as diet books) decreasing their intake of a milkshake they were asked to taste, particularly when they were in a state of limited attention.

Labelling is a type of nudge based on the mechanism of priming. Experimental results from the provision of labelling schemes have been mixed, especially from the studies employing labels with **numeric information.** Most of the studies on menu calorie labels found a limited or no impact before and after the intervention (see Harnack et al., 2008; Ebel et al., 2011; Finkelstein et al., 2011; Vadiveloo et al., 2011). Nevertheless, one real-world experiment found that in a group of restaurants, the participants who noted the calorie labels ordered 100 less calories (Dumanovsky

et al. 2011). Holdsworth et al. (1998), in a review of twenty different labelling interventions, most of which based on the provision of calorie information, also found some moderate short–term positive outcomes. In a successful nudge intervention conducted by the Danish Cancer Society (Vase, 2015), calorie labels were added on a coffee machine, indicating the calorie index of each beverage (plain; with sugar; with sugar and milk). Additionally, close to the coffee machine, two posters were added providing information for men (80kg) and women (60 kg), that included physical activity level and the time necessary to burn calories. The signage completed the intervention to offer a clearer idea to those who had no knowledge about the recommended daily calorie intake. This experiment still employed numeric data, however the numbers on the coffee machine were unequivocal, and supplementary information regarding daily total calorie needs was provided through the signage. This experiment also differs because when people head to a coffee machine, they are generally on a break, and therefore have more time for reading and processing information.

In the United States, using labelling to warn consumers about the calorie index of food products is a growing policy strategy (Ebel et al., 2011; Finkelstein et al., 2011; Vadiveloo et al., 2011; Thorndike et al., 2012). Information-based policies are employed based on the notion that consumers will act more rationally by selecting lower calorie products if they are equipped with information. However, research evidence about the effectiveness of numeric labels listing calorie information mostly reports negative outcomes (see Downs et al., 2009; Dubbert et al., 1984). The issue is that for several reasons consumers can hardly interpret nutrition data correctly: this presupposes having a knowledge of one's total daily caloric needs; not being in a condition of time pressure to consider the information; and requires numeracy skills (Thorndike et al., 2012). System 1 guides many of our food decisions, however health communication still employs numeric data (e.g. Body Mass Index, recommended calorie intake, nutritional indexes on the labels) that are processed by System 2 (Roberto and Kawachi, 2014). Peter et al. (2006; 2007) indicate a series of reasons that explain the lack of effectiveness of these indicators: these indicators are abstract, and people have difficulty in processing them; the numeric indicators are not absolute values but vary depending on the person (e.g. daily calorie intake); data does not successfully influence the perception of risk; finally, people may be more influenced by emotional factors and moods (Peters, 2009). Finally, as Downs et al. (2009) point out, overeating frequently depend from self-control issues that can occur regardless of a person's complete knowledge of the consequences. Hence,

these findings should inform future policies and communication campaigns for the development of more effective labelling systems, which should be developed to hit System 1.

Eye-tracking research on nutrition labels show that individuals tend to focus more on **images** rather than numbers. In a study conducted by Jones and Richardson (2007), the efficacy of two forms of nutrition labels was assessed, through the measure of eye movements and healthiness ratings. The researchers recorded the eye movements while the subjects completed healthiness ratings for two types of labels: standard nutrition labels vs. traffic light labels. The results revealed that the traffic light labels were more effective as they steered the participant's attention on the important nutrients and enhanced the accurateness of the healthiness ratings. Temple et al. (2011) compared the impact on food selection and intake of standard nutrition labels versus traffic light symbols that used red, yellow and green colours to indicate respectively high-calorie items, moderate calorie-items, and low-calorie items. The researchers calculated the total energy intake, the energy intake of each product, and the number of items purchased from each traffic light category. The intuitive colour scheme led to an increase in the consumption of "green" items and reduced the consumption of "red" items, while numeric nutrition labels reduced energy intake only in lean females. Stutts et al. (2011) in another laboratory study, tested the impact of standard calorie labels versus labels with the picture of a heart. The experiment involved 236 children, and labels were added to a fast food menu. Evidence showed that children exposed to the heart pictogram preferred healthier food options, compared to those exposed to the classic calorie label, or to menus without labels.

The previous studies were all conducted in a laboratory setting. Thorndike et al. (2012) conducted a renowned experiment to assess the impact of a labelling intervention followed by a choice architecture intervention, to nudge people towards healthy food in a **real-world setting**. They employed a labelling scheme to communicate to the consumers of a hospital cafeteria the 'healthiness' of the items. Like preceding researchers, Thorndike et al. (2012) opted for an intuitive semaphore strategy, with green, yellow, and red labels. The study had a duration of nine months. In the first three months, baseline data was collected, while in the following six months a two-phase choice architecture intervention was implemented: phase 1 added a labelling scheme; phase 2 added a choice architecture intervention to alter the accessibility of selected healthy items. Phase 1 employed semaphore labels on all the food and beverages, with the aim to offer immediate visual cues that hit System 1 to stimulate implicit associations and orient people's choices. The green

label indicated “consume often,” the yellow label “consume less often,” and red label “there is a better choice in green or yellow”. The meaning of the labels conveys a positive message, as green solicits towards an optimal choice while red is not punitive, and signage was posted to explain the labelling scheme. Phase 2 added a choice architecture intervention to alter the convenience and salience of three target products. Cold beverages were rearranged to display green beverages at eye level, while yellow and red beverages were placed beneath eye level. The same intervention was applied to the sandwich counter and to chips. Data showed that the labels increased the purchase of all green label food by 4.5 %, and green label beverages by 9.6 %. The salience intervention the selection of all green items slightly decreased by 0.8% compared to phase 1, but the purchase of green beverages further increased by 4.0%. The labelling scheme decreased the purchase of all red label food items (by 9.2 %) and of all red label beverages (by 16.5 %). The salience intervention further decreased the purchase of red label food products (by 4.9 %), and of red label beverages (by 11.4%). Overall, the project was successful to improve people’s consumption choices, and it is the first experiment that tested a combination of both a labelling nudge with a salience nudge.

In a study by Ensaff et al. (2015) the researchers tested a labelling intervention in a secondary school dining setting. Two secondary schools (1 intervention and 1 control school) were selected, that operated with the same menus and meals. The target of the intervention were plant-based options, namely fruit, vegetarian dishes, and sandwiches containing salad. The experimental design followed three phases: baseline (twenty-nine weeks); intervention (six weeks); and post-intervention when the cafeteria was reinstated to its baseline state (three weeks). The nudges selected were:

- Yellow stickers with a smiley face on the packaging of the sandwiches containing salad;
- A window sticker in the vegetarian display unit promoting the freshness of the meal: “Today’s SPECIAL - Make a fresh choice”;
- “GOOD for YOU” stickers on fruit pots and whole fruit.

The labels employed a simple signal code (i.e. smiley face), descriptive names (‘todays’ special’) and verbal prompting (i.e. ‘good for you’). These choices are in line with past research that demonstrated the effectiveness of using attractive names (Wansink et al, 2012) and verbal prompts (Schwartz, 2007). The results show that at the intervention school, purchase of fruit products

increased significantly during the intervention (4.2%) and post-intervention (3.7%), compared to the baseline (2.9%). The selection of sandwiches with salad also rose from 0.06% to 1.36%. Overall, the students were 2.5 times more likely to select one of the target items. Interestingly, data also revealed an increase in the selection of salads (from 0.2% to 1.6%) during the intervention period, even though the product was not among the targets of the intervention.

Kiviniemi et al. (2007) labelled '**affective associations'** the feelings that people associate to a certain behaviour, which in turn influences decision-making. Affective associations have been demonstrated to be involved in dietary behaviour (see Kiviniemi and Duangdao, 2009; Keer et al., 2010). People develop affective associations with food products, that is a mental association between a behaviour (in this case, the intake of a certain food) and an affective state (pleasure or repulsion for a certain food). For instance, people are able to identify the food products that they associate with positive feelings such as happiness and warmth (Wansink et al., 2003). On the other hand, food can also have negative affective association, such as the instant reaction of repulsion when a child eats spinach or brussels sprouts at its first exposure (Birch and Marlin, 1982). Knowing that feelings influence food choices, has key implications for interventions that aim to guide and change people's food intake. Kiviniemi and Duangdao (2009) investigated whether more positive affective associations with fruits and vegetables determined higher levels of consumption of fruit and vegetables. The researchers assessed adults' perceptions of the positive (benefits) and negative (barriers) factors in relation to the consumption of fruits and vegetables; their affective associations; and the actual level of current fruit and vegetable consumption. According to the hypothesis, the results confirmed that affective associations are a predictor of fruit and vegetable consumption. Walsh and Kiviniemi (2014) also demonstrated that the manipulation of affective associations can change behaviour. In a laboratory study, the affective associations towards fruit and vegetables were first altered through a priming intervention, and then the subjects were asked to choose a snack between fresh fruit (apples and bananas) or a granola bar. The results showed that the priming task significantly influenced the subject's snack choices, those who were primed with positive affective associations for fruit were more likely to select it, whereas subjects primed with neutral or negative affect were less likely to select fruit (ibid.).

The results of these studies are consistent with the theories on the role of affect in decision-making, such as the somatic marker hypothesis that postulates that affect serves as an indicator to the

possible expected reward or loss that is associated with a behavioural choice (Bechara et al., 1997; Damasio, 1994; Bechara and Damasio, 2005). Such automatic signalling might have an adaptive function, allowing people to decide quickly and without conscious deliberations; this might be particularly true for recurrent behaviours such as eating fruit and vegetables, for which minimizing cognition can be an optimal strategy (Kiviniemi and Duangdao, 2009). The limit of Walsh and Kiviniemi's (2014) study is the artificial laboratory setting, which leaves open the question of whether an intervention on affective associations could be effective in a real-world setting. This question will be addressed in the empirical study of the present research project, as outlined in paragraph 4.2.4.2. (chapter 4).

3.3 The role of habits in food choices

Repetition of behaviour is a core feature of everyday life, in fact up to 45% of behaviour is repeated on a daily basis and in the same setting (Wood et al., 2002; Quinn and Wood, 2005). A brief discussion about habits is fundamental in this domain because habits are a specific type of automaticity, in which behaviour is directly prompted by environmental cues. Habits are sequences of behaviour learned after past experiences, that occur without conscious deliberation and awareness (Van T'Riet, 2011). Aarts and Custers (2010) defined habits as stable responses to specific stimuli, that result from social and biological processes that determine strong associations in memory. Habits are performed principally because they represent the path of lowest resistance in the person's current course of action. As Wood and Neal (2009) point out, the tendency to behave guided by habits derives by the multiple daily demands, time pressure, distraction, or ego depletion. These are the occasions in which people are more likely to rely on habits. Furthermore, acting on habit reduces people's research for relevant information in the environment, as individuals tend to direct their attention towards information that is in line with their past behaviour (i.e. confirmatory bias). As Klockner and Prugsamatz (2012) illustrate, once a habit is established, it affects information research and the way information is processed. Habit determines a condition of behavioural stabilisation, which leads the person to unconsciously exclude counter-information. Indeed, this mechanism represents a barrier for behaviour change (ibid.). However, this does not imply the absence of deliberation in the process, since initially habits are the product of

preferences, intentions, or learned processes that enable goal pursuit; moreover, a habit can be interrupted by an act of deliberation and willpower (Wood and Neal, 2009).

Thus, if habitual behaviour is not guided by conscious intentions or information research, what triggers its operation? Findings in the literature suggest that habitual behaviour is mostly guided by situational cues. Verplanken and Aarts (1999) maintain that habits are types of automatic behaviours that are represented as goal-action associations in the mind, and according to this approach, goal-directed behaviour is automatically activated by environmental cues. Instead, Wood and Neal (2007) maintain that habitual behaviour can be triggered by external stimuli also in the absence of the mediating role of goals. They define habits as follows: *"[…] a specific type of automaticity characterized by a rigid contextual cuing of behaviour that does not depend on people's goals and intentions. Habits develop as people respond repeatedly in a stable context and thereby form direct associations in memory between that response and cues in the performance context*" (Wool and Neal, 2009: p. 580). What is most important for the present purposes, is that both theories recognise the influence of environmental stimuli over habitual behaviour (see also Verplanken and Wood, 2006).

Neal, Wood and Quinn (2006), illustrate three ways in which habits develop and are activated: direct context-cuing, implicit goal, and motivated goal contexts. First, in direct-context-cuing, the recurrent co-activation forms associations in memory between a context (or stimulus) and a response pattern. In this way, associative learning determines a specific response when perceiving a certain context or stimulus. Secondly, habitual responses can be the product of an implicit goal that has been repeatedly pursued in a specific context. Thus, when the goal is accessible, the person automatically activates the behavioural sequence of action. Finally, motivated context goals refer to the habits that evolved after rewarding past behaviour. This form of habit can be activated without the operation of goal, but simply by associated responses that predict rewards (ibid.).

But whether habits are the product of direct cues, implicit goals, or motivated, and after the process has been automatically triggered by a cue, all forms of habit share the feature of having a rigid performance. This phenomenon has important implications in the domain of nutrition behaviour and food choices. For researchers interested in the promotion of specific behaviours, it is important to bear in mind the effect of habit. Eating is a daily behaviour often characterized by recurrent patterns, such as eating in the same context or at the same time, which leads to the assumption that eating behaviour is likely to become largely habitual and tend to be stable over time (Riet, 2011).

For instance, this assumption is true in relation to food purchases, as studies on household panel data display a repetition of the same food purchases (see Carrasco et al., 2005; Naik and Moore, 1996). Whether an action is performed in a stable context is determinant for the establishment of a habit. A recurrent action in a same setting facilitates automaticity because over time, the cognitive process that guides the behaviour can be performed more rapidly, even multi-tasking on other activities, and with the deployment of minimal cognitive monitoring (Wood et al., 2002; Posner and Snyder, 1975). When an action is repeatedly performed in a same context, intentions do not guide the process; instead if an action is less frequently performed, or in variable contexts, intentions and cognitive monitoring is likely to guide behaviour (Danner et al., 2008). For instance, preparing a cup of tea at home in the morning may be a strong habit not governed by intentions; whereas making coffee at our mother's in law apartment may be a performance guided by deliberation and intention. The importance of the stability of a context is an important aspect to take into account when planning interventions to change behaviour, as in the case of the lunchroom experiment that will be illustrated in chapter four.

The dependency of habits on environmental stimuli is an important point of vulnerability; changing the cues that prompt and maintain habit performance leave behaviour open to change (Wood et al., 2005). Verplanken and Wood (2006); Neal et al. (2006); as well as Riet et al. (2011), discussed the role of habits in food choice settings, arguing that interventions directed at changing eating behaviours would increase in effectiveness if habitual behaviours were considered. The authors propose a strategy to break existing habits, which is in line with Wansink's studies and with the nudging approach: the alteration of the physical features in food choice setting, changing the exposure to environmental stimuli. Indeed, studies suggest also other available strategies to guide behaviour by changing existing habits: the use of implementation intentions, or strategies that promote the exercise of self-control (see Wood and Neal, 2009). Such suggestions have not been done in vain, as implementation intentions (Gollwitzer, 1999) have actually become a tool in the box of choice architects, along with nudges that promote self-control.

3.4. Conclusions

People are often unaware of their consumption volume and poor dietary choices, and dissatisfaction among people who wish to improve their diet and reduce their weight is common. Italian policy-makers and institutions are concerned with the rising costs of health care and the growing rate of overweight and obesity in the population. Food consumption is an area in which an understanding of behaviour is paramount and has direct implications for consumer welfare.

The notion that environmental stimuli influence consumption might not be new, but only in the last decade research piled up and new intervention strategies are being tested. Communication campaigns that convey information or interventions aimed to increase people's willpower and vigilant monitoring produced insufficient results and are unrealistic. Food consumption and heuristic mechanisms are closely related since eating is a habitual and daily behaviour. For this reason, to support people's adoption of more appropriate nutrition practices, choice architects and professionals involved in this task should bear in mind the influence of heuristics and employ them for the creation of new interventions. The adaptation of the environment is an important tool for overweight and obesity control, facilitating people in selecting healthier options.

A wide literature has examined the environmental architecture that influences dietary decisions, such as placement location; the order in menu options; or semaphore labels. Small and totally free changes in the layout of food in lunchrooms (e.g. accessibility or perceived variety) can unconsciously drive individuals to a healthier diet. The evidence presented in this chapter on the nudging interventions in cafeterias and lunchrooms, represents proof of the validity of this concept. However, further research is required to establish the generalisability of the results and evaluate the impact across different settings and national contexts. Therefore, the aim of this project is to extend this field of study by testing similar nudges in two lunchrooms of a public hospital in Milan. To date, choice architecture interventions has never been tested in an Italian hospital and, if successful, the intervention has the potential to be replicated and extended to other health care structures at local, regional or national level.

4. Nudging healthy food choices in a hospital

4.1. Context of the research

"*With health, everything is a source of pleasure; without it, nothing else, whatever it may be, is enjoyable...Health is by far the most important element in human happiness*."

Arthur Schopenhauer, 1851

Health Promotion is a key component of health policy, stemming from the recognition that lifestyles are the primary cause of the chronic conditions that constitute a grave burden for the individual and for society. In the past, the approach was to motivate people to change their behaviours, trying to influence their values, attitudes and beliefs. The present doctoral research project aims to enhance individual well-being shifting the focus away from a narrow attention on individual behaviours, towards the environmental factors that influence food choices and behaviour. The prevalence of overweight and obesity in the world is constantly and worryingly increasing. Overweight and obesity are commonly defined as an abnormal or excessive accumulation of fat in the body's fat tissue that poses health risks. The underlying cause is an energy surplus that results in weight gain; in other words, the calories introduced are higher than the calories burned. Many factors include hereditary predisposition, environmental and behavioural factors, aging and pregnancy (Rapporto Osservasalute, 2016). Overweight and obesity are among the major risk factors for non-communicable diseases such as ischemic heart disease, stroke, hypertension, type 2 diabetes, osteoarthritis and some cancers, and their ever-growing diffusion entails major impacts on the national health systems and is currently a public health priority issue worldwide (ibid.).

In Italy, the issue attracted the interest of different research groups, and increased the necessity for population surveys to provide useful information on people's lifestyles to early monitor the positive or negative trends. From the results of the multi-scope survey of Istat "Aspects of daily life" it emerges that in Italy, in 2015, more than one-third of the adult population (35.3%) is overweight, while just over one in ten people is obese (9.8%) (Table 6). Overall, 45.1% of Italians aged 18 years and over are overweight. The fact that just under half of the adult population (45.1%) is overweight (or obese) is undoubtedly an alarming figure, and the trend has maintained steady in the last years (Istat, 2015).

Regioni	Persone in sovrappeso	Persone obese
Piemonte	32,1	8,9
Valle d'Aosta-Vallée d'Aoste	30,4	10,7
Lombardia	31,9	8,7
Bolzano-Bozen	*31,8*	*7,8*
Trento	*27,1*	*10,1*
Veneto	34,5	9,6
Friuli Venezia Giulia	32,6	9,8
Liguria	33,5	10,1
Emilia-Romagna	36,3	8,8
Toscana	35,8	9,5
Umbria	34,2	10,2
Marche	31,5	9,5
Lazio	36,6	9,5
Abruzzo	36,2	12,7
Molise	38,6	14,1
Campania	39,3	11,7
Puglia	38,6	12,3
Basilicata	39,9	10,6
Calabria	37,8	10,4
Sicilia	38,7	9,2
Sardegna	33,2	10,2
Italia	**35,3**	**9,8**

Table 6. Prevalence of people aged 18 and over that are overweight and obese by region of residence (Istat, 2015).

Table 6 report data on the different regional situations: in Lombardy 40.6 % of the population is overweight or obese, which is not an irrelevant figure. The most affected are the southern regions of Molise (52.7 %), Campania (51 %) and Basilicata (50.5 %). Further data is offered by Sorveglianza Passi (2017a), a tool for gathering information on lifestyle and behavioural risk factors associated with the onset of chronic non-communicable diseases, and for gathering knowledge on the adherence to programs that Italy is implementing for prevention. According to the data on weight and height, estimates confirmed that about 4 adults out of 10 are overweight: 3 are overweight (with a body mass index between 25 and 29.9) and 1 is obese (BMI $\geq$ 30). Table 7 shows the prevalence of overweight by region: according to these data, Lombardy reaches 36.1 %; while the worst situation is confirmed to be found in southern Italy yet with different results from Istat's report (Campania 52.2; Sicily 48,7 %; Molise 41.7 %).

In nutrition, the typology of food we eat can truly make the difference for our health. The World Health Organization estimates that globally 1.7 million deaths are attributable to a poor consumption of fruit and vegetables (WHO, 2017). It is also estimated that 14% of deaths for

gastro-intestinal cancer, about 11% of deaths for ischemic heart disease, and 9% of stroke deaths are attributable to poor consumption of fruit and vegetables (ibid.).

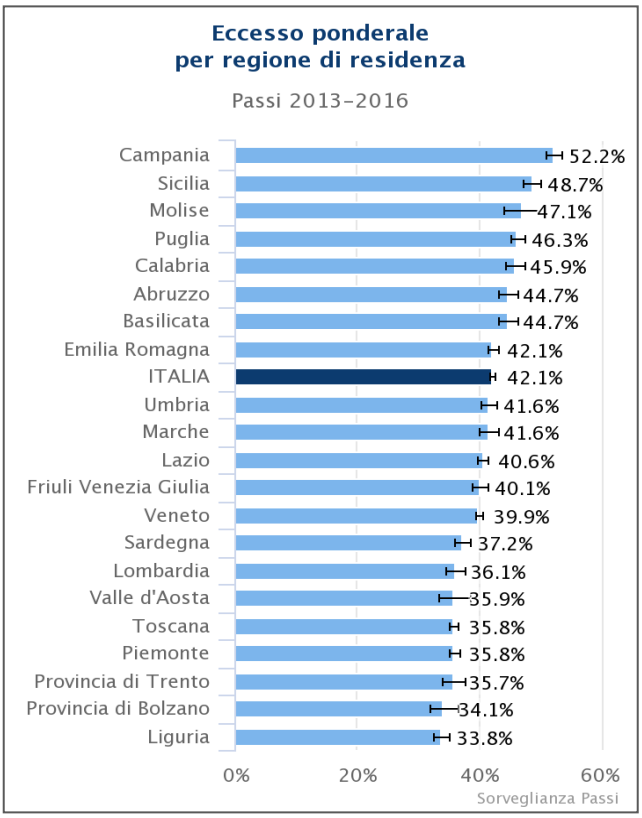


Table 7. Data on overweight per region of residence (Sorveglianza Passi, 2017a).

The Italian guidelines for healthy nutrition (National Research Institute for Food and Nutrition, INRAN 2003) assign a central role to the variety of foods, and especially to vegetables and fruits that stand out for their strong association with the reduction of the risk of cardiovascular disease and, more generally, for their ability to transport antioxidant substances within the human body. The guidelines for healthy nutrition (INRAN, 2003) point out that adequate amounts of fruit and vegetables, in addition to protecting against cardiovascular, neoplastic and respiratory diseases (asthma and bronchitis), also provide a significant supply of complex carbohydrates, nutrients (such as vitamins, minerals, and organic acids), and antioxidant protective substances; furthermore, thanks to the fact that these foods are rich in fibres that give a feeling of satiety, they help reducing the caloric intake of the diet.

The 2013-2016 data of Sorveglianza Passi (2017) show that in Italy, less than 5 adults out of 10 consume no more than 2 servings per day of fruit or vegetables, that less than 4 adults out of 10

consume 3-4 portions daily, while only 1 out of 10 adults consumes the recommended quantity of fruit or vegetables (i.e. five servings a day). Consuming at least five servings of fruit and vegetables a day, as recommended, is a habit that grows with age, and it is more common among women and people without economic difficulties. The geographical gradient is clear and shows that the adherence to the 'five a day' drops significantly in the central and southern regions compared to those in Northern Italy. Since 2008, the share of people who follows the 'five a day' rule remained substantially stable, it has been observed a slight increase since 2013, yet it is not sufficient to achieve statistical significance (ibid.).

The Osservasalute Report annually observes the health of the overall Italian population and compares the regional situations in relation to several health areas, including a section on "risk factors, lifestyles and prevention". As the Osservasalute Report (2016) recommends, it is important to promote the adoption of healthy patterns of consumption that include fruit and vegetables as an integral part of the diet, also with the help of producers and restaurateurs. A continuous monitoring of food consumption and lifestyle variables is also necessary to verify whether awareness-raising policies towards balanced and proper nutrition can produce the desired changes. The evidence that overweight and obesity are preventable has been driving national and international actions to promote a healthy lifestyle on an individual level. The Lombardy Region supports a variety of programs that are currently at work in different areas to promote healthy lifestyles, as in schools with the Health Behaviour in School-aged Children (HBSC) program, or with the Workers Health Promotion (WHP) program in public and private companies.

4.1.1 Health promotion and the role of hospitals

This section is dedicated to the illustration of the Workplace Health Promotion (WHP) program, a World Health Organization project developed to support workers to gain health in a series of areas, through a process that brings workers to consider their health as a resource to protect, and to improve their lifestyles and choices. Workplaces represent microcosms in which people spend most of their life, thereby it is intuitive to identify those contexts as privileged places to realise interventions aimed to adjust detrimental habits or behaviours.

The nudging intervention developed for the empirical research of the present dissertation, was activated as a WHP initiative by the public hospital Niguarda Cà Granda in Milan. Below, a brief

history of health promotion is provided to contextualise the project and to highlight the change of paradigm that occurred in European health policy that shifted the focus from cure to prevention. In 1988, based on the Ottawa Charter for Health Promotion, the World Health Organisation created an international project to establish a network of Health Promoting Hospitals (HPH), engaged in the implementation of related programs. The HPH is a tool to spur hospitals to add more emphasis on the promotion of health to prevent chronic disease, instead of narrowing the action by merely exerting activities of diagnosis and cure. This represents a shift to an improved vision in the concept of health that is no longer exclusively intended as 'absence of illness'. The vision of health is holistic, accounting also for the psychological and social well-being that represent an essential part in determining the health of an individual (Groene and Garcia-Barbera, 2005). This vision established in the Ottawa Charter (WHO, 2009: p. 1) defines health promotion as:

> "*(…) the process of enabling people to increase control over, and to improve, their health. To reach a state of complete physical, mental and social well-being, an individual or group must be able to identify and to realize aspirations, to satisfy needs, and to change or cope with the environment. Health is therefore, seen as a resource for everyday life, not the objective of living. Health is a positive concept emphasizing social and personal resources, as well as physical capacities*".

Two concepts emerge from the Ottawa Charter: the concept of **enabling** people means offering new incentives and opportunities to facilitate behaviours; which is in turn connected to the concept of **empowerment**, namely making people more responsible for the actions and decisions that influence their health (Groene and Garcia-Barbera, 2005). To these aims, the HPH movement has been divided into four areas of intervention: the promotion of patients' health; the promotion of workers' health; the transformation of the organization into a setting of health promotion; and the promotion of the health of the community present in the hospital area (ibid.). As Faviretti and Ricciardi (2002) note, to reorient health services, the HPH program is committed to:

- The development of initiatives of health promotion in the hospitals;
- To extend the interest of the hospital management beyond care, towards a broader concept of health;
- The development of good practices, that are reproducible and transferable to other structures;

- The facilitation of cooperation and exchange among the hospitals that adhere to the HPH network;
- The identification of common areas of interest, of codified programs and common procedures of evaluation.

In Italy, the regional HPH network is active in several regions (Lombardy, Piedmont, Emilia Romagna, Veneto, Liguria, Tuscany and Trentino-Alto Adige). Several strategies of health promotion have been implemented, along with a variety of programs that range from informative interventions to more structured initiatives. Among the most relevant HPH programs, Workers Health Promotion (WHP) aims to build within hospitals, contexts that facilitate the emission of healthy behaviours and choices, to reduce the onset of chronic disease among the workers.

The political activity that determined a higher level of cohesion among EU member states, accelerated the ability of the Union to work jointly on some crucial themes, such as health promotion (Burton, 2010). The European Network for Workplace Health Promotion (ENWHP) founded in 1996 and ratified in 1997 with the Luxembourg Declaration on Health Promotion in the Workplace, reflected the consensus of the group in the definition of workplace health promotion, namely the "*the combined efforts of employees, employers and society to improve the health and well-being of people at work*" (Burton, 2010: p. 12). Workplace Health Promotion is a concrete program that serves as a guide and methodological support for public (e.g. hospitals) and private organisations that wish to transform their workplace environment. It is nowadays ascertained that a healthy environment at work is critical for a good quality of life and for the well-being of the individual and the community (ibid.). A healthy workplace is the result of the interaction of a variety of elements, of the action of a variety of subjects, therefore a multivariate social process. The WHP program has the purpose to offer workers the opportunity to improve their health conditions as well as their mental well-being, by developing projects for the reduction of the risk factors implicated in the genesis of chronic disease.

In Lombardy, the WHP program was developed with the Regional Plan of Prevention (Piano Regionale della Prevenzione 2010–2013), formalized in the legislative decree n. 11861/2012, related to the promotion of lifestyles that are favorable to health in the workplace through the creation of sustainable and efficient programs (Regione Lombardia, PNR, 2015). The aim of the Lombardy WHP Network (Rete WHP Lombardia) is to improve workplace settings to make them suitable for the workers' well-being, and to prevent the major risk factors to health, particularly

those determined by individual behaviours. It is clear how prevention can contribute to the avoidance of a relevant quote of deceases that derive from predictable causes. As Dahlgren and Whitehead (1991) point out, individual lifestyles are substantial determinants of health up to about 50%, while 20% is attributed to genetics and environmental factors, and 10% to the health service. Research demonstrates that many behavioural, modifiable, risk factors are responsible for a series of disabilities, as synthesised in Table 8.

	RISK FACTOR							
	HYPERTENSION	SMOKE	ALCOHOL	HYPER-CHOLESTEROLEMIA	OVERWEIGHT	DIET	SEDENTARY LIFESTYLE	STRESS
CARDIOVASCULAR DISEASE/STROKE	■	■	■	■	■	■	■	■
CANCER		■			■	■		
DIABETES	■			■	■	■	■	
RESPIRATORY DISEASE	■				■			
DEPRESSION			■					

Table 8. Adapted and translated from Report ASL Lodi (2014, modified from World Economy Forum, Pricewaterhousecoopers - Health Research Institute Analysis 2007 and WHO Report 2004).

Much work must be done to improve the health and well-being of workers. The objective of the WHP program is to enable employers, associations, civil society and other stakeholders to cooperate toward the creation of workplaces where workers can enjoy more health and well-being as a result of their occupation. The action of the WHP program is oriented to offer all workers the same health opportunities through changes in the work environment, while the company and the workers themselves become responsible for the activation (i.e. they are empowered) of health processes. In this sense, implementing an intervention that is efficient in meeting the needs of workers, requires more than the mere knowledge of the issues to consider. Companies need to take an extra step, with the activation of interventions that envisage a continuous improvement, conducting research and activating processes of knowledge transfer. Currently, the WHP network in Lombardy involves both public and private companies in the realisation of functional interventions to promote health among the workers, following the set of 'good-practices' identified by the WHP program, whose validity is also guaranteed by the experts of the Local Sanitary

Agencies of the region. The network is characterized by the presence of a variety of stakeholders and actors from different sectors: professional organisations, Assolombarda, Confindustria Lombardia, public bodies, non-profit institutions, Fondazione Sodalitas, unions, scientific groups and Universities. The scientific program is coordinated and guaranteed by a regional panel composed of experts of the provinces of the region. The companies that respect the requirements and that realise the minimum number of practices required by the program, receive an annual accreditation in the name of the European network ENWHP. This accreditation assigns an annual logo as "workplace that promotes health".

The strength in the development of the network derives from a series of regional measures that defined the objectives and the procedure of the territorial sanitary agencies for health promotion. Particularly, the Regional Plan for Prevention 2015-2018 (Piano Regionale della Prevenzione 2015 – 2018) defined the path for the extension and enrichment of the WHP Program, through the identification of precise objectives. In 2015, the network of private and public companies in Lombardy reached 36% of the workers' population, 6% more than expected (ATS Brianza, 2016). Table 9 shows the data of 2014, first year of activity, in relation to both public (i.e. hospitals) and private companies that activated good practices, and the number of workers involved.

Insofar, the path in Lombardy has been to develop specific programs, as the first step of an evolutionary process. Overall, the results in terms of efficacy of the WHP interventions have been mixed, depending on the typology of the intervention and the characteristics of the target population. The major results pertain to the area of smoke cessation, particularly for groups programs and individual counselling (Regione Lombardia, 2015). The activation of the initiatives in the hospitals show a concrete shift from the concept of curing the pathologies, toward a broader strategy of health promotion and prevention. In Lombardy, the success of the initiatives can be seen in the number of workers involved, and in the high degree of participation registered from the first year of activity. Undoubtedly, the transformation of the whole hospital in a setting that promotes health, is an ambitious landmark, far from the present picture. To this end, to guarantee the efficacy of the interventions in the long-term, the promotion of health needs to be anchored to the organisational culture and its structure (Groene e Garcia Barbero, 2005).

GOOD PRACTICES	N° COMPANIES	N° WORKERS	% COMPANIES	% WORKERS
1 Area FOOD and NUTRITION	161	82.478	57%	59%
2 Area CONTRAST TO TOBACCO USE	64	37.117	23%	27%
3 Area PHYSICAL ACTIVITY	100	32.272	35%	23%
4 Area SAFE MOBILITY	32	12.937	11%	9%
5 Area CONTRAST TO ALCOHOL-DRUGS	26	5.984	9%	4%
6 Area WELL-BEING	83	39.969	29%	29%

Table 9. Data from ASL LODI (2014), on the first year of activity of the WHP program in Lombardy.

4.1.2 The activation of the WHP program at the hospital Niguarda Cà Granda

The commitment of the hospitals that adhere to the WHP Network is to develop interventions in one or more of the six macro-areas identified by the program, providing a set of good practices (evidence-based or recommended) for projects in the areas of (1) food and nutrition, (2) contrast to tobacco use, (3) physical activity, (4) contrast to alcohol and drug use, (5) well-being and life-work conciliation, and (6) safe and sustainable mobility. In Lombardy, the territorial sanitary agencies (Agenzia di Tutela della Salute, ATS) oversee the interventions implemented by the single hospitals through annually produced documentation, with the final aim of releasing a certificate of "Health Promoting Agency – ENWHP network".

The Niguarda Cà Granda hospital first adhered to the WHP program in 2015, planning to implement a set of good practices in the areas of nutrition and smoking. The same year, the project began with a workplace health assessment, to understand the key issues affecting employees' health, and a series of analyses were conducted to measure the level of obesity, physical activity, and smoking. The Employee Health Surveillance Service gathered the epidemiological data to assess the presence of overweight and obesity among the employees, through the body mass index (BMI) and the waist circumference measurement. Table 10 illustrates the data collected on a population of 2414 employees divided by gender (out of a total population of 4244 workers, of which 2794 females and 1450 males). The data reveal the necessity of an intervention: even in a health structure, where employees might supposedly be more aware of the importance of health

and nutrition, the level of overweight (39,4 %) and obesity (13,4 %) is relevant. Interestingly, the data on the prevalence of overweight and obesity at Niguarda are in line with the national statistics, revealing the representativeness of the sample (Istat, 2015).

VISITED WORKERS	2414		**F**	1636		**M**	778	**TOTAL**
OVERWEIGHT	657	27,20%	**F**	346	21,10%	**M**	307	39,40%
OBESITY 1° CLASS	221	9,10%	**F**	135	8,25%	**M**	85	10,90%
OBESITY 2° CLASS	68	2,81%	**F**	54	3,30%	**M**	13	1,60%
OBESITY 3° CLASS	34	1,40%	**F**	30	1,88%	**M**	3	0,90%

Table 10. Prevalence of overweight and obesity among the workers of the hospital Niguarda Cà Granda.

Thus, in 2015, for the first initiative to promote a proper nutrition, two good practices were adopted in the lunchrooms:

1. Presence in the menu of all the meals served in the lunchroom of fruit and vegetables (without additional payments, and non-exchangeable with dessert or other products); offer of bread with a low content of salt; and offer of whole bread.
2. Informational campaign in the lunchrooms with a poster to indicate the optimal servings of food (food pyramid), posters on salt reduction, and posters on whole bread.

The realization of point 1 entailed that it was no longer possible to substitute the selection of fruit and vegetables with one or more portions of yogurt, pudding, or fruit juices, which remained available in the lunchroom as extras. In fact, Niguarda's employees have a mandatory full menu comprised of first dish + second dish + side dish + dessert (fresh fruit, yogurt, pudding, or fruit juices) + water + bread. If the person does not want to eat one of the options, each item can be substituted with another fresh fruit, yogurt, pudding, fruit juice, by extra bread of bottles of water. This arrangement is problematic because people instead of eating vegetables or fresh fruit, often substitute these items with tastier puddings, yogurts, or fruit juices. This means that often a person ends up eating more carbohydrates and simple sugars that necessary, which is a direct cause of weight gain. The new arrangement started in early September, and after only five days, the project

was suspended. Employees had turned to labour unions denouncing the situation, outraged that the management tried to "save money on them", by preventing them from freely selecting yogurts, puddings and juices and by reducing their choice, obligating them to eat cheaper, less tasty, fruit and vegetables. This reaction came despite a previous communication campaign on the WHP initiative, which provided information through the publication of news and video interviews on the intranet (providing also the link of a questionnaire on lifestyle and habits); emails; and pop-ups. The intervention had been highly misunderstood, pushing the WHP team to step back and stop the initiative. After just one week, the menu in the lunchrooms went back to its previous form. It is interesting to dedicate a few words about the peculiar characteristics of the context at Niguarda. Since the first meeting with several directors and doctors, I learned that the nature of the relationship with the general population of workers was difficult. In fact, many employees have an antagonistic attitude to any policy proposed in the lunchroom, which seems to be due to a shared level of dissatisfaction with the food quality and the meal options. I also had the opportunity to talk personally to the cafeteria workers (managers, cashiers, food servers), many of whom have been working in the two lunchrooms for many years (some up to 20 years). From their accounts, it seems that the dissatisfaction of the public has been always present, even under the previous managements. Clearly, this situation does not facilitate the introduction of new initiatives that need to be carefully developed and communicated in advance, in order to prevent or at least to reduce any eventual protest. It is for this reason that the members of the Niguarda WHP team welcomed the idea of a nudging intervention, as a soft approach that preserves people's freedom of choice.

Thus, the first failure spurred the WHP team to learn from the past mistakes and to change perspective on the way to change employees' eating behaviour, which led to the development of the nudging initiative. This project is the outcome of a one-year series of meetings held with the Niguarda WHP team members and the representatives of CIR Food (Cooperativa Italiana di Ristorazione), the food service company in charge at Niguarda. The first meeting with the doctor in charge of the WHP Food Area took place in May 2016. More than a year was necessary to successfully implement the project, in June 2017. The aim of the present research project is to promote the consumption of fruit and vegetables, and more generally of a healthy nutrition among the workers of the Niguarda Hospital. The final objective is to offer a successful case to provide results that might be transferable in terms of policy, namely expandable to the 90.000 workers of the regional healthcare system in Lombardy. The evaluation, implementation, and the development

of effective interventions for health policy, need to be based on solid scientific data that include an appropriate use of behavioural sciences. The theoretical assumption is the scarce awareness and the presence of systematic cognitive errors at the base of many human decisions. The project envisages an intervention of choice architecture based on the use of nudges to orient food consumption in the two lunchrooms of Niguarda. The project has been developed and implemented in collaboration with the Nudge Team of the European Institute for the Study of Human Behavior (IESCUM). The Nudge Team is a research group dedicated to the application of the tools of behavioural economics in a variety of real-life settings. The group is member of the European Nudge Network (TEN). Before illustrating the empirical research and its results, the following Table 11 provides a timeline of how the present PhD project was developed and realised.

PERIOD	ACTION
Pre-experimental period	
Dec. 2015 – April 2016	Meetings with actors that could be potentially interested in the activation of a choice architecture project in the area of food. Meetings were held with several actors, among others, with the Director General of the Welfare area of the Lombardy Region; with the Socio-Sanitary Director of the Niguarda hospital; and with the Director of the Diet and Nutrition area at Niguarda.
May 2016	Meeting and presentation of choice architecture and nudging strategies to the Director General of the Niguarda hospital.
May 2016	First meeting at Niguarda with the WHP team member in charge of the food area.
June 2016	▪ Second meeting with the WHP team members to understand the characteristics of the context, learn about the previous WHP initiative, discuss about the issues, and illustrate possible choice architecture strategies; ▪ In-depth exploration of the existing literature related to nudge interventions in the area of food and nutrition; ▪ First observation of the lunchrooms' environment.
July 2016	Presentation of the first project proposal to the Director General of the Niguarda hospital, who approved the activation of a choice architecture initiative in the domain of the WHP program.
Oct. 2016	General meeting with all the WHP team members and CIR Food representatives, to present the project, discuss possible choice architecture strategies, and discuss the feasibility of the initiatives.

Dec. 2016 – Feb. 2017	▪ Monthly update meetings with the WHP team ▪ 14/12/2016: presentation of the choice architecture project at the annual Workers Health Promotion conference held at Università Statale di Milano. ▪ Observations in field (footpath, behaviour of the customers, habitual pattern, staff behaviour) and photographic documentation; ▪ Completion of the literature analysis; ▪ Finalisation of the research project: selection of the nudges, experimental design and research hypotheses.
March 2017	General meeting with all the WHP team members and CIR Food representatives to present the final project, discuss the new arrangements in the lunchrooms and the idea of the video cameras, select the date of the initiative.
April 2017	▪ Ideation of the posters and the label to be employed in the lunchrooms; ▪ Graphic development of the posters and the label by a professional graphic designer;
May 2017	▪ Collaboration with the lawyer in charge at the Legal Office Administration of Niguarda to verify the legal requirements and ensure the protection of the privacy of the workers during the video recordings in the lunchrooms; ▪ Development of the written communication to inform the workers at Niguarda about a renewed WHP initiative, about the presence of the video cameras and the privacy procedures; ▪ Test for the positioning and set-up of the action cameras in each lunchroom. ▪ Communication to the workers (emails, intranet) about the renewed WHP initiative; and about the presence of the video cameras and the privacy policy; ▪ Meeting with the staff of the canteens.
Experimental period	
June 2017	▪ Daily set-up of the video cameras at the cash registers in each cafeteria and download of the videos after each recording session; ▪ Daily presence of one researcher in each lunchroom to monitor the functioning of the video cameras and to offer explanation for eventual questions or privacy concerns.
	▪ Start of the experiment: control condition (5th –9th June); ▪ Display at the entrance of each lunchroom of a placard to inform the customers about the presence of the video cameras; ▪ Creation of the excel database and observation of the recorded videos.
	▪ Implementation of the communication initiative (12th–16th June): display of the posters at the entrance of each lunchroom.

	▪ Implementation of the nudge interventions (19th – 23th June): application of the Like sticker and its explanatory poster in the northern lunchroom, and re-arrangement of the southern lunchroom for the salience nudge.
Post-experimental period	
July – August 2017	▪ Completion of the excel database with the observations from both lunchrooms; ▪ Statistical analysis.
September 2017	▪ Completion of the research chapter and discussion of the findings.
Follow-up activities	
October 2017 – onwards	▪ Presentation of the results of the initiative to the WHP team members, CIR Food representatives, and the Director General; ▪ Writing of the research papers and submission to scientific journals; ▪ Activation of new nudging initiatives in the lunchrooms in the following areas: salt reduction and portions control; ▪ Meeting with the WHP team member in charge of the area "contrast to smoking", to discuss the potential activation of a choice architecture initiative in this area.

Table 11. Timeline that illustrates the process of development and realization of the research project and the future activities that are envisaged.

4.2 The research

This section is entirely dedicated to the pre-experimental phase of the study, illustrating: the purpose of the research; some data on the population of workers at Niguarda; the process of preliminary observations; the experimental design and the research hypotheses; how the intervention has been measured; and finally, the ultimate steps for the implementation of the project.

4.2.1. Purpose of the research

What is a key health issue affecting the employees of the Niguarda Cà Granda hospital? As indicated in the previous paragraph, overweight (39,40%) and obesity (13,4%) are a spread matter among the workers, with data that reflect the Italian national statistics, revealing the representativeness of the sample. A key element involved in the employees' health safety concerns is their daily dietary patterns. The WHP team members were concerned over the employee's poor nutritional choices, therefore, the objective of this intervention is to support people in making improved food choices and eat more balanced meals. The target behaviour is poor nutrition choices that often lack the key components such as vegetables and fruits, and in line with the Good Practices of the WHP program, the category of whole wheat bread was added. The goal behaviour is to increase the customer's selection of vegetables sides or salads and fruit, and the selection of whole bread instead of white bread.

4.2.2. Population

The Niguarda Cà Granda Hospital has a total population of 4244 employees, divided in 1450 males and 2794 females. The lunchrooms serve food primarily to the employees, nonetheless since the cafeterias are open to the public, some students and visitors are also present. In average per week, and only at lunch hours, the cafeterias together serve meals for about 2600 employees, and for about 450 other clients (mostly students or visitors). In order to pay for their meal, the employees have to scan their badge at the cash registers, which implies that each person is registered each time it attends the lunchroom. However, due to the requirements of privacy protection, it was not

possible to have access to the personal data of the population. The only available information regarding the sample of the study is provided in paragraph 4.3.

4.2.3. Preliminary observations: mapping the context

The first step before launching a behaviour change initiative is to comprehend existing behaviours and the context in which they occur. The surrounding environment and its characteristics have a relevant influence on our perception determining choices and behaviour (Zajonc, 1984; Bargh, 1997; Bechara and Damasio, 2005; Thaler and Sunstein, 2008; Kahneman, 2011). Therefore, it is crucial to understand the environmental elements that shape food-related behaviour: to observe the context and its features identifying the elements that trigger choices, the presence of behavioural patterns and the influence of habitual or automatic internal mechanisms (Wansink, 2004; 2006; 2010). Several preliminary observations were conducted in each lunchroom, both when the cafeteria was closed and during its opening hours. Photographs and notes were taken at each time, and questions were asked to the cafeteria staff (e.g. "which shelves need to be replenished more often?"). Summer menus were also studied to analyse the available daily offer and to verify if the type of vegetables present every day were comparable. Cir Food plans in advance the daily menus that will be available for the coming month, the menu offer is repeated the successive month and remains the same for a whole season.

The footpath. In both cafeterias, the environment was carefully observed, walking in the same footpath that people use and trying to get a sense of people's experience in the space.

In the southern cafeteria, the overall walking path is that people arrives and line up at the hot dishes, or directly goes to the cold dishes in the central area (see Figure 29 for a map of the space). At the hot food serving area, the counter display first courses (the daily selection of pasta and/or rice), second courses (meat, fish or omelettes), and vegetables. The central area is composed by four counters, two on each side: on the left side, the first counter contains the "Complete Meal" (a single complete dish) while the second counter displays cheese and cured meat; on the right side, two counters display a selection of fresh salads. From there, the flow of people equally splits in one of the two corridors that display the same products on each side. Customers display the habit of walking directly to one of the aisles and toward the fridge counters, mostly ignoring a central counter that displays desserts (syrup fruit and cake slices) that require an extra fee to be purchased

(sales of this category are the lowest). This observation led to the decision to focus on the fridge counters, and to work in the area where people already has the habit to go, instead of disrupting the existing order. The fridge counters display a selection of fresh fruit, yogurt, pudding, fruit juices, and water. I observed if there was a shelf that needed replenishment more often, and which shelves were at eye-level and tray-level. Finally, people head toward the cash register where white bread, whole bread, and cracker/grissini are available, along with cutlery (see Figure 3 in the Appendix for a large map of the southern lunchroom). There is a further aisle that serves pizza, but it is located at the exit of the space, on the right of cash register n.1.

The northern cafeteria has a simpler layout (see Figure 1 in the Appendix). The space opens with the hot meal area, structured in the same order of the southern cafeteria. Proceeding on the right side of the hall room, the first counter displays the 'complete meal' followed by the fridge counters with fruit, yogurt, pudding and juice. On the opposite (left) side of the space, a series of counters display food in this order: first desserts (those purchasable for an extra fee), cheese and cured meats, fresh salads, and there is a pizza counter close to the cash registers.

Photographic documentation. Several photographs were taken and divided in two folders of about 25 photos per each lunchroom (see Appendix for a selection of the images). Photos were reviewed in group meetings in which we discussed the current layout and where improvement could be made. Photos were taken to represent both the overall view of the area ('the first impression') and the eye-level perspective, aa well as the areas of interest:

- Overall view of the area
- Eye-level and tray-level perspective
- Wall space, signs and posters
- Menu blackboard
- Where people line up at the hot food area
- Hot food serving area
- Cold food self-service area
- Salad bar
- Refrigerators displaying fruit
- Dessert area
- Bread basket
- Cutlery storage

This auditing phase of the consumption decision-making process allowed the identification of the environmental elements that did not favour people's optimal food choices, and the areas that would have benefited from a nudging strategy were identified. For instance, fresh salads were offered only in the counters located on the right side of the cafeteria, and since the corridors are separated by a metal barrier, many individuals who walked in the left corridor did not walk back to observe the offer of salads on the other side, or just did not notice them. Whole bread was also offered in a non-salient area, just close to the cash registers and displayed next to white bread. In the same way, the disposition of the fruit was not very noticeable, as shown in Figure 26.

Figure 26. View of the fridge counter displaying from the right: yogurt, pudding, water, fruit in a corner, and fruit juices.

4.2.4. Experimental design

The experimental design is a before-after design in two separate lunchrooms; the research was structured to follow three phases each of the duration of a week (working days only), as schematised in Table 8. The duration of the experimental period was defined based on the necessity of having a significant span of time to measure the choice behaviour (i.e. five days in each condition) and increase the sample size. At the same time, the three-weeks length seemed to the WHP team a fair and not excessively long period that they agreed upon. First, to have a **control condition**, the current situation in each lunchroom was monitored, therefore no changes were made

in the cafeterias during this week. The patterns of choice observed during phase 1 of the study represent the baseline that will be compared with the data gathered successively in the intervention weeks, to verify the desired changes in consumption. In **phase 2** three posters were positioned at the entrance of each cafeteria, evoking the food categories to encourage, with the slogan "Your best choice". This phase has been distinguished from the following to control for its eventual influence, to isolate this variable and maintain a more accurate experimental design, even if we did not expect classic persuasion-based communication to have a relevant effect.

Lastly, in **phase 3**, the nudges were activated, namely labelling in the northern cafeteria, and salience at the southern cafeteria. The experimental research was carried out for three weeks (Monday to Friday), with weekly video recordings (see paragraph 4.2.5) during the lunch opening hours (from 11.00 to 14.30 at the northern cafeteria, and from 12.00 to 14.30 at the southern cafeteria). The following two paragraphs provide more detail on phase 2 and 3.

PHASE	DURATION	NORTHERN LUNCHROOM	SOUNTHERN LUNCHROOM
1	Five days	Baseline	Baseline
2	Five days	Communication: 3 posters	Communication: 3 posters
3	Five days	Nudge: labelling	Nudge: salience

Table 6. Experimental design of the study.

4.2.4.1. Communicating the best choice

Following the requirement of the WHP program (see the Good Practices outlined in Regione Lombardia, 2014), a communication initiative was included in the intervention. This phase was added to comply with the requirement of the program and thereby to meet the needs of the Niguarda WHP team. However, we did not expect relevant results from this phase, since communication targets System 2 and therefore requires deliberate, conscious information processing (Stanovich and West, 2000; Kahneman, 2011). Rather than conducting a general communication campaign on healthy nutrition, we took advantage of the communication phase by connecting it to the nudge intervention. Therefore, the communication materials were developed to focus explicitly on the key food items that were at the heart of the nudge intervention. Three posters were developed to convey the concept of healthy nutrition and to explicitly indicate the categories of food to select: fruit, vegetables (generic poster), and whole bread. The layout of the

posters was kept very simple and neat to facilitate immediate cognitive processing, and the headline was “Your best choice” (i.e. in Italian “La tua scelta migliore”) to encourage goal pursuit (see Custers and Aarts, 2010). To improve the visibility of the target items, the images were especially large, in the attempt to use the posters to prime people activating the idea in their mind of healthy food (see Bargh, 1990; Aarts and Dijksterhuis, 2003; Bargh, 2006; Bateson et al., 2006).

Figure 37. The posters that evoke the key food categories to nudge.

4.2.4.2. Selection of the nudges

Environmental support for nutrition entails the design of a space that encourages proper nutrition, where healthy food options are appropriately displayed for easy identification. Two simple strategies were identified to be suitable for the context, especially in a long-term perspective of maintenance of the intervention. Niguarda Cà Granda hospital is a public structure and keeping low costs is a top priority as funds are limited. Therefore, we developed an initiative that entailed an exclusively initial and low-cost expenditure, which was totally sustainable in the long run. Indeed, one of the tenets of the nudging discipline is also its low costs, which facilitated the acceptance of the project by Niguarda’s executive director and by the representatives of CIR Food. Two were the nudges selected: labelling and salience. As discussed in the previous chapter, these strategies have proved to be successful, and maintain the public’s freedom of choice by making non-intrusive changes. Given the presence of two lunchrooms, we decided to test only one nudge in each canteen, in order to have a clearer experimental plan and separate the variables.

Labelling. Labelling was the selected nudge for the northern cafeteria. Because of the simpler disposition of its spaces, labelling seemed to be more appropriate to be employed in this lunchroom. The initial idea was to replicate the traffic light intervention (see Jones and Richardson, 2007; Temple et al., 2011; Thorndike, 2012) to test its effectiveness in a new cultural context. However, the challenging nature of the circumstances at Niguarda, casted doubts on the potential issues that could have arisen from the use of the red and yellow labels. The members of the WHP team worried that especially the red label could be perceived as punitive and easily trigger hostile reactions by the already discontent public of the lunchroom. Therefore, the 'Like' label was created: a green label to positively support the decision-making process and guide people towards the selection of the key food categories (fruits, vegetable sides, salads whole bread). The smiley face has been added to positively connotate the target items, in the attempt to influence peoples' affective associations (Kiviniemi et al., 2007; Kiviniemi and Duangdao, 2009; Keer et al., 2010). The Like label was accompanied by a poster displayed at the entrance, providing brief instructions (i.e. "The Like label suggests you what are the best food items for your health. It has been developed to help you increase your consumption of vitamins, minerals, and fibres"). The instructions concluded with the prompt "Follow it!" (Figure 28). An image that illustrates the layout of the northern lunchroom before and after the intervention is available in the Appendix (Fig. 1 and 2, pag. 176).

Figure 28. The Like label and the explanatory poster with the prompt "Follow it!".

Salience. Salience was the selected nudge to be employed at the southern cafeteria. The purpose of this nudge is to change the layout to make the key food categories more salient, immediately more visible, and easier to select. Several actions (Table 13) were designated for each category:

Whole wheat Bread	Fruit	Salads	Vegetable sides
Make it more salient and a sort of 'default option' by offering it right at the entrance close to the trays; and on a table in the central area.	Place fruit in all the lower shelves (tray-level) and in all the mid shelves (eye-height) to make it more visible and convey the impression of increased variety.	Offer the salads on both sides of the hallway and display them in the first counters of the central space.	Make vegetable side-dishes more salient by moving them in the first position in the hot food line. In this way, vegetables are the first food that people see when they reach the hot food counter.

Table 13. The healthy items to nudge and the actions planned.

To attract people's attention and guide choices, the key food items were positioned in a strategic manner: vegetables were displayed first in the hot food line (i.e. according to Wansink and Hank's rule "first food most"); fresh salads were finally more visible; the offer of fresh fruit was increased in size; while whole wheat bread was made available in different locations in the lunchroom.

The following page provide two images that show the layout of the southern lunchroom before and after the intervention (Figure 29; see Appendix for a larger image). It is important to point out that the change in the positioning of the vegetable side-dishes entailed a change also in the disposition of the second and first courses. In fact, the cafeteria staff pointed out that because they primarily serve vegetables to accompany the protein-based option (i.e. meat, fish, eggs), in order to avoid hopping from one side to the other behind the counter and maintain the service fast, the two options should be located close to one another. Their opinion was backed by other members of the WHP team, so we accepted this alteration in the arrangement, quite unconvinced but interested about the outcomes. Hence, the new arrangement displayed vegetables first, followed by protein-based options, and first courses. Basically, the order of the hot meal counter was reversed.

In the fridge counters, the salience of fruit was altered by simply increasing the quantity of the produce displayed, and by filling the lower and two central shelves of the fridge counter (see Figures 30 and 31). The variety of the fruit offered remained the same, however the layout was more appealing, and it conveyed the impression of an increased variety.

As illustrated in chapter 4, increasing the perceived variety of an assortment can induce a person to consume more, even if the real variety of the assortment is not increased, the mere alteration of the layout can increase consumption. According to Wansink (2004) reasons behind this may be that perceived variety is associated with a higher level of enjoyment; or that perception of an increased variety suggests a consumption norm.

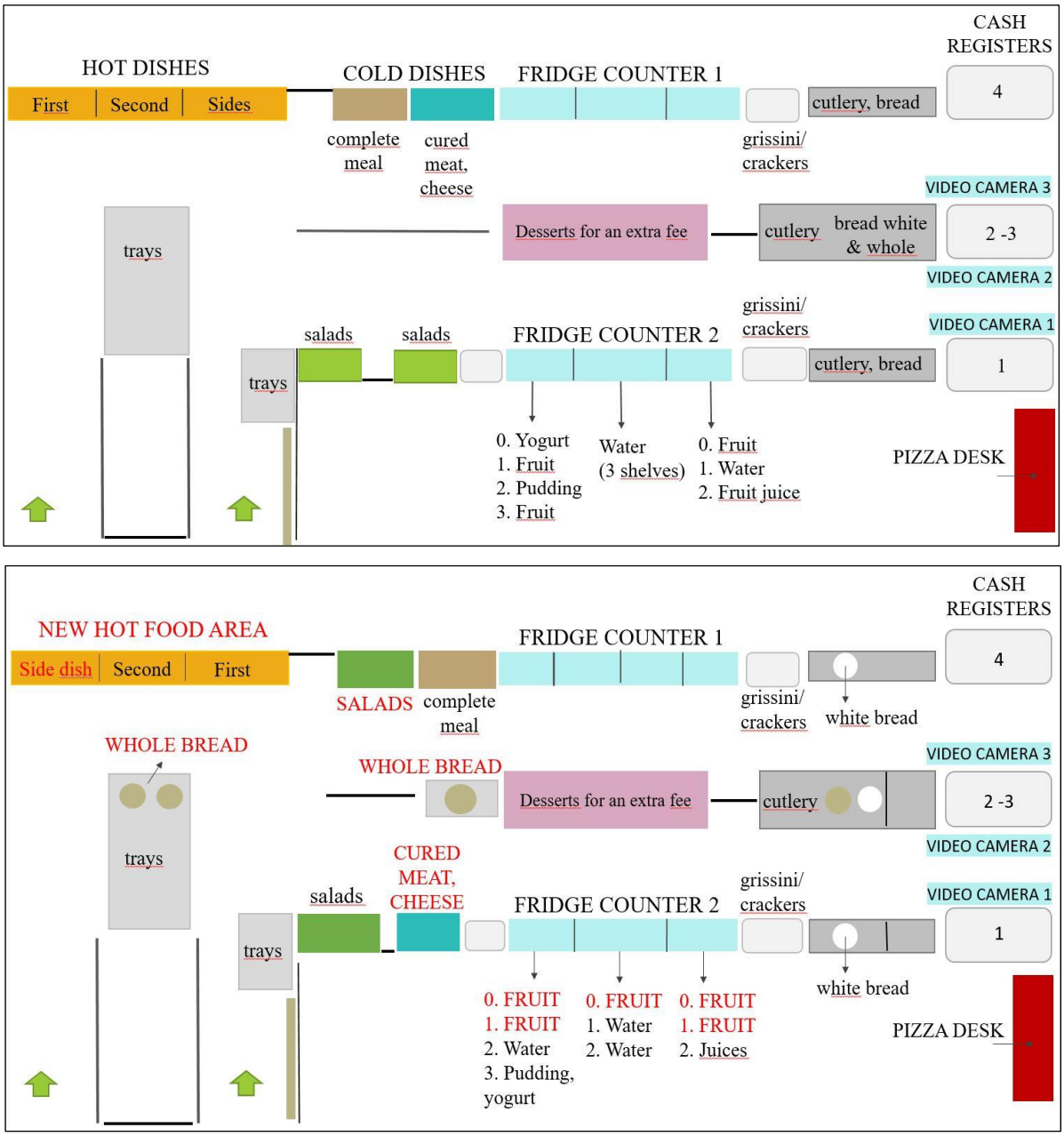


Figure 29. Maps of the southern lunchroom: above during the baseline and phase 2, and below during the nudging intervention.

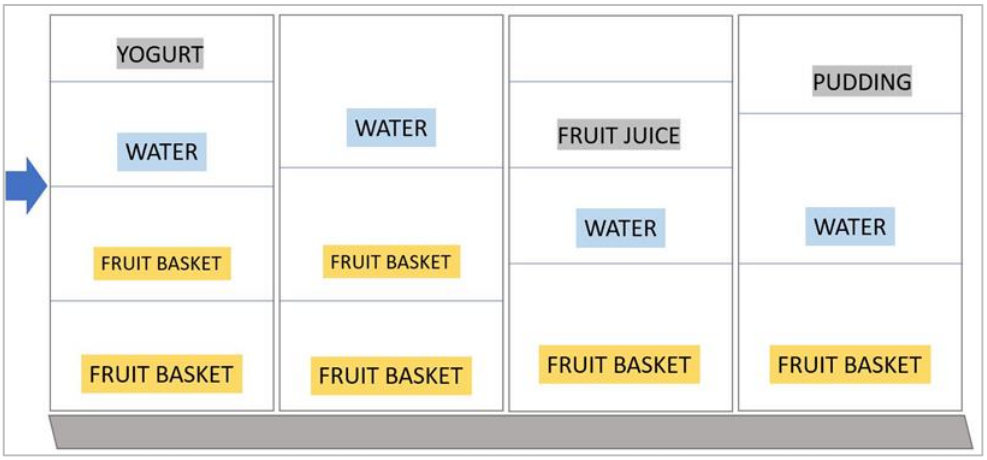


Figure 30. The new arrangement of the fridge counter located on the left side of the hallway.

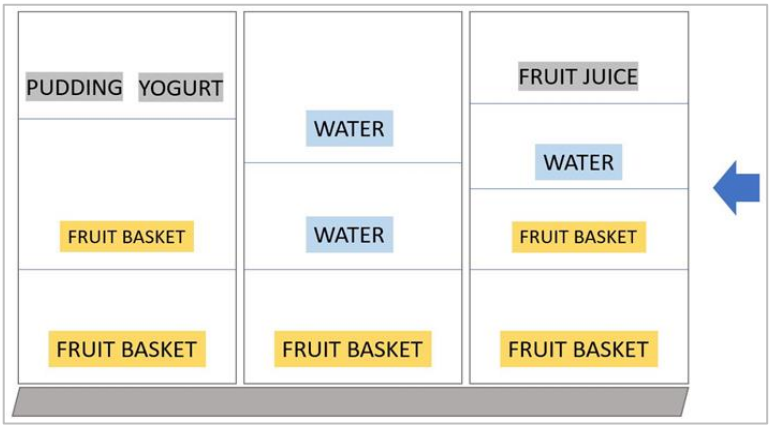


Figure 31. The new arrangement of the fridge counter located on the right side of the hallway.

While yogurts, puddings and fruit juices were not the direct target of the intervention in the fridge counters, the alteration to the display of fresh fruit impacted on these products. Thus, we took the opportunity to make these items less noticeable by positioning them in the upper shelves. During the observations, we noticed that people often selected fruit juice instead of fresh fruit, or added yogurt or pudding to their tray already rich in carbohydrate such as pasta and bread. That snacks are rich in sugars is well-known. However, many sugars are also hidden in unsuspected foods such as yogurt, especially those enriched with fruit. If we are to comply with the invitation to contain sugar consumption launched by the World Health Organization and the scientific community, we must take this fact into account. According to the latest indications of the World Health Organization (2015), total daily sugar intake should be maintained within 10% of the total intake of ingested calories, and possibly less than 5%. Yogurt is certainly not junk food, yet it contains a fair amount of simple sugars. Fruit yogurt jars, generally - apart from some exceptions - are

prepared with a fruit puree that makes the sugar content about 14/16 grams per unit. In the yogurt available in the Niguarda lunchrooms (125 grams jar from a known brand), the sugar content was 15.6 g per unit. The same is true for puddings that are loaded with simple sugars: the pudding pots available in the cafeteria contained 17.25 grams of sugar per unit. Therefore, it is preferable to consume fresh fruit, which in addition to its natural sugary content provides vitamins and minerals, along with fibres that modulate the absorption of sugar.

4.2.4.3 Research hypotheses

Based on the experimental design, the following research hypotheses have been formulated:

Hypothesis 1: The use of the communication materials during the second week may prime the idea of healthy food increasing the choice of the target items compared to the baseline, but relevant results are not expected because the intervention targets System 2.

Hypothesis 2: The effect of the manipulation of the environmental stimuli through the labelling intervention will be greater than the effect of the communication intervention and increase the selection of the target items.

Hypothesis 2a: The use of a green label in the northern lunchroom to indicate the healthy options, will positively prime people and guide choices, increasing the consumption of the target items, compared to the baseline.

Hypothesis 3: The effect of the manipulation of environmental stimuli through the nudge of salience will be greater than the effect of the communication intervention and increase the selection of the target items.

Hypothesis 3a: Manipulating the salience of whole bread by offering it in several points in the southern lunchroom will increase the choice of this item, compared to the baseline.

Hypothesis 3b: Manipulating the salience of fresh fruit in terms of perceived variety will increase the choice of this category, compared to the baseline.

Hypothesis 3c: The manipulation of the display of fresh fruit in the fridge counters entailed the relocation of fruit juices, yogurt, and pudding on the higher shelves, making these items less salient. This manipulation may decrease the choice for these items, compared to the baseline.

Hypothesis 3d: Manipulating the salience of salads by displaying them in the first counters located on each side of the central area will increase the choice of this category, compared to the baseline.

Hypothesis 3e: Manipulating the salience of vegetable sides by offering them at the beginning of the hot food counter will increase the choice of this category, compared to the baseline.

4.2.5. Measuring the intervention

The issue about how to calculate the results of the intervention has been a matter of discussion for some time. Initially, the idea was to carry out systematic observations in field, with three researchers per cafeteria standing at the exit of the cash registers, observing people's trays and writing down their choices. However, in two cafeterias in which each serve up to 700 meals only at lunch hours, classic observations in field would have been fairly burdening, and the risk of errors occurring in the process of rapidly reporting the observed data was not indifferent. Furthermore, the presence of three researchers observing each day for three weeks the passing trays, was likely to be perceived as invasive or annoying by the public. Therefore, we decided to employ small action cameras to capture the passing trays, one for each cash register, with no interruption during the lunch hours. The video cameras ensure a continuous and error-free observations of the meal compositions and are less salient than the physical presence of human observers. A further advantage of these cameras is their small dimension and ease of use, so they could be easily placed and removed every day (see Figure 32).

The lawyer in charge at the Legal Office Administration of Niguarda supported us in this process, since Art. 4 par. 2 of the Workers' Statute provides that control systems and equipment that are required by organisational and productive needs or work safety, which also result in the remote control of the workers, can only to be installed through prior agreements. One month was necessary to develop and sign an agreement and define the appropriate indications to attach to the employee communications. To protect the privacy of workers and visitors of the hospital, in the lunchrooms the action cameras were accurately positioned at the cash registers, and the zoom was adjusted to frame exclusively the trays to observe the meal composition. No faces nor full body figures were ensured to be filmed. A trained field researcher was daily present at each cafeteria to set up the video cameras and remove them at the end, to monitor their correct functioning, and to answer any

eventual questions from the public in relation to privacy or the scope of the initiative. Three action cameras were employed in each lunchroom, since only three lines of payment are open and the fourth cash register is permanently closed.

Figure 32. A video camera at the cash register and a frame from the recorded video displaying a 'healthy tray', in which whole bread, salad and fruit are present.

4.2.6. Implementation

For the success of the initiative, and the prevention of any issue or complaint, especially regarding privacy, a communication plan was defined in agreement with the WHP team members. Communication was carefully written by us to avoid influences and without revealing anything about the nudging intervention. During the month preceding the initiative, employees received information through intranet posts and emails of a renewed start of the WHP program in the domain of nutrition. Communications informed about the presence for three weeks of the video cameras in the lunchrooms, underlying that measures had been taken to protect the privacy of the workers and the public, and that the experimental intent was merely to observe the patterns of consumption. Communication stated that "*The data will only be processed by the research team, who will to delete any material or frame containing elements that could be associated to the person, such as badges left on the tray*".

Presenting communication in the right way can be crucial in determining the perception, and therefore the behaviour of people. Aware of the criticisms received the first year of implementation

of the WHP project, and of the former lack of an effective communication, we took extra care in defining this phase's activity. In 2015, the WHP intervention that failed was more paternalistic as people were required to add a portion of vegetables and fruit in their meal composition, and fruit was no longer non-exchangeable with other products (yogurt/pudding/juice). Therefore, the communication stressed that the purpose of the new WHP initiative was not to modify the food offer or the menu composition, but to generally promote healthy eating by maintaining freedom of choice. In addition, the first day of the initiative an information plaque was positioned at the entrance of the cafeterias to immediately indicate the presence of the video cameras. To avoid influencing people about the purpose of the search, the placard contained simple and generic information:

> Dear employees and visitors,
>
> A research is currently underway in the context of the Workers Health Promotion program. To see if we are doing a good job, we will film the trays using GoPro video cameras located at the cash registers. We will not be able to trace back to users, so your choices will remain anonymous.
>
> We thank you for your collaboration,
> WHP team and IULM research team

Indeed, despite the accuracy devoted to preventing people from being influenced by the communication, some effect may have occurred. On the one hand, communication was mandatory because of the hospital requirement to protect the privacy of its workers; on the other hand, it was also necessary to prevent the harsh complaints that caused the first WHP project to fail in 2015.
The week before the start of the experiment, cafeteria staff was informed about the project. Staff was not informed about the purpose of the research to prevent the diffusion of any information that may have influenced people's behaviour and thereby the outcome of the project. Instead, staff received information about the video camera and the privacy policy, that no faces or bodies were going to be filmed and neither the cashiers. We told them that if a person had issues with their tray being observed, cameras could be obscured at any time by simply putting the hand in front of the camera lens. This actually happened a few times. Staff was also invited to simply answer that consumption choices were being observed by the researchers of an external university, and that further questions could be answered by the researcher present in the lunchroom. Finally, staff was also asked to make sure that the food items were always available and continually replenished.

4.3 Presentation of data and findings

The data in Figure 33 shows the daily number of employees eating in the lunchrooms during the three weeks of the study. The label 'employees' refers to all the workers with indefinite and temporary contract; the label 'external workers' refers to the workers with fixed-term contract (e.g. freelance or similar).

JUNE	5	6	7	8	9	12	13	14	15	16	19	20	21	22	23	TOTAL
External W. (Southern)	107	99	95	120	101	120	97	130	119	107	114	111	96	117	109	1.642
Employees (Southern)	523	568	553	517	522	538	523	543	537	532	536	536	526	523	508	7.985
TOTAL SOUTHERN LUNCHES	**630**	**667**	**648**	**637**	**623**	**658**	**620**	**673**	**656**	**639**	**650**	**647**	**622**	**640**	**617**	**9.627**
External W. (Northern)	152	166	187	152	158	166	171	163	165	145	153	159	160	151	151	2.399
Employees (Northern)	707	725	679	666	655	668	693	688	656	641	667	695	694	642	606	10.082
TOTAL NORTHERN LUNCHES	**859**	**891**	**866**	**818**	**813**	**834**	**864**	**851**	**821**	**786**	**820**	**854**	**854**	**793**	**757**	**12.481**

Figure 33. Daily number of employees who ate at the lunchrooms during the three weeks of the intervention.

Data in Figure 34 shows the daily number of external visitors in that ate lunch in each cafeteria during the three weeks of the intervention:

JUNE	Mon	Tue	Wed	Thu	Fri	Mon	Tue	Wed	Thu	Fri	Mon	Tue	Wed	Thu	Fri
Southern	81	85	76	88	83	94	105	97	75	93	73	72	78	77	77
Northern	82	91	86	79	85	82	76	85	94	86	83	75	81	86	74
TOTAL	**163**	**176**	**162**	**167**	**168**	**176**	**181**	**182**	**169**	**179**	**156**	**147**	**159**	**163**	**151**

Figure 34. Daily number of visitors who ate at the lunchrooms during the three weeks of the intervention.

Because of the large amount of data, a sampling procedure was conducted by observing only 1 out of 5 trays in the video. In this way, in the Northern lunchroom, we observed: 789 trays in week 1; 791 trays in week 2; and 670 trays in week 3. The presence of less observations during the third week is due to a functioning error, for which we lost the recordings of two cameras on Wednesday. In the Southern lunchroom, we observed: 673 trays in week 1; 702 trays in week 2; 690 trays in week 3. Since the purpose of the experimental research was to increase the consumption of healthy foods (whole bread, fruit, salads, vegetable sides) and to test the effectiveness of the nudge, a score of 0/1 was assigned to indicate the absence or the presence of each target item on the tray (see Figure 35). The exact point in time (hour: minute: second) of appearance of the observed tray in the video, was also recorded in the file. Additionally, to verify if the intervention determined any drop or increase in the choice of substitute products, the 0/1 score was also assigned the following items: fruit juice, yogurt, puddings that may substitute fresh fruit; white bread and grissini/crackers (one category) that are the substitutes for whole bread. Since salads and vegetables sides had no direct substitutes, no other products have been added to the present analysis.

	A	B	C	D	E	F	G
1				TARGET ITEMS			
2	DAY	ID	TIME	Whole Bread 1	Fruit 1	Salads 1	Vegetable sides 1
3	Monday camera 1	1	12:03:47	1	1	1	0
4	Monday camera 1	2	12:04:51	0	0	1	0
5	Monday camera 1	3	12:07:39	0	0	0	1
6	Monday camera 1	4	12:08:39	1	0	0	1
7	Monday camera 1	5	12:09:20	0	0	0	1
8	Monday camera 1	6	12:11:48	0	1	1	0
9	Monday camera 1	7	12:12:49	0	0	0	1
10	Monday camera 1	8	12:13:39	0	0	0	1
11	Monday camera 1	9	12:15:13	0	0	0	0
12	Monday camera 1	10	12:16:00	1	1	1	0
13	Monday camera 1	11	12:17:43	1	0	1	0
14	Monday camera 1	12	12:20:29	0	0	0	1
15	Monday camera 1	13	12:24:32	0	1	0	0
16	Monday camera 1	14	12:26:51	0	1	1	0
17	Monday camera 1	15	12:28:34	0	0	0	1
18	Monday camera 1	16	12:31:41	0	0	1	0

Figure 35. Excerpt of the database collecting the observations. The number 1 near each item indicates the baseline condition. The score 0 indicates that the item was not selected, the score 1 indicates that the item was selected.

Weekly food choice patterns in both lunchrooms were examined using Chi-Square tests (χ^2). The test is adequate to observe whether the subjects have or do not have a certain behaviour; all the results are reported in contingency tables. In this section, the results of each research hypothesis are provided. Note that there is one hypothesis to assess the impact of the labelling intervention (H2a), whereas since the salience intervention came in many forms, the food items have a specific research hypothesis.

4.3.1 Comparing the populations of the two lunchrooms

The first analysis conducted on the data have the primary purpose of comparing the two populations that belong to the northern lunchroom and the southern lunchroom. These two blocks represent the two groups of observations on which the analysis is based: with such a separation, the first necessity is to consider the existence of a distributive independence between the eating behaviours of the two samples, justifying a separate study in each lunchroom and understanding whether they are comparable.

In order to determine an adequate index of independence between the two distributions, a Chi-Square test was conducted to compare the dietary behaviour of the two populations.

			FOOD ITEMS									Total
			Whole Bread	Fruit	Salads	Vegetable Sides	Fruit Juice	Yogurt	Pudding	White Bread	Grissini/ Crackers	
BLOCK	**Northern Lunchroom**	Count	211	244	236	335	113	124	67	67	242	1639
		% of GROUP	12,9%	14,9%	14,4%	20,4%	6,9%	7,6%	4,1%	4,1%	14,8%	100,0%
		% of FOOD	53,8%	54,8%	59,1%	51,1%	60,4%	55,6%	50,8%	56,8%	62,9%	55,8%
		% of TOTAL	7,2%	8,3%	8,0%	11,4%	3,8%	4,2%	2,3%	2,3%	8,2%	55,8%
	Southern Lunchroom	Count	181	201	163	320	74	99	65	51	143	1297
		% of GROUP	14,0%	15,5%	12,6%	24,7%	5,7%	7,6%	5,0%	3,9%	11,0%	100,0%
		% of FOOD	46,2%	45,2%	40,9%	48,9%	39,6%	44,4%	49,2%	43,2%	37,1%	44,2%
		% of TOTAL	6,2%	6,8%	5,6%	10,9%	2,5%	3,4%	2,2%	1,7%	4,9%	44,2%
Total		Count	392	445	399	655	187	223	132	118	385	2936
		% of GROUP	13,4%	15,2%	13,6%	22,3%	6,4%	7,6%	4,5%	4,0%	13,1%	100,0%
		% of FOOD	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
		% of TOTAL	13,4%	15,2%	13,6%	22,3%	6,4%	7,6%	4,5%	4,0%	13,1%	100,0%

Table 14. Contingency Table – Blocks/Food items.

Table 14 shows the contingencies related to the distribution of the food choices in the two different lunchrooms, while Table 15 illustrates the results of the relative Chi-Square test. From this preliminary analysis, it emerges that the set of choices analysed in the baseline weeks in the 2

blocks are substantially different. In fact, the significance value of Cramer's V is significantly lower than 0,05: this allows us to reasonably reject the null hypothesis, that is, the independence of the two blocks given the sufficient difference between the theoretical frequencies and the observations.

Chi-Square			
	Value	df	Asymp. Sig.. (2 tailed)
Pearson Chi- Square	19,166	8	,014
Likelihood Ratio	19,260	8	,014
N. of valid cases	2936		

Symmetric Measures			
		Value	Approx. Sig.
	Phi	,081	,014
	Cramer's V	,081	,014
N. of valid cases		2936	

Table 15. Chi Square test - Blocks/Food items.

Hence, it is possible to conclude that the two blocks (i.e. lunchrooms) are characterised by two populations that display different eating behaviours. This supports the necessity of a separated analysis of the pattern of food choices occurred in the second week of the experiment.

4.3.2 Effect of the communication initiative

> **Hypothesis 1**: *The use of the communication materials during the second week may prime the idea of healthy food increasing the choice of the target items compared to the baseline, but relevant results are not expected because the intervention targets System 2.*

Once the separate study in the two lunchrooms has been justified, the first hypothesis to verify is whether the posters added in the lunchrooms during the second week were effective in communicating the concept of the healthy food categories to the public, thereby increasing the choice of target items. In order to do that, for each lunchroom the distribution of frequencies of the food choices has been analysed, by cross-checking the data on the choices of both the target and the non-target food items compared to the presence or not of the communication intervention. Table 16 shows the data for the northern lunchroom, while Table 17 displays the relative Chi-Square test:

Northern Lunchroom			FOOD ITEMS									Total
			Whole Bread	Fruit	Salads	Vegetable Sides	Fruit Juice	Yogurt	Pudding	White Bread	Grissini/ Crackers	
TYPOLOGY	BASELINE	COUNT	211	244	236	335	113	124	67	67	242	1639
		% of TYPOLOGY	12,9%	14,9%	14,4%	20,4%	6,9%	7,6%	4,1%	4,1%	14,8%	100,0%
		% of FOOD	49,9%	45,8%	51,9%	55,5%	51,6%	46,3%	51,9%	54,9%	54,4%	51,3%
		% of TOTAL	6,6%	7,6%	7,4%	10,5%	3,5%	3,9%	2,1%	2,1%	7,6%	51,3%
	COMMUNICATION	COUNT	212	289	219	269	106	144	62	55	203	1559
		% of TYPOLOGY	13,6%	18,5%	14,0%	17,3%	6,8%	9,2%	4,0%	3,5%	13,0%	100,0%
		% of FOOD	50,1%	54,2%	48,1%	44,5%	48,4%	53,7%	48,1%	45,1%	45,6%	48,7%
		% of TOTAL	6,6%	9,0%	6,8%	8,4%	3,3%	4,5%	1,9%	1,7%	6,3%	48,7%
TOTAL		COUNT	423	533	455	604	219	268	129	122	445	3198
		% of TYPOLOGY	13,2%	16,7%	14,2%	18,9%	6,8%	8,4%	4,0%	3,8%	13,9%	100,0%
		% of FOOD	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
		% of TOTAL	13,2%	16,7%	14,2%	18,9%	6,8%	8,4%	4,0%	3,8%	13,9%	100,0%

Table 16. Contingency table – communication intervention/Food items (northern lunchroom).

Chi-Square			
	Value	df	Asym. Sig. (2 tailed)
Pearson Chi- Square	16,166a	8	,040
Likelihood ratio	16,182	8	,040
N. of valid cases	3198		

Symmetric Measures			
		Value	Approx. Sig.
Nominal by nominal	Phi Coefficient	,071	,040
	Cramer's V	,071	,040
N. of valid cases		3198	

Table 17. Chi Square test – Northern Lunchroom Communication/Food items (northern lunchroom).

In the following page, Table 18 shows the results for the southern lunchroom, while Table 19 shows the results of the relative Chi-Square test.

Southern Lunchroom			FOOD ITEMS									Total
			Whole Bread	Fruit	Salads	Vegetable Sides	Fruit Juice	Yogurt	Pudding	White Bread	Grissini/ Crackers	
TYPOLOGY	BASELINE	COUNT	181	201	163	320	74	99	65	51	143	1297
		% of TYPOLOGY	14,0%	15,5%	12,6%	24,7%	5,7%	7,6%	5,0%	3,9%	11,0%	100,0%
		% of FOOD	51,7%	46,3%	42,6%	52,2%	47,1%	49,3%	50,8%	39,2%	46,7%	48,0%
		% of TOTAL	6,7%	7,4%	6,0%	11,8%	2,7%	3,7%	2,4%	1,9%	5,3%	48,0%
	COMMUNICATION	COUNT	169	233	220	293	83	102	63	79	163	1405
		% of TYPOLOGY	12,0%	16,6%	15,7%	20,9%	5,9%	7,3%	4,5%	5,6%	11,6%	100,0%
		% of FOOD	48,3%	53,7%	57,4%	47,8%	52,9%	50,7%	49,2%	60,8%	53,3%	52,0%
		% of TOTAL	6,3%	8,6%	8,1%	10,8%	3,1%	3,8%	2,3%	2,9%	6,0%	52,0%
TOTAL		COUNT	350	434	383	613	157	201	128	130	306	2702
		% of TYPOLOGY	13,0%	16,1%	14,2%	22,7%	5,8%	7,4%	4,7%	4,8%	11,3%	100,0%
		% of FOOD	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
		% of TOTAL	13,0%	16,1%	14,2%	22,7%	5,8%	7,4%	4,7%	4,8%	11,3%	100,0%

Table 18. Contingency table – Communication intervention/Food items (southern lunchroom).

Chi-Square			
	Value	df	Asym. Sig. (2 tailed)
Pearson Chi- Square	16,082a	8	,041
Likelihood ratio	16,138	8	,040
N. of valid cases	2702		

Symmetric Measures			
		Value	Approx. Sig.
Nominal by nominal	Phi coefficient	,077	,041
	Cramer's V	,077	,041
N. of valid cases		2702	

Table 19. Chi-Square test – Communication intervention/Food items (southern lunchroom).

The significance of the two Chi-Square tests shows that in both lunchrooms there is a tie of dependence, albeit not very high (p = 0,040), between the choice behaviour of the target foods and the presence of the communication initiative.

The changes in choice is illustrated in Figure 36, which shows the positive or negative variation of each target food items as well as the non-target products.

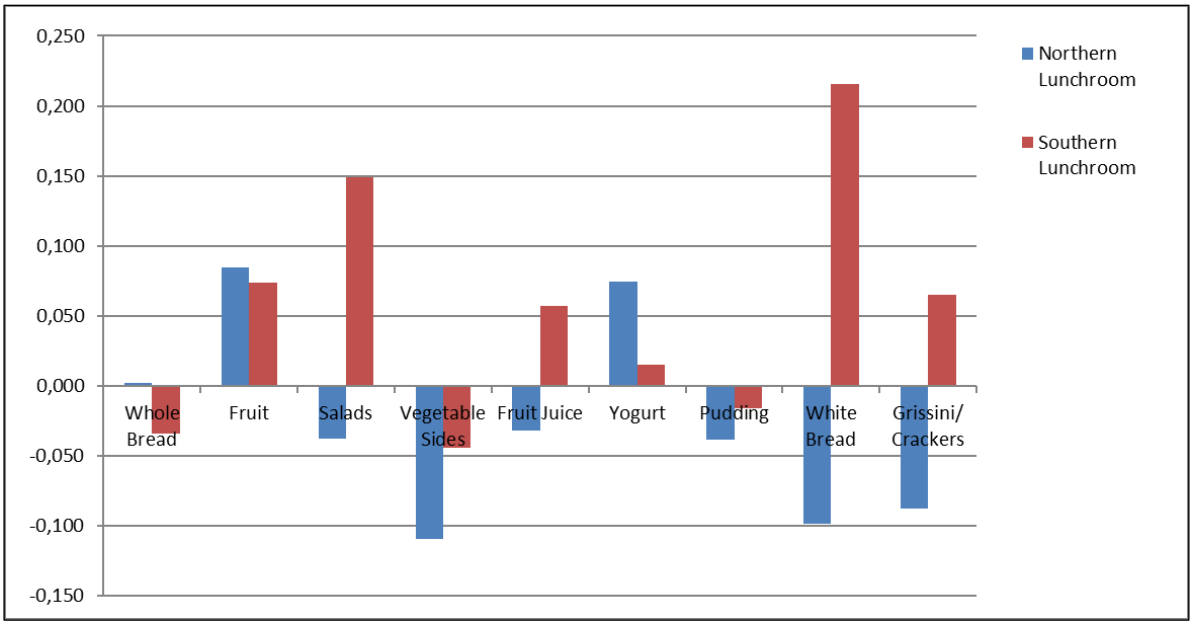


Figure 36. The changes of food choices for the target and the non-target items.

	Whole Bread	Fruit	Salads	Vegetable Sides	
Northern Lunchroom	0,2%	8,4%	-3,8%	-10,9%	
Southern Lunchroom	-3,4%	7,4%	14,8%	-4,4%	
	Fruit Juice	**Yogurt**	**Pudding**	**White Bread**	**Grissini/Crackers**
Northern Lunchroom	-3,2%	7,5%	-3,9%	-9,8%	-8,8%
Southern Lunchroom	5,7%	1,5%	-1,6%	21,5%	6,5%

Table 20. The exact percentage in the changes of food choice.

In the northern lunchroom, only the selection of fruit increased (+ 8,4%), whole bread did not vary (+ 0,2%), while the selection of salads (- 3,8%) and vegetable sides (- 10,9%) oddly decreased. Among the extra items observed, yogurt was selected more compared to the baseline (+ 7,5%), while the selection of the other non-target items decreased.

In the southern lunchroom, the selection of fruit (+ 7,4%) and salads (+ 14,8%) considerably increased, while the selection of whole bread (- 3,4%) and vegetable sides (- 4,4%) decreased. Among the extra items, the selection of white bread, fruit juice, and grissini/crackers increased. The outcome of this analysis is in line with hypothesis 1, in which some results were expected – demonstrated in the case of fruit and salads - but not relevant results because the intervention targets System 2.

4.3.3. Effect of the labelling nudge in the northern lunchroom

Hypothesis 2: *The effect of the manipulation of the environmental stimuli through the labelling intervention will be greater than the effect of the communication intervention and increase the selection of the target items.*

Hypothesis 2 considers the effect on food choices of the labelling nudge, compared to the communication initiative. The results show, during week 3 compared to week 2, a positive variation in the selection of salads, a slight increase in the selection of fruit, and a negative variation in the selection of whole bread and vegetable sides. The selection of fruit juices, yogurt, pudding, and grissini/crackers decreased, while the selection of white bread increased (accordingly with the decrease in the selection of whole bread).

Northern Lunchroom			FOOD ITEMS									Total
			Whole Bread	Fruit	Salads	Vegetable Sides	Fruit Juice	Yogurt	Pudding	White Bread	Grissini/ Crackers	
TYPOLOGY	LABELLING	COUNT	188	300	262	244	58	109	34	58	168	1421
		% of TYPOLOGY	13,2%	21,1%	18,4%	17,2%	4,1%	7,7%	2,4%	4,1%	11,8%	100,0%
		% of FOOD	47,0%	50,9%	54,5%	47,6%	35,4%	43,1%	35,4%	51,3%	45,3%	47,7%
		% of TOTAL	6,3%	10,1%	8,8%	8,2%	1,9%	3,7%	1,1%	1,9%	5,6%	47,7%
	COMMUNICATION	COUNT	212	289	219	269	106	144	62	55	203	1559
		% of TYPOLOGY	13,6%	18,5%	14,0%	17,3%	6,8%	9,2%	4,0%	3,5%	13,0%	100,0%
		% of FOOD	53,0%	49,1%	45,5%	52,4%	64,6%	56,9%	64,6%	48,7%	54,7%	52,3%
		% of TOTAL	7,1%	9,7%	7,3%	9,0%	3,6%	4,8%	2,1%	1,8%	6,8%	52,3%

Table 21. Results of the labelling intervention/communication initiative.

Chi-Square			
	Value	df	Asym. Sig. (2 tailed)
Pearson Chi-Square	30,822a	8	,000
Likelihood Ratio	31,109	8	,000
N. of valid cases	2980		

Table 22. The relative Chi-Square test.

Hypothesis 2a: *The use of a green label in the northern lunchroom to indicate the healthy options, will positively prime people and guide choices, increasing the consumption of the target items, compared to the baseline.*

Hypothesis 2 takes into account, for the northern lunchroom table, the labelling intervention and its influence over the selection of target and non-target items. The contingency table displays a positive variation (or change in the relative frequencies) of the choice behaviour for fruit and salads. However, the selection of whole bread and vegetable sides has decreased compared to the baseline.

Northern Lunchroom			FOOD ITEMS									Total
			Whole Bread	Fruit	Salads	Vegetable Sides	Fruit Juice	Yogurt	Pudding	White Bread	Grissini/ Crackers	
TIPOLOGY	BASELINE	COUNT	211	244	236	335	113	124	67	67	242	1639
		% of TYPOLOGY	12,9%	14,9%	14,4%	20,4%	6,9%	7,6%	4,1%	4,1%	14,8%	100,0%
		% of FOOD	52,9%	44,9%	47,4%	57,9%	66,1%	53,2%	66,3%	53,6%	59,0%	53,6%
		% of TOTAL	6,9%	8,0%	7,7%	10,9%	3,7%	4,1%	2,2%	2,2%	7,9%	53,6%
	LABELLING	COUNT	188	300	262	244	58	109	34	58	168	1421
		% of TYPOLOGY	13,2%	21,1%	18,4%	17,2%	4,1%	7,7%	2,4%	4,1%	11,8%	100,0%
		% of FOOD	47,1%	55,1%	52,6%	42,1%	33,9%	46,8%	33,7%	46,4%	41,0%	46,4%
		% of TOTAL	6,1%	9,8%	8,6%	8,0%	1,9%	3,6%	1,1%	1,9%	5,5%	46,4%
Total		COUNT	399	544	498	579	171	233	101	125	410	3060
		% of TYPOLOGY	13,0%	17,8%	16,3%	18,9%	5,6%	7,6%	3,3%	4,1%	13,4%	100,0%
		% of FOOD	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
		% of TOTAL	13,0%	17,8%	16,3%	18,9%	5,6%	7,6%	3,3%	4,1%	13,4%	100,0%

Table 23. Results of the labelling intervention/baseline.

The relative Chi-Square test indicates that the level of significance is maximum:

Chi-Square			
	Value	df	Asym. Sig. (2 tailed)
Pearson Chi-Square	50,920a	8	,000
Likelihood Ratio	51,313	8	,000
N. of valid cases	3060		

Table 24. The relative Chi-Square test.

The positive effect on consumption choices of the target foods following the activation of the labelling intervention is driven mainly by the 9% increase in salad selection (see Table 21). Since

the results indicate a global negative outcome of the use of the Like label on the target items, the specific analysis to assess each item has not been conducted.

4.3.4. Effect of the salience nudge in the southern lunchroom

Hypothesis 3: *The effect of the manipulation of environmental stimuli through the nudge of salience will be greater than the effect of the communication intervention and increase the selection of the target items.*

Hypothesis 3 compares the performance of the salience intervention in terms of changes in food choices, compared to the communication initiative. As we can see from the contingency table below (Table 25), the selection of whole bread (+ 10,2%), fruit (+ 15%), and salads (+ 12%) positively increased; whereas the selection of vegetables sides varied minimally (- 1%).

Southern Lunchroom			FOOD ITEMS									Total
			Whole Bread	Fruit	Salads	Vegetable Sides	Fruit Juice	Yogurt	Pudding	White Bread	Grissini/ Crackers	
TYPOLOGY	COMMUNICATION	COUNT	169	233	220	293	83	102	63	79	163	1405
		% of TYPOLOGY	12,0%	16,6%	15,7%	20,9%	5,9%	7,3%	4,5%	5,6%	11,6%	100,0%
		% of FOOD	44,9%	42,5%	44,0%	50,5%	56,1%	54,5%	56,3%	64,8%	47,7%	48,2%
		% of TOTAL	5,8%	8,0%	7,5%	10,1%	2,8%	3,5%	2,2%	2,7%	5,6%	48,2%
	SALIENCE	COUNT	207	315	280	287	65	85	49	43	179	1510
		% of TYPOLOGY	13,7%	20,9%	18,5%	19,0%	4,3%	5,6%	3,2%	2,8%	11,9%	100,0%
		% of FOOD	55,1%	57,5%	56,0%	49,5%	43,9%	45,5%	43,8%	35,2%	52,3%	51,8%
		% of TOTAL	7,1%	10,8%	9,6%	9,8%	2,2%	2,9%	1,7%	1,5%	6,1%	51,8%

Table 25. Results of the salience intervention/communication initiative.

Chi-Square			
	Value	df	Asym. Sig. (2 tailed)
Pearson Chi-Square	36,494a	8	,000
Likelihood Ratio	36,688	8	,000
N. of valid cases	2915		

Table 26. The relative Chi-Square test.

Also in this case, as in the previous hypothesis, the test reaches maximum significance (p = 0,000), which highlights the remarkably significant effect of the salience nudge (Table 26). As the significant variation of the relative frequencies between the two weeks displays, the third phase of the project showed a more relevant effect on food choices compared to the one in the northern lunchroom (see Figure 37 and Table 27).

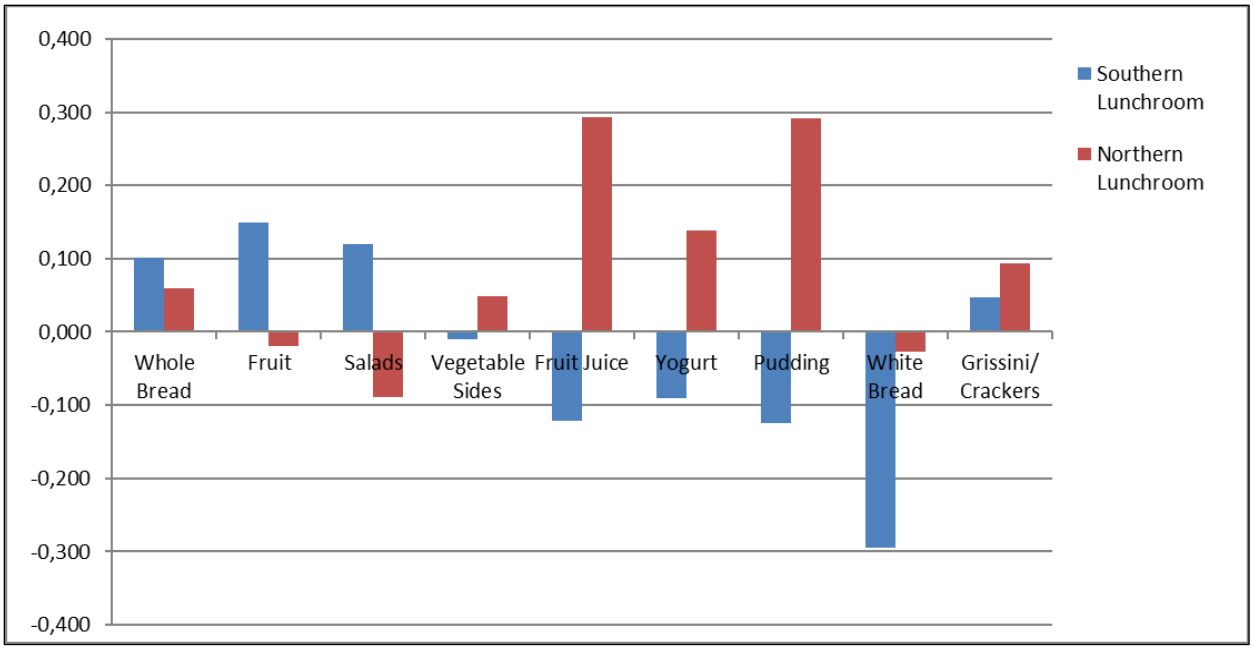


Figure 37. Changes in food choices between week 2 and 3 in each lunchroom.

	Whole Bread	Fruit	Salads	Vegetable Sides	Fruit Juice	Yogurt	Pudding	White Bread	Grissini/ Crackers
Southern Lunchroom	10,2%	15,0%	12,0%	-1,0%	-12,2%	-9,1%	-12,5%	-29,5%	4,7%
Northern Lunchroom	6,0%	-1,9%	-8,9%	4,9%	29,3%	13,8%	29,2%	-2,7%	9,4%

Table 27. The percentage change in food choices between week 2 and 3 in each lunchroom.

So far, the analysis concerned on the overall trends of food decisions, with reference to the totality of the target and non-target products, with the disadvantage of diminishing the specific effect of each product through the algebraic sum (see the positive and negative trends of the previous graph) of the overall effects. The rest of the study will therefore look at the changes in food selection in relation to each target product, highlighting the impact of the salience nudge in altering the selection of the items.

It is important to note that the fact that most of the target items did not vary or even decreased during the communication initiative (see Table 16 and 18), and that the level of significance in both lunchrooms is not very high (p = 0,040), suggests that this initiative did not provide relevant outcomes. This led to the decision to compare only week 3 vs. week 1 in the following analysis of each item conducted for the southern lunchroom.

Whole bread

> **Hypothesis 3a:** *Manipulating the salience of whole bread by offering it in several points in the southern lunchroom will increase the choice of this item, compared to the baseline.*

Starting from whole bread, the hypothesis to be verified is the effectiveness of making this item more salient by increasing its visibility and by placing it in several strategic spaces in the lunchroom. Table 28 shows the variation in consumption choices derived from the nudge, comparing the salience week with the baseline, and the values 0 and 1 indicate respectively 'absence of choice' or 'choice of the item'. The results show that during the nudge intervention the consumption of whole bread is 30% compared to the 26,9 % of the baseline.

However, it is important to point out that although the hypothesis under consideration is confirmed, the significance (p = 0,020) of the test is not maximum (Table 29). Since whole bread has a direct substitute product, it is likely that the nudge was effective only on those people that do not have a strong preference for white bread.

Southern Lunchroom			Whole Bread		
			0	1	Total
TYPOLOGY	BASELINE	Count	492	181	673
		% of TYPOLOGY	73,1%	26,9%	100,0%
		% of whole bread	50,5%	46,6%	49,4%
		% of TOTAL	36,1%	13,3%	49,4%
	SALIENCE	Count	483	207	690
		% of TYPOLOGY	70,0%	30,0%	100,0%
		% of whole bread	49,5%	53,4%	50,6%
		% of TOTAL	35,4%	15,2%	50,6%

Table 28. Effect of salience on the selection of whole bread.

Chi-Square			
	Value	gl	Asymptotic significance (2-sided)
Pearson Chi-Square	1,614	1	0,020
Continuity correction[c]	1,465	1	0,023
Likelihood ratio	1,615	1	0,020
N of valid cases	1363		

Table 29. The relative Chi-Square test.

Fresh Fruit

Hypothesis 3b: *Manipulating the salience of fresh fruit in terms of perceived variety will increase the choice of this category, compared to the baseline.*

The same analysis is replicated for fresh fruit, and Table 30 illustrates the results. As before, the values 0 and 1 indicate respectively 'absence of choice' or 'choice of the item'. In this case, the effect of the third week is significantly more significant and more incisive, with a change in consumption choices that passed from 29,9% during the baseline to 45,7% with the nudge intervention. The significance of this intervention, as evidenced by the Chi Square test (Table 31) is very high (p = 0,000).

Southern Lunchroom			Fruit 0	Fruit 1	Total
TYPOLOGY	BASELINE	Count	472	201	673
		% of TYPOLOGY	70,1%	29,9%	100,0%
		% of fruit	55,7%	39,0%	49,4%
		% of TOTAL	34,6%	14,7%	49,4%
	SALIENCE	Count	375	315	690
		% of TYPOLOGY	54,3%	45,7%	100,0%
		% of fruit	44,3%	61,0%	50,6%
		% of TOTAL	27,5%	23,1%	50,6%

Table 30. Effect of salience on the selection of fresh fruit.

Chi-Square			
	Value	gl	Asymptotic significance (2-sided)
Pearson Chi-Square	36,088	1	0,000
Continuity correction[c]	35,420	1	0,000
Likelihood ratio	36,316	1	0,000
N. of valid cases	1363		

Table 31. The relative Chi-Square test.

Fruit juice, Yogurt, Pudding

Hypothesis 3c: *The manipulation of the display of fresh fruit in the fridge counters entailed the relocation of fruit juices, yogurt, and pudding, on the higher shelves, making these items less salient. This manipulation may decrease the choice for these items, compared to the baseline.*

The high impact of the nudge on the selection of fresh fruit has led to an opposite effect on the consumption of the non-target items, which had been moved during week 3 in the upper shelves, making these items less visible and therefore less salient.

Comparing the positive effect of fresh fruit with the selection of fruit juices, the following results are obtained (Table 32 and 33):

Southern Lunchroom			FOOD ITEMS		
			Fruit	Fruit Juice	Total
TYPOLOGY	BASELINE	Count	201	74	275
		% of TYPOLOGY	73,1%	26,9%	100,0%
		% in FOOD	39,0%	53,2%	42,0%
		% of TOTAL	30,7%	11,3%	42,0%
	SALIENCE	Count	315	65	380
		% of TYPOLOGY	82,9%	17,1%	100,0%
		% in FOOD	61,0%	46,8%	58,0%
		% of TOTAL	48,1%	9,9%	58,0%

Table 32. Comparing the effect of salience on fresh fruit/fruit juice.

Chi-Square			
	Value	gl	Asymptotic significance (2-sided)
Pearson Chi-Square	9,172[b]	1	0,002
Continuity correction[c]	8,595	1	0,003
Likelihood ratio	9,073	1	0,003
N of valid cases	655		

Table 33. The relative Chi-Square test.

Comparing the positive effect of fresh fruit with the selection of yogurt, the following results are obtained (Table 34 and 35):

Southern Lunchroom			FOOD ITEMS		
			Fruit	Yogurt	Total
TYPOLOGY	BASELINE	Count	201	99	300
		% of TYPOLOGY	67,0%	33,0%	100,0%
		% in FOOD	39,0%	53,8%	42,9%
		% of TOTAL	28,7%	14,1%	42,9%
	SALIENCE	Count	315	85	400
		% of TYPOLOGY	78,8%	21,3%	100,0%
		% in FOOD	61,0%	46,2%	57,1%
		% of TOTAL	45,0%	12,1%	57,1%

Table 34. Comparing the effect of salience on fresh fruit/yogurt.

Chi-Square			
	Value	gl	Asymptotic significance (2-sided)
Pearson Chi-Square	12,215[b]	1	0,000
Continuity correction[c]	11,616	1	0,001
Likelihood ratio	12,127	1	0,000
N of valid cases	700		

Table 35. The relative Chi-Square test.

Finally, the results of the comparison of fresh fruit and pudding, are displayed in Table 36 and 37.

Southern Lunchroom			FOOD ITEMS		
			Fruit	Pudding	Total
TYPOLOGY	BASELINE	Count	201	65	266
		% of TYPOLOGY	75,6%	24,4%	100,0%
		% in FOOD	39,0%	57,0%	42,2%
		% of TOTAL	31,9%	10,3%	42,2%
	SALIENCE	Count	315	49	364
		% of TYPOLOGY	86,5%	13,5%	100,0%
		% in FOOD	61,0%	43,0%	57,8%
		% of TOTAL	50,0%	7,8%	57,8%

Table 36. Comparing the effect of salience on fresh fruit/pudding.

Chi-Square			
	Value	gl	Asymptotic significance (2-sided)
Pearson Chi-Square	12,489[b]	1	0,000
Continuity correction[c]	11,760	1	0,001
Likelihood ratio	12,342	1	0,000
N of valid cases	630		

Table 37. The relative Chi-Square test.

The results from the analysis on the three non-target items, demonstrate a significant decrease in the selection of fruit juices (from 26, 9% to 17,1%), yogurt (from 33% to 21,3%), and pudding (from 24,4% to 13,5%), and all the variations are marked by the maximum level of significance (p = 0,000).

With the last hypothesis, the analysis moves to the two target products from the category of vegetables: fresh salads (displayed on each side of the central area of the lunchroom to increase their visibility) and vegetable sides (offered in first position in the hot food counter).

Salads

Hypothesis 3d: *Manipulating the salience of salads by displaying them in the first counters located on each side of the central area will increase the choice of this category, compared to the baseline.*

Also in this case, the contingency Table 38 shows the positive effect of the salience intervention, with an increase in the choice of salads (from 24,2% to 40,6%), among the highest of the experiment. The significance of this hypothesis (p = 0,000) is demonstrated by the results of the Chi-Square test as shown in Table 39.

Southern Lunchroom			Salads		Total
			0	1	
TYPOLOGY	BASELINE	Count	510	163	673
		% of TYPOLOGY	75,8%	24,2%	100,0%
		% of salads	55,4%	36,8%	49,4%
		% of TOTAL	37,4%	12,0%	49,4%
	SALIENCE	Count	410	280	690
		% of TYPOLOGY	59,4%	40,6%	100,0%
		% of salads	44,6%	63,2%	50,6%
		% of TOTAL	30,1%	20,5%	50,6%

Table 38. Effect of salience nudge on the selection of salads compared to the baseline.

Chi-Square			
	Value	gl	Asymptotic significance (2-sided)
Pearson Chi-square	41,565	1	0,000
Continuity correction[c]	40,822	1	0,000
Likelihood ratio	41,949	1	0,000
N of valid cases	1363		

Table 39. The relative Chi-Square test.

Vegetable Sides

Hypothesis 3e: *Manipulating the salience of vegetable sides by offering them at the beginning of the hot food counter will increase the choice of this category, compared to the baseline.*

Finally, the effect determined by salience on vegetable sides (Table 40), is less pronounced (from 41,6% to 47,5%), compared to the results of fruit and salads. This is also visible from the level of significance (Table 41), which while being positive, is lower than in the previous hypotheses (p = 0,027).

Southern Lunchroom			Vegetable Sides		
			0	1	Total
TYPOLOGY	BASELINE	COUNT	353	320	673
		% of TYPOLOGY	58,4%	41,6%	100,0%
		% in vegetable sides	46,7%	52,7%	49,4%
		% of TOTAL	25,9%	23,5%	49,4%
	SALIENCE	COUNT	403	287	690
		% of TYPOLOGY	52,5%	47,5%	100,0%
		% in vegetable sides	53,3%	47,3%	50,6%
		% of TOTAL	29,6%	21,1%	50,6%

Table 40. Effect of the salience nudge on the selection of vegetable sides.

Chi-Square			
	Value	gl	Asymptotic significance (2-sided)
Pearson Chi-Square	4,89	1	0,027
Continuity correction[c]	4,652	1	0,031
Likelihood ratio	4,892	1	0,027
N of valid cases	1363		

Table 41. The relative Chi-Square test.

4.3.5 Discussion of the findings

In the domain of health promotion, health and weight changes are difficult to be directly associated to changes in dietary patterns. It is complex to separate the effects of a dietary intervention from other factors, as health and weight changes may result from physical activity, a different performance at work, a psychological state or life circumstance, and much more. In the present experimental project, instead of aiming to change and monitor the employee's health and weight changes, the goal was to test whether people complied with the nudge towards the selection of healthier food choices. The effectiveness of the choice architecture was measured in terms of changes in choice (i.e. increase or decrease) of the targeted healthy food items. The patterns of selection of some additional, non-target food items were also monitored.

H1: *The use of the communication materials during the second week may prime the idea of healthy food increasing the choice of the target* items*, but relevant results compared to the baseline are not expected, because the intervention targets System 2.*

This hypothesis has been confirmed by the results in the northern lunchroom. In the northern lunchroom, only the selection of fruit increased (+ 8,4%), the selection of whole bread varied minimally (+ 0,2%), while the selection of salads (- 3,8%) and vegetables sides (- 11%) decreased. Hence, while there is a positive and significant outcome for fresh fruit, for the rest of the target items the communication initiative was not effective (i.e. whole bread) or even backfired (i.e. for salads and vegetables).

This hypothesis has not been confirmed by the results in the southern lunchroom. In the southern lunchroom, the results are mixed: the choice of fresh fruit (+ 7,4%) and salads (+ 14,8%) increased significantly, whereas the selection of whole bread (- 3,4%) and of vegetable sides (- 4,4%) decreased significantly. In relation to the southern lunchroom, it is not possible to fully reject the hypothesis since while two items positively increased, the selection of two target items decreased. Furthermore, among the non-target items, the selection of white bread increased by 21,6% (Table 18), which evidently contrasts with the intention of the communication initiative.

In summary, the posters had a positive effect only on the consumption of fruit in the northern lunchroom, and on salads and fruit in the southern lunchroom, **3 out of 8** target items overall.

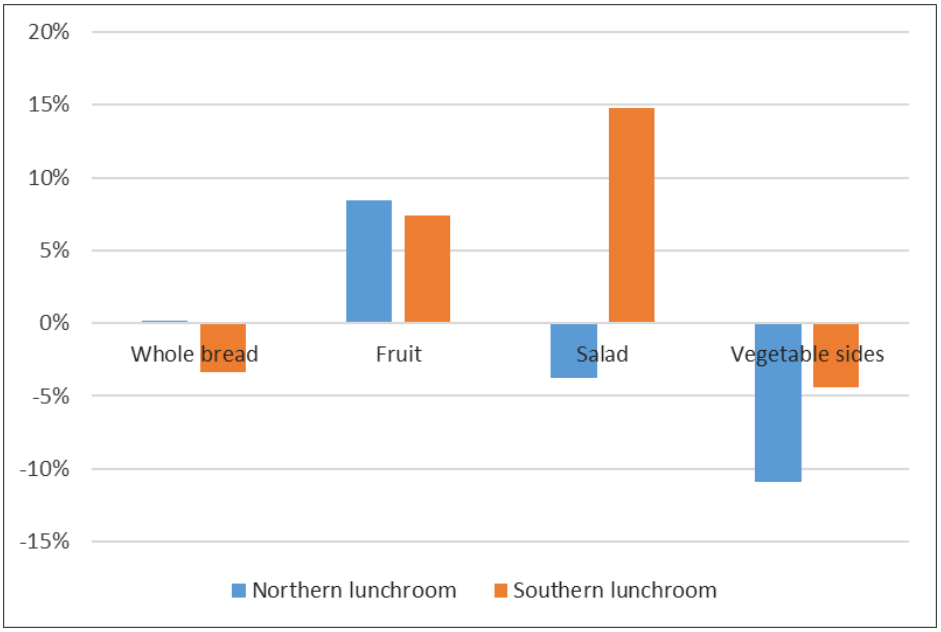


Figure 38. Effect of the communication intervention on the target items.

The fact that the choice of some foods has even decreased during the week of communication suggests that the results of the communication initiative should be considered as not fully not reliable. For instance, in the case of vegetable sides, the selection of this category during the second week even decreased in both lunchrooms. A plausible explanation could have been that the type of offer of vegetable sides available in week 2 was less appealing to the public, leading to the decrease in the selection in both lunchrooms. However, this is not the case, because the menu changes daily but the same options are offered in rotation during each week. Another possible explanation for this outcome could be found in the layout of the poster itself: in fact, while the claim was "Vegetables? Your best choice", the image displayed a salad bowl (Figure 37, p. 124). However, if the poster truly had an impact, the selection of salads should have increased in both lunchrooms.

For the category of salads, data from the northern and the southern lunchroom are not coherent. In the southern cafeteria the selection of salads increased evidently (from 42,6% during the baseline to 57,4 % with the communication initiative); whereas in the northern cafeteria, the communication initiative did not impact positively on the selection of salads, in fact a - 3,8% decrease occurred. Perhaps, the different positioning of the posters might explain the different outcomes. The posters were displayed differently at the entrance of each lunchroom, which was due to a diverse

configuration of the spaces and to the presence of other elements on the walls that could not be removed. In the southern cafeteria, the poster displaying the image of salads (see Figure 37, p. 124) was displayed at the center of an empty wall at the entrance, in a very salient location. Instead, in the northern cafeteria, the poster displaying the image of salads was located at the entrance but close to another poster of large dimensions displaying a food pyramid, which could not be removed (see Figure 5 in the Appendix).

The mixed results of the communication initiative influenced the successive decision, in the analysis of each target item in the southern lunchroom, to compare exclusively the first week with the third week. It is more sensible to make a comparison between week 1 and 3, yet by bearing in mind the positive outcomes obtained in the second week (i.e. in the case of fruit and salads).

Communication initiatives are an attempt to rationally persuade the consumers, and health communication has been long dominated by the classic stimulus-response theoretical perspective (Lupton, 1994). The realization of the communication phase involved the positioning of three posters of big dimension, only at the entrance of the lunchrooms. The posters contained a minimal amount of text, while more space was devoted to a large image in the attempt to prime people with the idea of these healthy items. Despite these precautions, the posters globally had a positive impact only on three out of eight items. Perhaps, if the posters were visible also in the point-of choice (i.e. inside the area for the selection of food) the results might have improved. Still, in consideration of the limited impact of this type of initiatives, the effect would still have been limited. The results of this study are in line with the behavioural economics literature of System 1 and 2 (e.g. Stanovich and West, 2000; Kahneman, 2011); humans are not rational decision-makers therefore persuasion-based interventions can yield only limited results.

H2: *The effect of the manipulation of the environmental stimuli through the labelling intervention will be greater than the effect of the communication intervention and increase the selection of the target items*.

This hypothesis was not confirmed. The analysis provided mixed results: only the selection of salads increased evidently during the labelling nudge (+ 9%), fruit had a minimal variation (+ 1,8%), while the selection of whole bread and vegetable sides decreased (- 6% and - 4,8% respectively).

H2a: *The use of a green label in the northern lunchroom to indicate the healthy options, will positively prime people and guide choices, increasing the consumption of the target items, compared to the baseline.*

This hypothesis was not confirmed. The green label employed in this experiment, "the Like sticker", provided poor results. The positive effect during the intervention is related to the increase in the selection of salads exclusively.

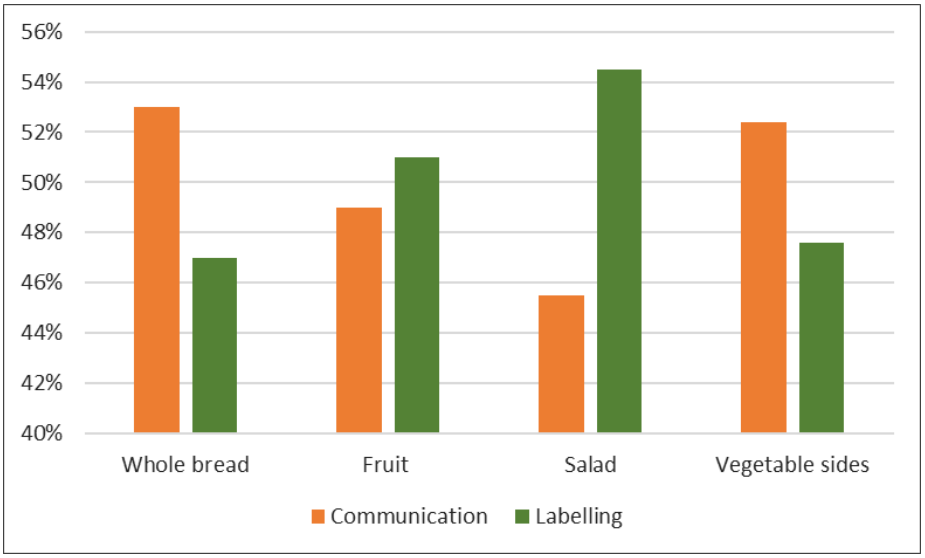


Figure 39. Effect of labelling/communication

As explained in the first chapter, priming (e.g. Bargh et al., 2001; Kahneman, 2011) improves a person's ability to detect an object or stimulus, and increases the speed and efficiency of interaction with the environment (Squire and Kandel, 2000). As illustrated in chapter 2, the scientific literature on the use of semaphore labels provided encouraging results (see Jones and Richardson, 2007; Temple et al., 2011; Thorndike et al., 2012). The present experiment, instead of a semaphore scheme, employed a green label exclusively, since the members of the WHP team were concerned that the red and yellow labels might convey a punitive impression and wanted to minimise potential complaints. It seems that compared to the semaphore scheme, the use of the green label exclusively, is less efficient. It would be interesting to test, in a follow-up initiative, if the addition of the red and yellow labels could provide positive outcomes in the context of the Niguarda hospital. A second explanation of the limited effectiveness of this intervention is that priming

occurs only when people are not aware of the potential impact of the prime (Schwartz et al 1991). Research demonstrated that when people can consciously recall the priming episode, or are subtly reminded of the primed concept, effects are not likely to be obtained (ibid.) Following Hansen and Jespersen's (2015) framework, we can locate the Like label in the Transparent-Type 2 quadrant of the matrix. The Like label was designed to influence the automatic system guiding deliberate food choices (i.e. Type 2), and its intent was overt (i.e. Transparent). In the case of the Like label, the positive affective association (Kiviniemi et al. 2007) associated to the target healthy items was not subliminal but evident. Furthermore, the workers were aware that a research was taking place and it was easy to identify the scope of the labelling nudge intervention, whereas the salience intervention could have been simply interpreted as a re-arrangement of the products, as it commonly occurs in the lunchroom during the year.

H3: *The effect of the manipulation of environmental stimuli through the nudge of salience will be greater than the effect of the communication intervention and increase the selection of the target items compared to the baseline*.

This hypothesis has been confirmed. The selection of whole bread (+ 10,2%), fruit (+ 15%), and salads (+12%) increased significantly during the nudge week compared to the communication week. Only the selection of vegetable sides decreased minimally (- 1%) during the third week. Hence, the nudge of salience provided more effective compared to the labelling nudge.

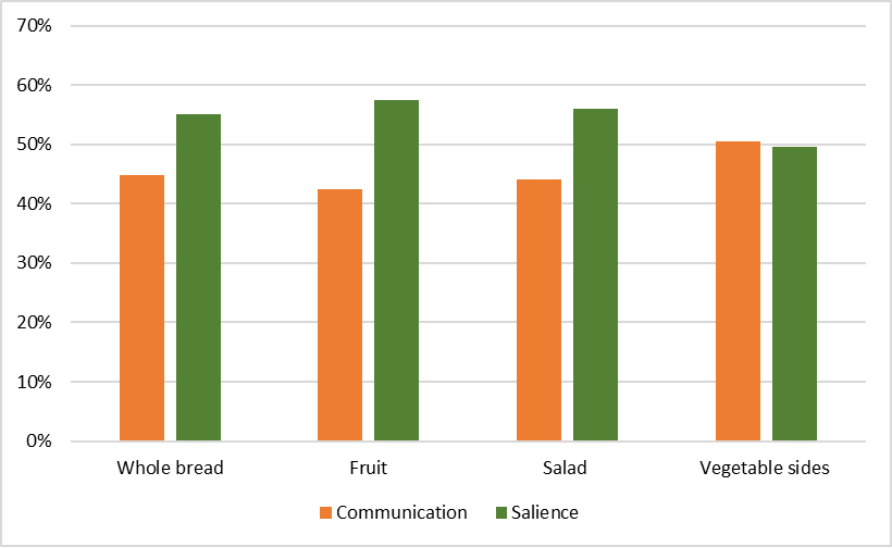


Figure 40. Effect of salience intervention/communication initiative

H3a: *Manipulating the salience of whole bread by offering it in several points in the southern lunchroom will increase the choice of this item, compared to the baseline.*

This hypothesis has been confirmed. In the southern cafeteria, the first basket of whole bread was offered at the entrance of the lunchroom, on the table were customers collect their tray and serviette; while a second basket was positioned on a table in the central area. In order to maintain freedom of choice, white bread was still offered in the original location, close to cutlery and right before the cash registers. The results confirm that a higher degree of accessibility alters people's perception and choices (see Wansink, 2004; Painter et al., 2002). Convenience is an environmental factor that influences food choice: if a food item is easy to see and reach, people are more likely to choose it. During the salience intervention, the selection of whole bread increased by 3,1% compared to the baseline (Table 28). During the second week the selection of whole bread had dropped (Table 18), and the nudge restored the selection of this item. However, the impact of this intervention is less substantial than the effect obtained on fruit or salads in the southern lunchroom, and the significance of this change is not maximum ($p = 0,020$). It is likely that the nudge influenced those people who did not have a stable preference for either whole or white bread (see Goldin, 2015, for a framework on the role of preferences in nudge interventions).

H3b: *Manipulating the salience of fresh fruit in terms of perceived variety will increase the choice of this category, compared to the baseline.*

This hypothesis has been confirmed. Consistently with the expectations and the literature on the influence of perceptual salience and perceived variety, the selection of fruit increased during the nudge week (see Table 30). In this case the significance of the increase in the selection of this items was supported by the increase in the selection of fruit that occurred during week 2 (see Table 25).

While Van Kleef et al. (2012) successfully nudged healthy snacks by displaying the items on the higher shelves; in the context of the southern lunchroom the ideal positions identified during the preliminary observations were the lowest (i.e. tray-level) and the mid shelf to offer fruit. In line with the study conducted by Van Kleef et al. (2012) the availability of fruit was altered, particularly, 50 % of the shelves in the fridge counters were occupied exclusively by fruit (see Figure 38). Rolls (1986) and Rolls and McDermott (1991) demonstrated that a higher degree of variety of food can increase consumption volume. However, actual variety is not necessarily

required, since merely altering availability can be a successful strategy. Kahn and Wansink (2004) demonstrated that merely altering the structure of an assortment leads to an increase in the perceived variety and thereby to an increase in consumption. In this study, rather than increase consumption, the aim was to trigger the selection of fruit. The effectiveness of this intervention demonstrates that perceived variety not only increases the consumption volume of an item, but also triggers the desire for that item. One explanation, as Kahn and Wansink (2004) pointed out, is that the perception of a higher variety of an assortment is automatically associated to a higher level of enjoyment; secondly, the effect occurred because a higher availability of fruit increased its salience and attractiveness.

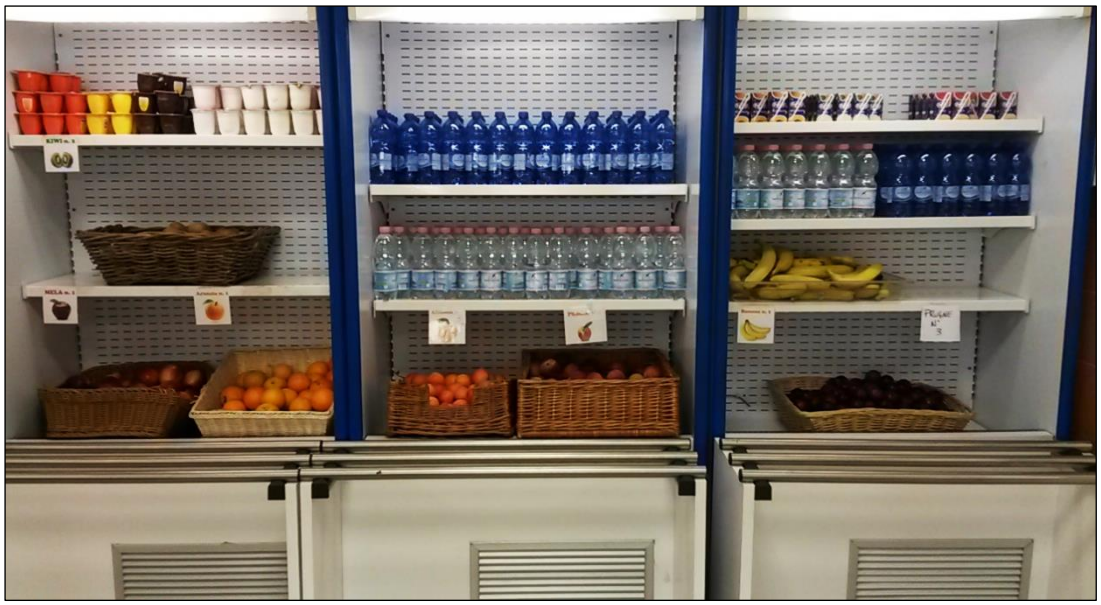


Figure 41. Assortment of the fridge counter during the salience nudge week.

H3c: *The manipulation of the display of fresh fruit in the fridge counters entailed the relocation of fruit juices, yogurt, and pudding on the higher shelves, making these items less salient. This manipulation may decrease the choice for these items, compared to the baseline*.

This hypothesis has been confirmed. While this study was focused on the promotion of healthy foods, changes to other items deemed less favourable were also applied, by manipulating the location of these items to make them less salient. The rearrangement of yogurt (from 33% in week 1 to 21,3% in week 3), pudding (from 24,4% in week 1 to 13,5% in week 3), and fruit juices (from 26,9% in week 1 to 17,1% in week 3) on the upper shelves determined a significant decrease in

their selection, confirming the effectiveness of altering accessibility and changing perceptual salience.

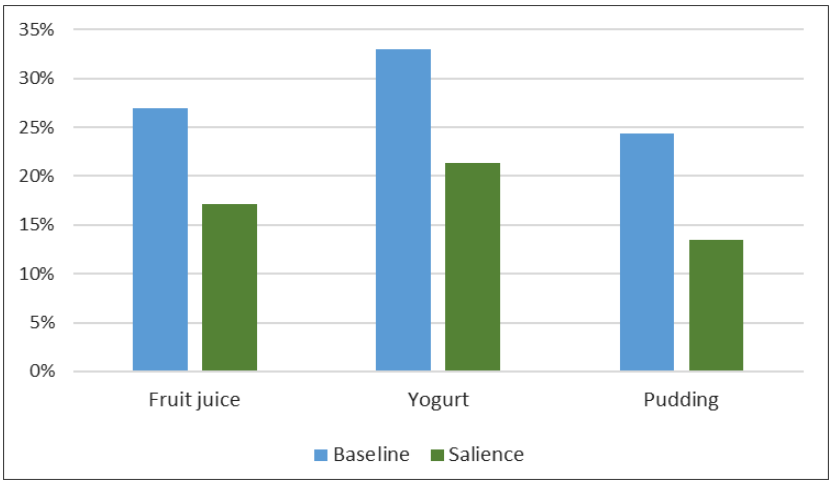


Figure 42. Effect of salience on the substitute products of fruit.

H3d: *Manipulating the salience of salads by displaying them in the first counters located on each side of the central area will increase the choice of this category, compared to the baseline.*

This hypothesis has been confirmed. The choice of salads increased from 24,2% in the baseline week up to 40,6% during the salience nudge (see Table 38). Therefore, perceptual salience is confirmed to be an effective mechanism. However, a significant and positive variation in the choice of salads (+14,8%) occurred already in the passage from the baseline to the communication week (see Table 18). Therefore, the success of the communication initiative was extended by the nudge during week 3.

H3e: *Manipulating the salience of vegetable sides by displaying them in the first position in the hot food counter will increase the choice of this category, compared to the baseline.*

This hypothesis has been confirmed. This intervention was ideated according to the literature on perceptual salience (Tversky and Kahneman, 1983; Kahneman, 2003; Kahneman, 2011). Order effects are also commonly known in the literature on choice architecture, which can take place in several ways (e.g. Dayan and Bar-Hillel 2011; Cohen and Babey, 2012). Wansink and Hanks (2013), investigating order effects, revealed that people are biased by the order of presentation of food, and Wansink calls the ‘‘first foods most’’ principle, the phenomena that occurs when people

select the food that they see first (ibid.). In this case, the salience nudge on vegetable sides (from 41,6% during the baseline to 47,5% during the salience week) was less effective compared to the results of the intervention on salads. The level of significance ($p = 0,027$) despite being positive, is inferior compared to the previous hypotheses. Perhaps, the public's reaction had reduced the potential impact of the intervention. In fact, the change in the disposition of food applied at the hot food counter, was ill-received by the customers, objections were made about the reversed order in the display of the food. Some people could not understand where they should queue generating confusion, and staff was repeatedly interrogated about the reason of the new arrangement, some people even presented unpleasant comments. Thus, negative emotions might have influenced people's decision-making process diminishing the potential impact of the nudge.

4.5. Strengths and limitations

In in view of the study's findings, the relevant strengths and limitations should be considered. The main strength of the present research is that, to date, it represents the first initiative of choice architecture carried out in an Italian hospital. While the approach of nudging is receiving international attention, becoming a policy tool (see Thaler and Sunstein, 2008; Marteau et al., 2011; Ly and Soman, 2013; Chetty, 2015) with practical applications in several countries (e.g. Behavioural Insights Team, 2014, 2016; White House, 2016), it is the first time that a choice architecture intervention is tested in the context of an Italian public hospital. Furthermore, the study was officially activated as an initiative of the Workers Health Promotion program, whose relevance is recognised at a regional, national and international level. The present study is the first application of a choice architecture intervention that could be repeated in other Italian health care establishments.

The field study was based on the food choices that occurred during three weeks for two lunchroom populations. The strength of field studies is that they are carried out in natural, real-life situations, and the homogeneous sample of workers convey an added value to the research. One strength of the study comes from the extent of the data collected. Data registered through video cameras provide an accurate and error-free account of food choices compared to self-reported data. Furthermore, the presence of a control week, enabled a valuable comparison of the changes occurred in choice. Seasonal changes were also taken into account by conducting the research in the same period, during the summer month of June.

The strict privacy policy at Niguarda did not allow the collection of personal data such as gender or age, which could have been interesting to form a more comprehensive account of the choice patterns. The database with the observations was progressively built during the viewing of the collected footage, which consisted exclusively of trays. Because of this, analysis could not be expanded to sociological considerations, hence the lack of possibility of crossing decisions on the basis of personal data such as sex and age is a limit of the research. As previously explained, the experimental action was not free but tied to a restrictive privacy policy (see pp. 130-132), which was implemented to prevent the issues that arose from the workers during the first WHP initiative in the lunchrooms (see pp. 115-116).

Another limitation of the study is that it only controlled for target food selection and not for actual consumption, which could have been monitored through the collection of tray waste data. However, the objective of the study was to verify the effectiveness of the nudges to guide people's choices, and actual consumption can be determined by other variables such as liking or satiety. Finally, since the research was conducted over the course of three-weeks, long-term effects cannot be established.

5. Conclusion

This dissertation provided a broad literature review of the main contributions to the study of unconscious processes, focusing on automatic behaviour and decision-making, and successively on the relation between eating behaviour and environmental influences. Human functioning is supported and guided by automatic processes of thought that working in parallel are faster than conscious decisions, and accompanied by little or no awareness of their influence on behaviour.
As previously stressed, equipping people with knowledge about a healthy diet and the health costs of unhealthy nutrition is very important, but insufficient to change behaviour. In the same way, information that aims to rationally persuade people to change behaviour, as in the use of calorie labels or other forms of standard communication is not a credible solution. Furthermore, the cognitive cost of sticking to a diet, of monitoring each eating episode, added to the myriad of other thoughts in one's mind, and to the environmental variables that influence individual behaviour, makes it unreasonable to expect that people will successfully manage to adopt a mindful and optimal nutrition behaviour at all times, following nutrition recommendations. If sustained cognitive monitoring is hard for those who are disciplined and motivated, it is virtually unbearable for those who are not, and reliance on willpower can be very disappointing. Nutrition behaviour is particularly challenging in out-of-home contexts (see Cohen and Babey, 2012) since people are faced with a cornucopia of food choices, biased by cues, influenced by norms, which explains why we fall into environmental traps. This situation suggests a complementary strategy, that is, focusing on altering the context of choice. Choice architecture relies on environmental interventions that guide people into taking better food choices. These alterations to the environment represent small steps that enable people to make improved choices and benefiting, over time, in terms of prevention and perhaps even weight loss. Nudges in the environment support people to effortlessly select the best options without the necessity of being disciplined or fully motivated. At the same time, libertarian paternalism ensures freedom of choice, so the person can decide without restrictions to avoid the nudge and follow its preferences.

Interventions informed by psychology provide more productive results, and the evidence presented in chapter 2 about the implementation of nudges in the domain of health illustrates this point. Policymakers are fruitfully starting to gather from the results of academic research, developing

empirically informed policies. The list of choice-preserving strategies is ample and growing, therefore it is important to test the impact of these interventions on larger population and in different cultures, as the present research aimed to do. The simple and low-cost nature of the present intervention makes it an inexpensive policy initiative that can be easily implemented in hospitals as well as in other establishments across the region and the nation.

The development of the WHP initiative required a lengthy process of meeting, which involved the WHP team (composed of ten members), the CIR Food delegates and the management of the hospital. The process was complex at times, especially when the concern over the public's reactions came into discussion. This determined first the reduction of the semaphore labelling scheme to a simple green label; and later, the concern over privacy led to the impossibility to gather any demographic data on the population. Still, the fact that nudging is not invasive and a liberty-preserving approach, was the winning card that led the management to welcome the initiative in the first place. Finally, one communication initiative and two choice architecture strategies were tested in the two lunchrooms. In relation to the mixed results of the communication initiative, this reinforces the view that it is necessary to act on the unconscious and automatic level to successfully influence food choices.

In the northern lunchroom, a **labelling nudge** was tested to induce positive affective association towards the target items. The labelling intervention did not provide the expected results, with a positive effect on the selection of salads (+ 9% compared to the communication week), and a minor increase in the selection of fruit (+1,8% compared to week 2). This suggests that the green label was not a sufficiently strong strategy to produce behaviour change in relation to the selection of the target healthy items. It is likely that the results would have improved with the use of a semaphore labelling scheme (see Jones and Richardson, 2007; Temple et al., 2011; Thorndike et al., 2012). Furthermore, the transparent nature of the nudge (see Hansen and Jespersen, 2015) in which the aim was clear, might have reduced the priming effect (see Schwartz et al., 1991).

Considering the role of accessibility in the decision-making process of food consumption is relevant for the development of effective nudge interventions. The results in the southern lunchroom confirmed that increasing the **salience** of healthy items by enlarging their visibility, is a promising strategy. Increasing the visibility and desirability of whole bread by offering it at the entrance of the cafeteria in wicker baskets attracted consumer's attention (+ 10,2% compared to

week 2). The nudge on whole bread was particularly successful since in week 2 the selection of this item decreased compared to the baseline, and the nudge restored consumption increasing its selection. Offering salads in a more prominent location also increased their selection. Manipulating the salience of fresh fruit by merely increasing the quantity displayed, enhanced the desirability and visibility of this category, positively impacting on choice. In the same fridge counter, placing less healthy (sugary) items in the least convenient, less salient, highest shelves did also influence choices: in fact, while the selection of fresh fruit increased, the choice of yogurt, pudding, and fruit juices especially, decreased. The salience nudge applied on salads was effective, and in this case the communication intervention supported this positive outcome. In fact, the increase in the selection of salads began in the second week, and it was confirmed by a stronger and positive variation during the nudge week. Finally, the nudge applied to vegetable sides was also successful, however it provided less significant results compared to the previous hypotheses.

Overall, this study provides encouraging evidence about the influence of small changes on customer's food selection in a hospital lunchroom. The work environment has a relevant influence on food choices since people spend most of their day at the workplace, consuming a large amount of their daily energy intake. The opportunity to improve the employee's diet at lunchtime raises the potential for significant gains in terms of personal well-being and performance, and the present findings have implications for practice and policy. As the literature discussed in chapter 3 demonstrates, there is a range of possibilities of implementation of nudging strategies, from labelling schemes, to product accessibility and variety, menu orders, and so on. Regardless of the type of nudging strategy, engagement with the cafeteria staff is an important determinant to achieve a successful implementation. It is also crucial that changes are not burdensome and do not detract time from the day-to-day service of the staff. Whilst the nudges employed in this intervention have a valuable contribution to make, further choice architecture strategies need to be tested to improve people's choices in workplaces, especially in the longer term. Most nudge initiatives only document the effectiveness of the intervention during the specific time period, and it is not known whether the effects persist or fade in the long run. A crucial step for future research is to investigate behaviour change over time and after the context changes, and to develop interventions to support the formation of habits; boundary research should also be encouraged, especially between the fields of consumer neuroscience, consumer psychology, nutrition

behaviour and behavioural economics, to develop innovative strategies and conduct studies with practical impact.

In relation to the generalisation of the research findings, it is interesting to stress that the data on overweight and obesity of the population of Niguarda's workers, as previously mentioned (see paragraph 4.1.2.), is in line with the data of the broader Italian population. This assigns to the sample an element of representativeness in favour of the potential generalisation of the results.

It is not the first time that encouraging evidence has been provided with the activation of nudging strategies in a lunchroom (e.g. Rozin et al., 2011; Hanks et al., 2012; Thorndike et al., 2012). In fact, the aim of the present study was to replicate salience and labelling strategies that proved to be effective in other cultural contexts, to observe their impact in the Italian context. The positive results of the research support the generalisation of the research findings to other similar populations of employees as in the lunchrooms of other hospitals or private organisations. It is not possible to declare with certainty if the same intervention in school lunchrooms or cafeterias that involve a target in a different age could provide the same results, therefore the initiative should be replicated to observe the effects on different populations. Furthermore, Milan is a peculiar context with its own features, therefore it would be fruitful to extend the intervention to other smaller realities of the Lombardy region, as well as to other regions to provide more solid results.

The evidence on automaticity and bounded rationality should enlighten the development of the policy process: the question that policy makers ought to focus on should no longer be how to influence individuals to change their food consumption behaviour, since posing this question still implies that people make independent and rational choices. Rather, the focus should be on 'where and how does the food consumption behaviours occur?': in other words, rather than focusing on the individual, the central issue is to understand the consumption process in the environment in which it takes place, and the mental mechanisms that support the behaviour. Looking at how a certain eating behaviour occurs in its context is the first step to identify the suitable strategies to satisfy the very same drivers of behaviour. As the present dissertation has illustrated and empirically tested, changes in the physical environment where the behaviour occurs is crucial to initiate and facilitate behavioural change. Behaviours are tied to habit and context therefore altering the circumstances is a key factor.

The first step of an effective policy should be to identify the set of environmental and mental barriers to the desired behaviour by carefully considering what barriers can actually be addressed,

as well as the existence of opposing forces that influence behaviour (e.g. marketing strategies or social norms). Policy-makers could support initiatives in workplaces by diffusing and financing networking, good-practice sharing and by defining rules if necessary. In fact, workplaces are one of the most important contexts as people spend most of their days at work and influencing people towards optimal eating behaviours is a more promising and feasible strategy than attempting to influence home behaviours. Particularly, policy could support correct practices in workplaces by developing synergies with the caterers, where reasons could be found in reducing food waste or saving money. In the same way, synergies with the public or private organisations could be motivated by having healthier employees. Finally, Interventions should be prioritised, for instance on a certain issue (e.g. increasing the consumption of fruit and vegetables) or on a particular segment of the population (e.g. employees).

The standard policy initiative to change food behaviours has been to generate education or communication campaigns. It is likely that the performance could be much higher if information was designed by considering bounded rationality. For instance, information should be made more salient and precise pieces of information should be presented with a contemplated timing. At the same time, bearing in mind that communication is just a small part of a complex set of patterns that define behaviour and that it impacts on rational thinking, should inform policy-makers to revise the financial resourcing of these interventions, as funds could be devoted elsewhere.

Appendix A: Maps of the lunchroom spaces

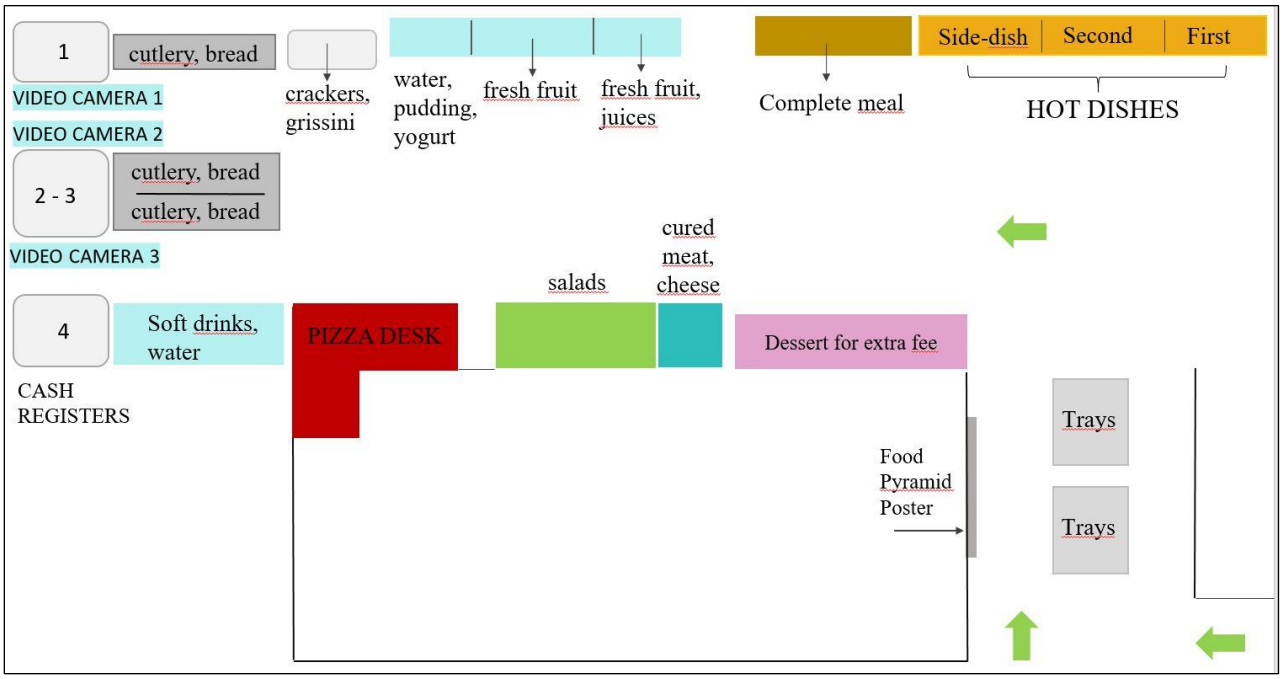


Figure 1. Map of the northern lunchroom during baseline (1) and during the communication phase (2).

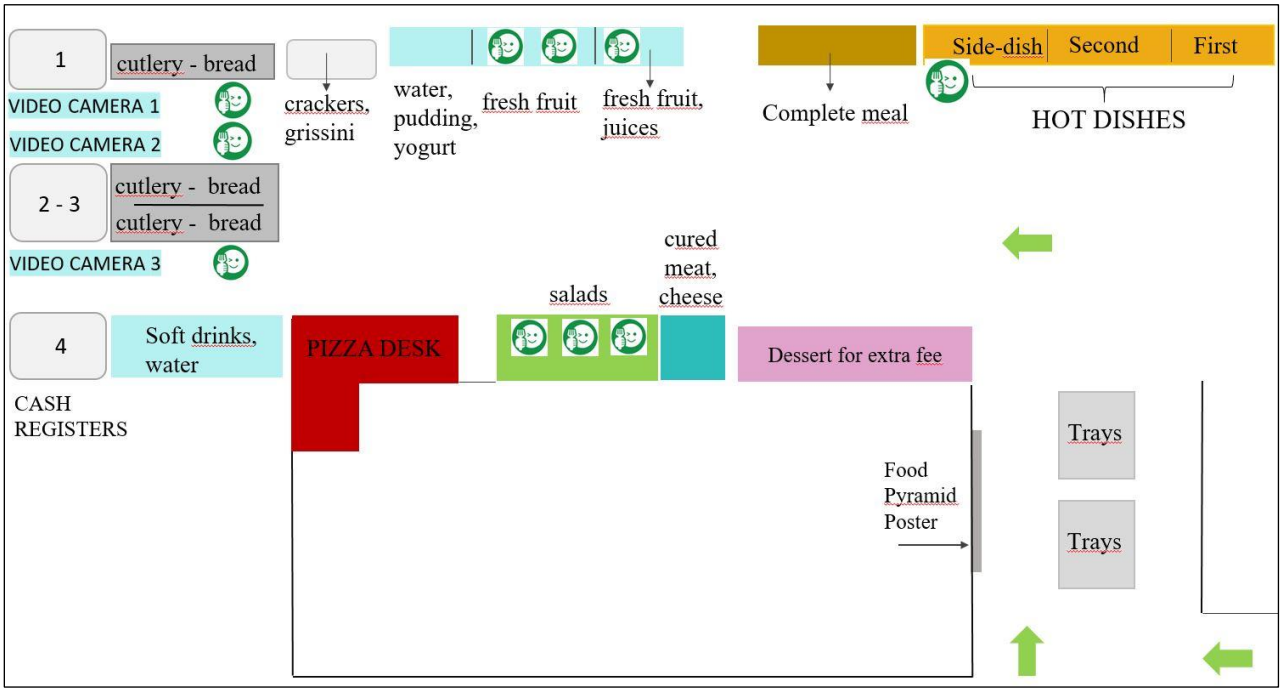


Figure 2. Map of the northern lunchroom during the nudging intervention (3).

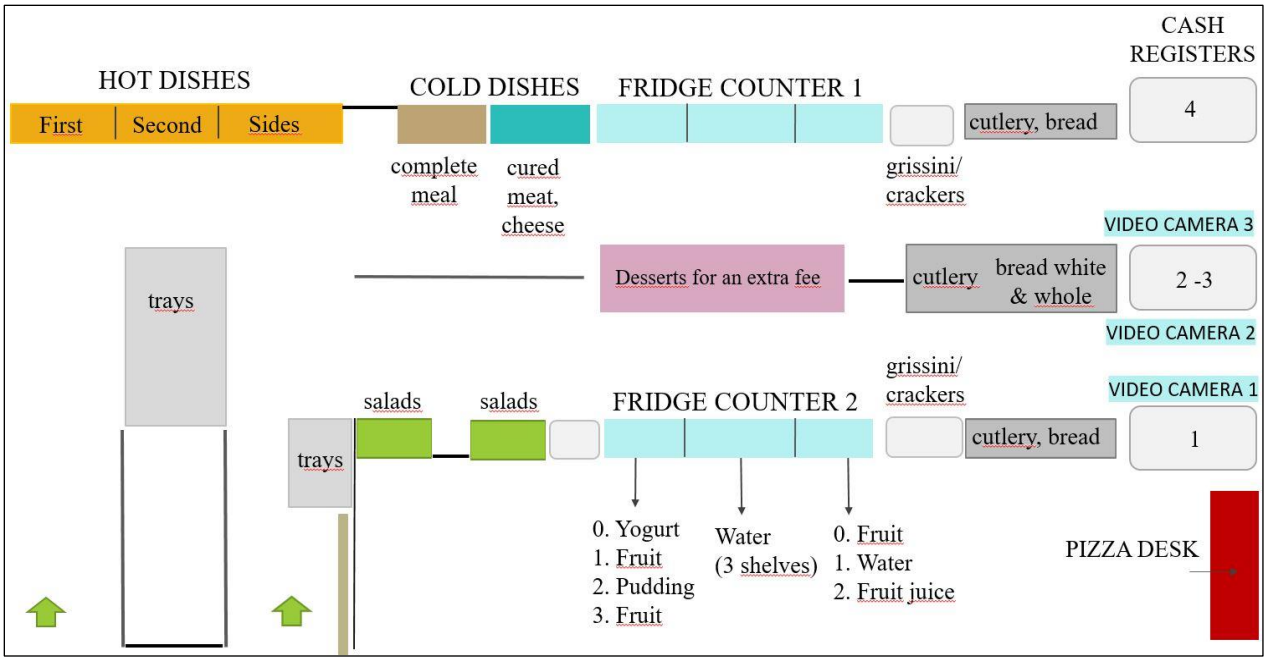


Figure 3. Map of the southern lunchroom during baseline (1) and during the communication phase (2).

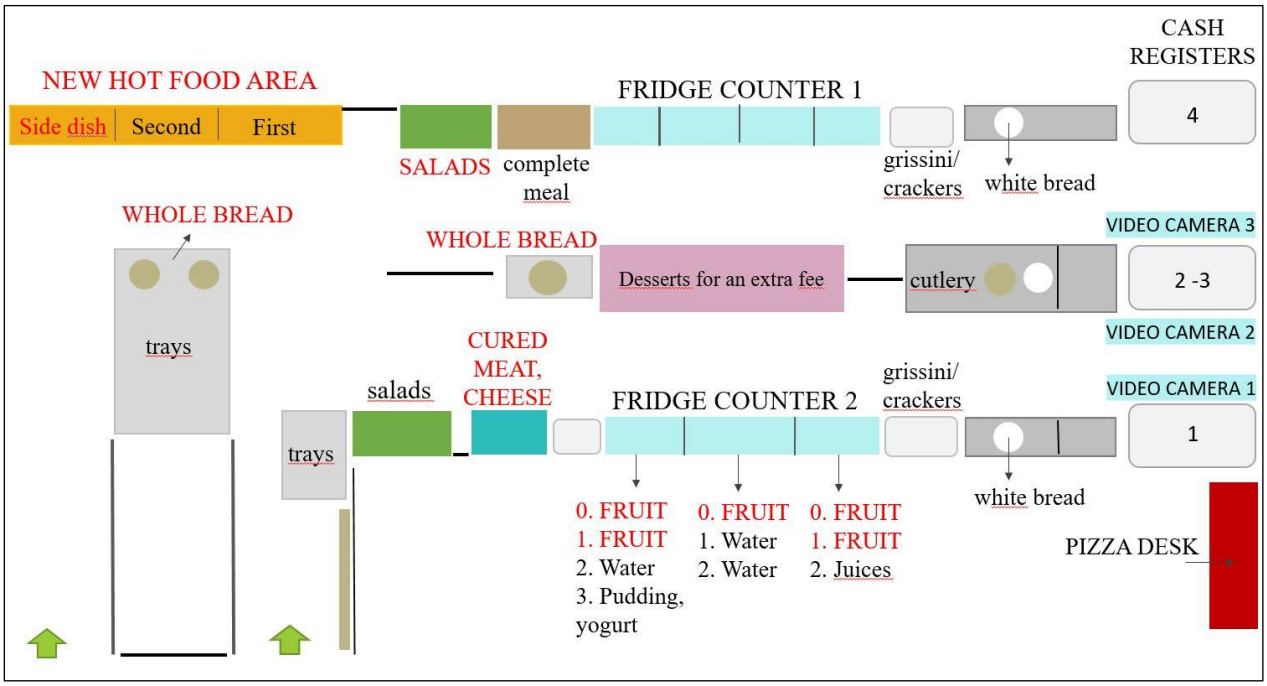


Figure 4. Map of the southern lunchroom during the nudging intervention (3).

Appendix B: Photographic documentation

Photos taken at the Northern Lunchroom during the baseline (1)

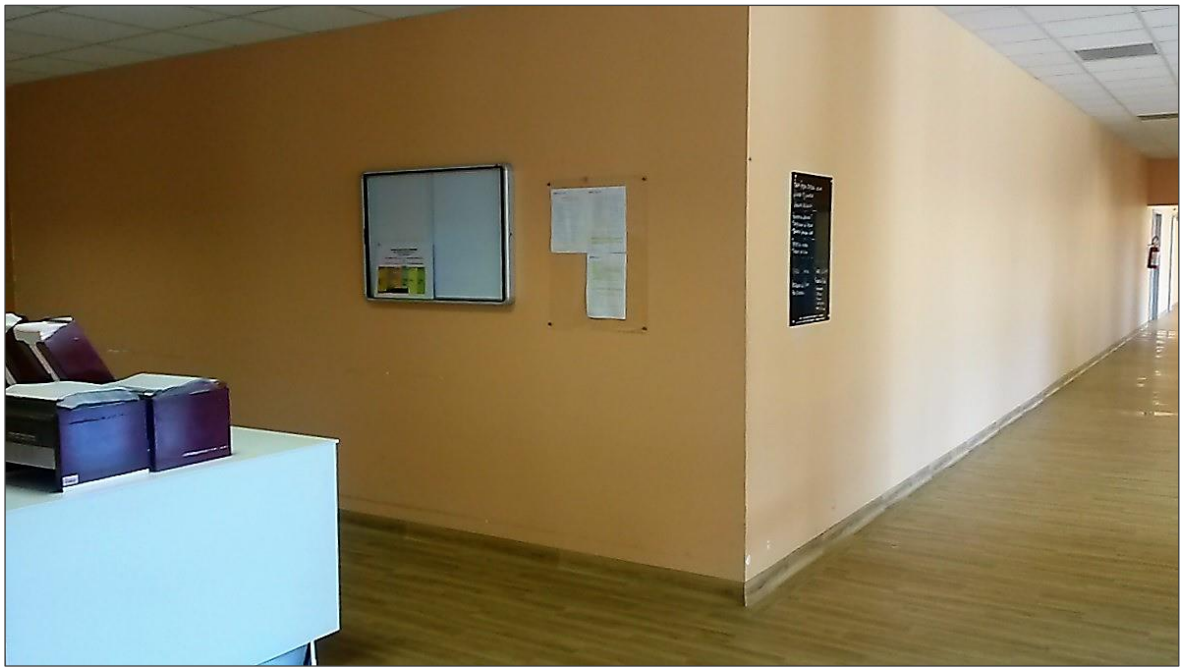


Figure 5. Walls on the right side at the entrance of the lunchroom.

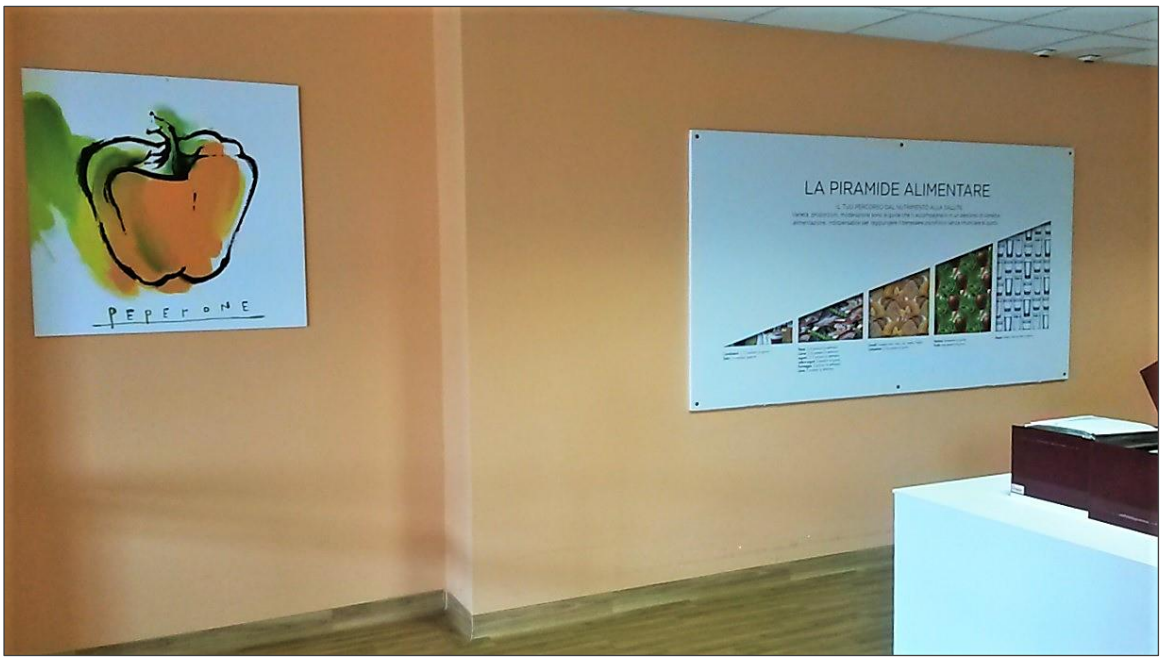


Figure 6. Walls on the left side at the entrance of the lunchroom.

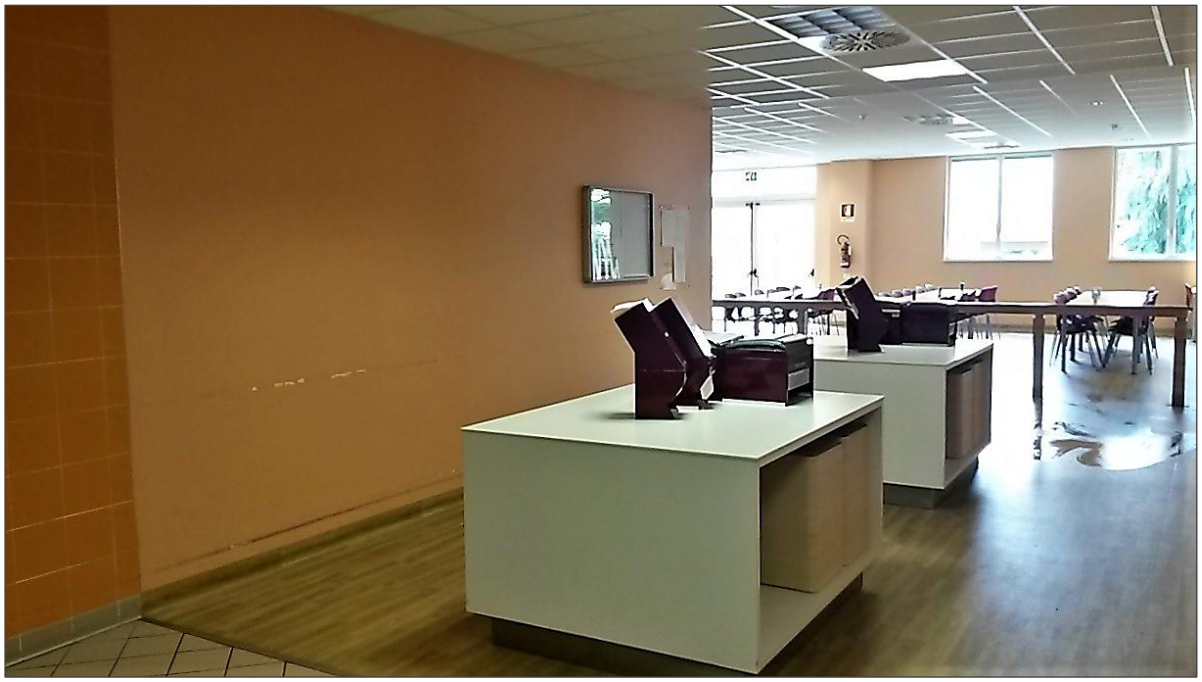


Figure 7. Entrance of the lunchroom where the trays are available.

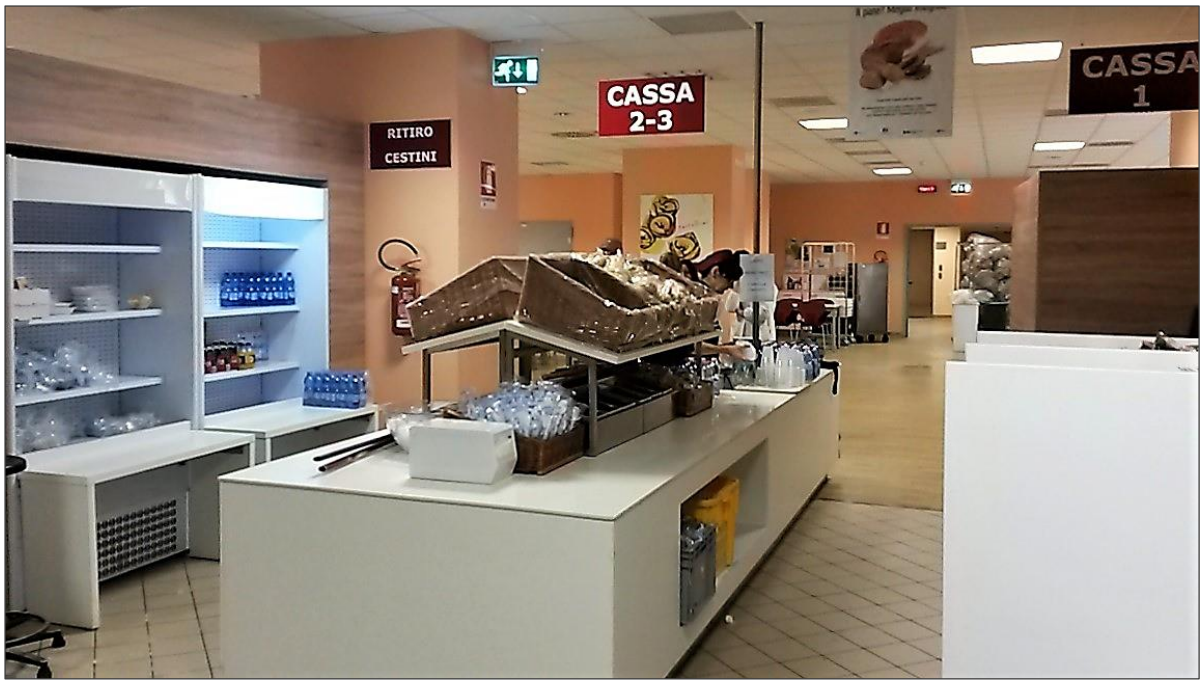


Figure 8. View of the counter with bread baskets before the cash registers.

Photos taken at the Northern Lunchroom during the communication week (2)

Figure 9. Wall on the left side of the entrance.

Figure 10. Wall on the right side of the entrance.

Photos taken at the Northern Lunchroom during week three (labelling)

Figure 11. Poster explaining the Like sticker located near to the menu blackboard.

Figure 12. The Like sticker added to the posters.

Figure 13. Like sticker at the vegetable side dish counter.

Figure 14. Like sticker on the fresh salads counter.

Figure 15. Like sticker at the fridge counter.

Figure 56. Like sticker on the whole bread baskets.

Photos taken at the Southern Lunchroom during the baseline (1)

Figure 17. Entrance of the lunchroom.

Figure 18. View of the hot meals serving area.

Figure 19. View of the lunchroom from the table at the entrance where trays are available.

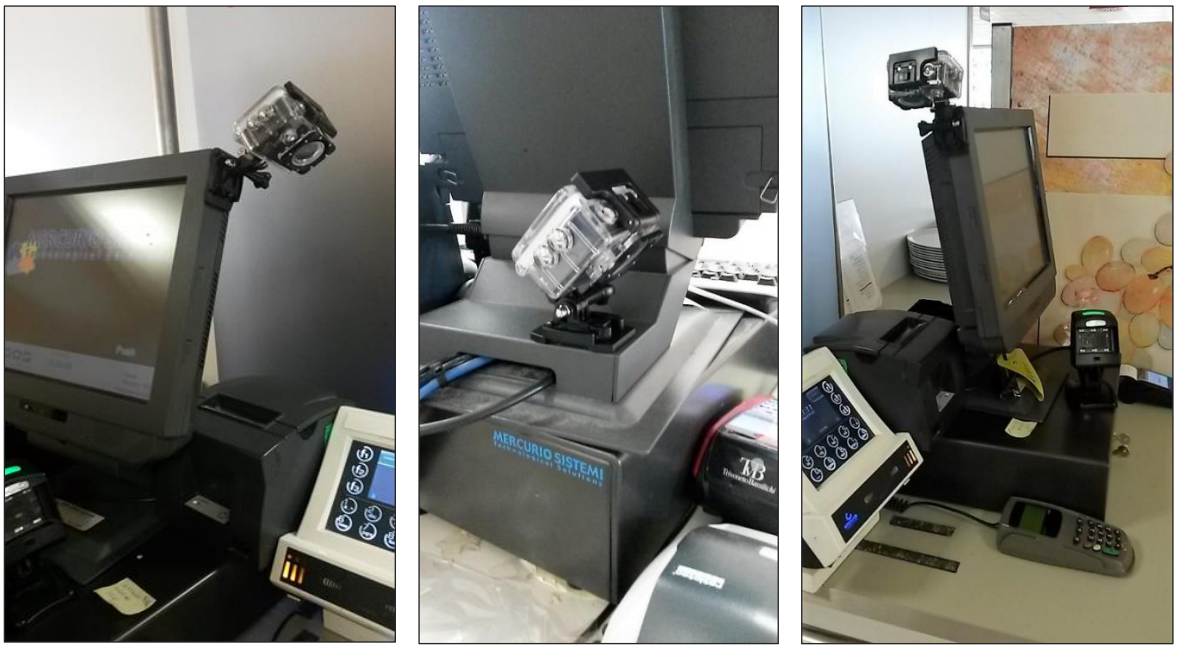


Figure 20. The images show the location of the three video cameras at the cash registers.

Photos taken at the Southern Lunchroom during week 3 (salience)

Figure 21. View of the whole bread baskets located at the entrance (unfortunately the poor quality of this image makes the bread look white, but this was actually whole bread).

Figure 22. View of the new table displaying two baskets (one per hallway) of whole bread.

Figure 23. View of the central space of the lunchroom, with salads counters in first position on both sides (yellow arrows).

Figure 24. View of the salad counter (left) and the counter that displays the 'complete meal' (right).

Figure 25. View of the fridge counter (left side of the hallway) displaying fresh fruit on the lower (tray level), and mid-level (eye-level) shelves.

Figure 26. View of the fridge counter on the right side of the hallway.

Bibliography

Aarts, H., and Custers, R. (2009) Habit, Action, and Consciousness. In "Encyclopedia of Consciousness", pp. 315–328

Aarts, H., and Dijksterhuis, A. (2003) The silence of library: environment, situational norm, and social behavior. Journal of Personality and Social Psychology, Vol. 84 (1): pp.18-28

Aarts, H., Custers, R., Veltkamp, M. (2006) Goal Priming and the Affective Motivational route to Non-Conscious Goal Pursuit. Social Cognition, Vol. 26 (5): pp. 555-577

Ainslie, G. (1975) Specious reward: a behavioral theory of impulsiveness and impulse control. Psychology Bulletin, Vol. 82 (4): pp. 463-496

Altmann, S., and Traxler, C. (2014) Nudges at the dentist. European Economic Review, Vol. 72: pp. 19–38

Appleton, K. M., Hemingway, A., Saulais, L., Dinnella, C., Monteleone, E., Depezay, L., Hartwell, H. (2016). Increasing vegetable intakes: rationale and systematic review of published interventions. European Journal of Nutrition, Vol. 55 (3): pp. 869–896

Arkes, H. R., and Blumer, C. (1985) The psychology of sunk costs. Organizational Behavior and Human Decision Processes, Vol. 35: pp. 124-140

Arno, A. and Thomas, S. (2016) The efficacy of nudge theory strategies in influencing adult dietary behaviour: a systematic review and meta-analysis. BMC Public Health, Vol. 16: pp. 676

Arriaga, A., Bader, A. M., Wong, J. M, Lipsitz, S. R., Berry, W. R., Ziewacz, J. E., Hepner, D. L. Boorman, J. D., Pozner, C., Smink, D., Gawande, A. (2013), Simulation-Based Trial of Surgical-Crisis Checklists. New England Journal of Medicine, Vol. 368: pp. 246-253

Asch, S. (1995) Opinions and Social Pressure. In "Readings About the Social Animal", Aronson and Freeman (ed.), New York.

ASST Bergamo Ovest (2016) Descrizione Buona Pratica Alimentazione [online] https://whpaslbg.files.wordpress.com/2015/11/asst-bg-ovest_corso-alimentazione.pdf

Atella V., Kopinska J., Medea G., Belotti F., Piano Mortari A., Cricelli C., Fontana L. (2014) Disease burden and relative health care expenditures associated with overweight and obesity. Mimeo.

ATS Brianza (2016) Piano Integrato Locale Degli Interventi Di Promozione Della Salute. Regione Lombardia [online] https://www.asl.lecco.it/intranet/docs_file/PIL_2016_ATS_Brianza.pdf

Bahia L., Coutinho E.S., Barufaldi L.A., Abreu Gde A., Malhão T.A., de Souza C.P., Araujo D.V. (2012) The costs of overweight and obesity-related diseases in the Brazilian public health system: cross-sectional study, BMC Public Health, Vol. 12: pp. 440

Banks, S. M., Salovey, P., Greener, S., Rothman, A. J., Moyer, A., Beauvais, J., Epel, E. (1995) The Effects of Message Framing on Mammography Utilization. Health Psychology, Vol. 14 (2): pp. 178-184

Bargh, J. A. (1990) Auto-motives: Preconscious determinants of social interaction. In E. T. Higgins, E. Tory, Sorrentino, R. M. (Ed) "Handbook of motivation and cognition: Foundations of social behavior", Vol. 2: pp. 93-130. New York, NY, US: Guilford Press

Bargh, J. A. (1994) The four horsemen of automaticity: Awareness, intention, efficiency, and control in social cognition. In Wyer, Robert S., Jr. (Ed); Srull, Thomas K. (Ed), "Handbook of social cognition: Basic processes; Applications" Vols. 1-2, 2nd ed. (pp. 1-40). Hillsdale, NJ, US: Lawrence Erlbaum Associates

Bargh, J. A. (1997) The automaticity of everyday life. In Wyer, Robert S., Jr. (Ed) "The automaticity of everyday life: Advances in social cognition" Vol. 10 (pp. 1-61). Mahwah, NJ, US: Lawrence Erlbaum Associates Publishers

Bargh, J. A. (2005) Bypassing the Will: Toward Demystifying the Nonconscious Control of Social Behavior. Chapter in Hassin, Uleman, Bargh (Ed.) "The New Unconscious". New York: Oxford University Press

Bargh, J. A. (2006) What have we been priming all these years? On the development, mechanisms, and ecology of nonconscious social behavior. European Journal of Social Psychology, Vol. 36: pp. 147-168

Bargh, J. A. (2011) Unconscious thought theory and its discontents: a critique of the critiques. Social Cognition, Vol. 29 (6): pp. 629–647

Bargh, J. A. and Morsella, E. (2008) The Unconscious Mind. Perspectives on Psychological Science, Vol. 3 (1): pp. 73–79

Bargh, J. A. and Morsella, E. (2009) Unconscious behavioural guidance systems. Chapter in Agnew, Carlston, Graziano, Kelly (Ed.) "Then a miracle occurs: Focusing on behavior in social psychological theory and research". New York: Oxford University Press

Bargh, J. A., and Chartrand, T. L. (1999) The unbearable automaticity of being. American Psychologist, Vol. 54: pp. 462–479

Bargh, J. A., and Ferguson, M. J. (2000) Beyond behaviorism: On the automaticity of higher mental processes. Psychological Bulletin, Vol. 126 (6): pp. 925–94

Bargh, J. A., Chen, M., Burrows, L. (1996) Automaticity of social behaviour: Direct effects of trait construct and stereotype activation on action. Journal of Personality and Social Psychology, 71 (2): pp. 230–244

Bargh, J. A., Gollwitzer, P. M., Lee-Chai, A., Barndollar, K., Trötschel, R. (2001). The automated will: Nonconscious activation and pursuit of behavioral goals. Journal of Personality and Social Psychology, Vol. 81(6): pp. 1014–1027

Barros, G. (2010) Herbert A. Simon and the concept of rationality: Boundaries and procedures. Brazilian Journal of Political Economy, Vol. 30 (3): pp. 455-472

Bateson, M., Nettle, D., Roberts, G. (2006). Cues of being watched enhance cooperation in a real-world setting. Biology Letters, Vol. 2 (3): pp. 412–414

Baumeister, R. F., Vohs, K. D., Nathan DeWall, C., Liqing Zhang. (2007) How Emotion Shapes Behavior: Feedback, Anticipation, and Reflection, Rather Than Direct Causation. Personality and Social Psychology Review, Vol. 11 (2): pp. 167–203

Baumeister, R., Bratslavsky, E., Muraven, M., Case, D.M.T. (1998) Ego Depletion: is the Active Self a Limited Resource? Journal of Personality and Social Psychology, Vol. u. (5): pp. 1232-65

Bechara, A. and Damasio, A. R. (2005) The somatic marker hypothesis: A neural theory of economic decision. Games and Economic Behavior, 52 Vol. (2), 336–372

Behavioural Insights Team (BIT, 2011) Applying behavioural insight to health. London: Cabinet Office

Behavioural Insights Team (BIT, 2012) Test, Learn, Adapt: Developing Public Policy Using Randomised Controlled Trials. Cabinet Office [online] Available at: <https://www.gov.

uk/government/publications/test-learn-adapt-developing-public-policy-with-randomised-controlled-trials>

Behavioural Insights Team (BIT, 2014) EAST Four simple ways to apply behavioural insights. Cabinet Office [online] Available at: <http://www.behaviouralinsights.co.uk/publications/east-four-simple-ways-to-apply-behavioural-insights/>

Berkman, L. F., Glass, T., Brissette, I., & Seeman, T. E. (2000). From social integration to health: Durkheim in the new millennium. Social Science & Medicine, Vol. 51 (6): pp. 843–857

Birch, L. L., and Marlin, D. W. (1982) I don't like it; I never tried it: Effects of exposure on 2-year-old children's food preferences. Appetite, Vol. 3: pp. 353–360

Blanchette, L. and Brug, J. (2005) Determinants of fruit and vegetable consumption among 6-12-year-old children and effective interventions to increase consumption. Journal of Human Nutrition and Dietetics, Vol. 18 (6): pp. 431-43

Bloom, A. (1975) Justice: John Rawls vs. the tradition of political philosophy. American Political Science Review, Vol. 69 (02): pp. 648-662

Blumenthal-Barby, J. S. and Burroughs, H. (2012) Seeking Better Health Care Outcomes: The Ethics of Using the "Nudge". The American Journal of Bioethics, Vol. 12 (2): pp. 1–10

Blundell J., de Graaf C., Hulshof T., Jebb S., Livingstone B., Lluch A., et al. (2010) Appetite control: methodological aspects of the evaluation of foods. Obesity Review, Vol. 11 (3): pp. 251–70

Bode, S., He, A. H., Soon, C. S., Trampel, R., Turner, R., Haynes, J.-D. (2011) Tracking the Unconscious Generation of Free Decisions Using UItra-High Field fMRI. PLoS ONE, Vol. 6 (6): e21612

Bovens, L. (2009) The Ethics of Nudge. Preference Change, pp. 207–219

Brownell, K. D., and Horgen, K. B. (2004) "Food fight: The inside story of the food industry, America's obesity crisis, and what we can do about it". New York: McGraw-Hill, Contemporary Books

Bryan, J., and Tiggemann, M. (2001) The effect of weight-loss dieting on cognitive performance andpsychological well-being in overweight women. Appetite, Vol. 36: pp. 147–56

Buehler, R.G., Griffin, D., Ross, M. (1994) Exploring the "planning fallacy": why people underestimate their task completion times. Journal of Personality and Social Psychology, Vol. 67(3): pp. 366–81

Burton, J. (2010) WHO Healthy Workplace Framework and Model: Background and Supporting Literature and Practices. World Health Organization [online] http://www.who.int/occupational_health/healthy_workplace_framework.pdf

BVA (2016) French citizens nudged by BVA and the French tax administration [online] Available at: <http://www.bva.fr/en/news/press_releases/french_citizens_nudged_by_bva_and_the_french_tax_administration.html>

Camerer, C., Loewenstein, G., Prelec, D. (2005) Neuroeconomics: How Neuroscience Can Inform Economics. Journal of Economic Literature, Vol. 43(1): pp. 9–64

Carpenter, W. B. (1852) On the influence of suggestion in modifying and directing muscular movement, independently of volition. Proceedings of the Royal Institution, pp. 147–154

Carrasco, R., Labeaga, J. M., Lopez-Salido, J. D. (2005) Consumption and habits. Evidence from panel data. Economic Journal, Vol. 115: pp. 144–165

Cawley J., Meyerhoeferd C. (2012) The medical care costs of obesity: An instrumental variables approach, Journal of Health Economics, Vol. 31: pp. 219–230

Chaiken, S. (1980) Heuristic Versus Systematic Information Processing and the Use of Source Versus Message Cues in Persuasion. Journal of Personality & Social Psychology, Vol. 39(5): pp. 752-766

Chance, Z., Gorlin, M., Dhar, R. (2014) Why Choosing Healthy Foods is Hard, and How to Help: Presenting the 4Ps Framework for Behavior Change. Customer Needs and Solutions, Vol. 1 (4): pp. 253–262

Chandon P., and Wansink B. (2007) Is obesity caused by calorie underestimation? A psychophysical model of fast-food meal size estimation. Journal of Marketing Research, Vol. 44 (1): pp. 84-99

Chandon, P., and Wansink, B. (2002) When Are Stockpiled Products Consumed Faster? A Convenience–Salience Framework of Postpurchase Consumption Incidence and Quantity. Journal of Marketing Research, Vol. 39 (3): pp. 321–335

Chapman, G. B., and Johnson, E. J. (1999) Anchoring, Activation, and the Construction of Values. Organizational Behavior and Human Decision Processes, Vol. 79(2): pp. 115–153

Chartrand T. L., and Bargh J. A. (2002) Nonconscious motivations: Their activation, operation, and consequences. In Tesser, Stapel, Wood (Eds.) Self and Innovation: Emerging psychological perspectives. Washington. DC: American Psychological Association.

Chetty, R. (2015) Behavioral Economics and Public Policy: A Pragmatic Perspective. American Economic Review, American Economic Association, Vol. 105 (5): pp. 1-33

Cheung A., Weir, M., Mayhew, A., Kozloff, N., Brown, K., and Grimshaw, J. (2012) Overview of systematic reviews of the effectiveness of reminders in improving healthcare professional behavior. Systematic Reviews Journal, Vol. 1 (36): pp. 1-8

Cialdini, R.B. (2008) Influence: Science and Practice, 5th ed. Boston: Pearson

Codagnone, C., Bogliacino, F., Veltri, G. A., Gaskell, G. (2014) Nudging in the world of international policymaking. In A. Samson (Ed.) The Behavioral Economics Guide (pp. 51-58)

Cohen, D., and Babey, S. (2012) Contextual Influences on Eating Behaviors: Heuristic Processing and Dietary Choices. Obesity Review. Vol. 13 (9): pp. 766–779

Cornell, C. E., Rodin, J., Weingarten, H. (1989) Stimulus-induced eating when satiated. Physiology & Behavior, Vol. 45 (4): pp. 695–704

Custers, R., and Aarts, H. (2010) The Unconscious Will: How the Pursuit of Goals Operates Outside of Conscious Awareness. Science, Vol. 329 (5987): pp. 47–50

Dahlgren G. and Whitehead M. (1991) Policies and Strategies to Promote Equity in Health. Copenhagen: WHO Regional Office for Europe

Damasio A. R. (1994) Descartes' Error: Emotion, Reason and the Human Brain. New York: G.P. Putnam

Danner, U. N., Aarts, H., Vries, N. K. (2008) Habit vs. intention in the prediction of future behaviour: The role of frequency, context stability and mental accessibility of past behaviour. British Journal of Social Psychology, Vol. 47(2): pp. 245–265

Darwin, C. (1872) The expression of the emotions in man and animals. London: Fontana Press

Dayan, E. and Bar-Hillel, M. (2011) Nudge to nobesity II: Menu positions influence food orders. Judgment and Decision Making, Vol. 6 (4): pp. 333–342

Dennett, D. C. (1992) Consciousness explained. Back Bay Books

Dijksterhuis, A. P., Smith, P. K., van Baaren, R. B., Wigboldus, D. (2005) The Unconscious Consumer: Effects of Environment on Consumer Behavior. Journal of consumer psychology, Vol. 15 (3): pp. 193-202

Dijksterhuis, A., and van Knippenberg, A. (1998) The relation between perception and behavior, or how to win a game of Trivial Pursuit. Journal of Personality and Social Psychology, Vol. 74 (4): pp. 865–877

Diliberti, N., Bordi, P. L., Conklin, M. T., Roe, L. S, Rolls B. J. (2004) Increased portion size leads to increased energy intake in a restaurant meal. Obesity Research, Vol. 12: pp. 562–568

Dolan, P., Hallworth, M., Halpern, D., King, D., Vlaev, I. (2010) MINDSPACE: Influencing Behaviour through Public Policy. London: Cabinet Office and Institute for Government [online] available at: <https://www.instituteforgovernment.org.uk/sites/default/files/publications/MINDSPACE.pdf>

Downs, J. S., Loewenstein, G., Wisdom, J. (2009) Strategies for Promoting Healthier Food Choices. American Economic Review, Vol. 99 (2): pp. 1–10

Dubbert, P. M., Johnson, W. G., Schlundt, D. G., Montague, N. W. (1984) The influence of caloric information on cafeteria food choices. Journal of Applied Behavior Analysis, Vol. 17(1): pp. 85–92

Dumanovsky, T., Huang C. Y., Nonas, C. A., Matte, TD, Bassett, M. T., Silver, L. D. (2011) Changes in energy content of lunchtime purchases from fast food restaurants after introduction of calorie labelling: cross sectional customer surveys. BMJ (Clinical Research Ed), Vol. 343: d4464–d64

Dunning, D. (2005) Self-insight: Roadblocks and detours on the path to knowing thyself. New York: Psychology Press

Edelman B., Engell D., Bronstein P., Hirsch, E. (1986) Environmental effects on the intake of overweight and normal weight men. Appetite, Vol. 7: pp. 71–83

Elbel, B., Gyamfi, J., Kersh, R. (2011) Child and adolescent fast-food choice and the influence of calorie labeling: a natural experiment. International Journal of Obesity, Vol. 35 (4): pp. 493–500

Engel, G.L. (1977). The need for a new medical model: a challenge for biomedicine. Science, Vol. 196: pp.129-136

Ensaff, H., Homer, M., Sahota, P., Braybrook, D., Coan, S., McLeod, H. (2015) Food Choice Architecture: An Intervention in a Secondary School and its Impact on Students' Plant-based Food Choices. Nutrients, Vol. 7 (6): pp. 4426–4437

Epley, N., and Gilovich, T. (2010) Anchoring unbound. Journal of Consumer Psychology, Vol. 20(1): pp. 20–24

EURO/WHO (1991) The Budapest Declaration on Health Promoting Hospitals

EURO/WHO (1997) The Vienna Recommendation on Health Promoting Hospitals

Evans J. S., Over D.E., Manktelow K.I. (1993) Reasoning, decision making and rationality. Cognition, Vol. 49 (1-2): pp. 165-87

Faith, M.S., Fontaine, K.R., Baskin, M.L., Allison, D.B. (2007) Toward the reduction of population obesity: Macrolevel environmental approaches to the problems of food, eating, and obesity. Psychological Bulletin, Vol. 133: pp. 205–226

Favaretti, C. e Ricciardi, W. (2002) Le attività ed i risultati del progetto "Ospedali per la Promozione della Salute in Europa [online] <http://www.academia.edu/22094273/Le_attivit%C3%A0_ed_i_risultati _del_progetto_Ospedali_per_la_promozione_della_salute_in_Europa>

Favaretti, C., De Pieri, P., Marcolongo, A., Spolaore, P. (1999) Gli ospedali per la promozione della salute [online] <http://www.carlofavaretti.it/pdf/art_monografia_salute_territorio1999.pdf?>

Finkelstein, E. A., Strombotne, K. L., Chan, N. L., Krieger, J. (2011) Mandatory Menu Labeling in One Fast-Food Chain in King County, Washington. American Journal of Preventive Medicine, Vol. 40 (2): pp. 122–127

Finucane, M., Alhakami, A., SLovic, P., and Johnson, S. (2000) The Affect Heuristic in Judgments of Risks and Benefits. Journal of Behavioral Decision Making, Vol. 13: pp. 1-17

Fischer, M. and Lotz, S. (2014) Is Soft Paternalism Ethically Legitimate? – The Relevance of Psychological Processes for the Assessment of Nudge-Based Policies. Cologne Graduate School Working Paper, Vol. 5 (2)

Fishbach, A., Friedman, R. S., Kruglanski, A. W. (2003) Leading us not into temptation: Momentary allurements elicit overriding goal activation. Journal of Personality and Social Psychology, Vol. 84 (2): pp. 296–309

Fitzsimons, G. M., Chartrand, T. L., Fitzsimons, G. J. (2008) Automatic Effects of Brand Exposure on Motivated Behavior: How Apple Makes You "Think Different." Journal of Consumer Research, Vol. 35(1): pp. 21–35

Fontaine K.R., Redden D.T., Wang C., Westfall A.O., Allison D.B. (2003) Years of life lost due to obesity, Journal of the American Medical Association Vol. 289 (2): pp. 187–193

Food and Agriculture Organisation (2004) Fruit and Vegetables for Health. Report for a Joint FAO/WHO Workshop [online] available at: <http://www.who.int/dietphysicalactivity/publications/fruit_ vegetables_report.pdf>

Forwood, S. E., Ahern, A. L., Hollands, G. J., Ng, Y.-L., Marteau, T. M. (2015) Priming healthy eating. You can't prime all the people all of the time. Appetite, Vol. 89: pp. 93–102

Frederick, S., Loewenstein, G., O'donoghue, T. (2002) Time Discounting and Time Preference: A Critical Review. Journal of Economic Literature, Vol. 40 (2): pp. 351–401

Freud, S., and Breuer, J. (1895) Studies on Hysteria.

Friction: Experimental Evidence from Medicare Drug Plans. Quarterly Journal of Economics, Vol. 127 (1): pp. 199-235

Furedi, F. (2011) Defending Moral Autonomy Against an Army of Nudgers. Spiked [online] Available at: <http://tinyurl.com/6kfafka>

Gigerenzer, G., and Goldstein, D. G. (1996) Reasoning the fast and frugal way: Models of bounded rationality. Psychological Review, Vol. 103: pp. 650-669

Gigerenzer, G., and Todd, P. M. (1999) Fast and frugal heuristics: The adaptive toolbox, In G. Gigerenzer, P. M. Todd, and the ABC research group "Simple Heuristics that Make Us Smart" (pp. 3-34), New York: Oxford University Press

Giner-Sorolla, R. (2001) Guilty pleasures and grim necessities: Affective attitudes in dilemmas of self-control. Journal of Personality and Social Psychology, Vol. 80 (2): pp. 206–221

Glanzer, M., and Cunitz, A. R. (1966) Two storage mechanisms in free recall. Journal of Verbal Learning and Verbal Behavior, Vol. 5 (4): pp. 351-360

Goldin, J. (2015) Which Way To Nudge? Uncovering Preferences in the Behavioral Age. Yale Law Journal, Vol. 125 (1): pp. 1- 39

Goldstein, D. G., and Gigerenzer, G. (2002) Models of ecological rationality: the recognition heuristic. Psychological Review, Vol. 109(1): pp. 75-90

Goldstein, D. G., and Gigerenzer, G. (2009) Fast and frugal forecasting. International Journal of Forecasting, Vol. 25: pp. 760-772

Gollwitzer, P. M. (1999) Implementation intentions: Strong effects of simple plans. American Psychologist, Vol. 54: pp. 493-503

Gollwitzer, P. M. and Bargh, J. (2005) Automaticity in goal pursuit. Elliot A.J. and Dweck C. (Ed) "Handbook of Competence and Motivation", chapter 34: pp. 624-646. London: Guildford Press

Goodale, M. A., Milner, A. D., Jakobson, L. S., Carey, D. P. (1991) A neurological dissociation between perceiving objects and grasping them. Nature, Vol. 349 (6305): pp. 154–156

Goodwin, T. (2012) Why We Should Reject "Nudge." Politics, Vol. 32 (2): pp. 85–92

Gortmaker S.L. et al., Social and Economic Consequences of Overweight in Adolescence and Young Adulthood, New England Journal of Medicine, Vol. 329, pp. 1008-1012, 1993

Greenwald, A. G., McGhee, D. E., Schwartz, J. L. K. (1998) Measuring individual differences in implicit cognition: The Implicit Association Test. Journal of Personality and Social Psychology, Vol. 74: pp. 1464–1480

Groene, O. and Garcia-Barbero, M. (2005) Health Promotion in Hospitals: Evidence and Quality Management. Country Systems, Policies and Services Division of Country Support WHO Regional Office for Europe.

Gurol-Urganci I., de Jongh, T., Vodopivec-Jamsek, V., Atun, R., Car, J.1. (2013) Mobile phone messaging reminders for attendance at healthcare appointments. Cochrane Database of Systematic Reviews, Vol. 12: pp. 2-24

Guthrie, J. (2010). A Nudge in the Right Direction: USDA Sponsors Behavioral Economics Research to Promote Healthy Eating at School. United States Department of Agriculture [online] Available at: <http://blogs.usda.gov/2010/11/18/anudge-in-the-right-direction-usda-sponsors-behavioral-economics-research-to-promotehealthy-eating-at-school/>

Guthrie, J., Mancino, L., and Lin, C.-T. J. (2015) Nudging Consumers toward Better Food Choices: Policy Approaches to Changing Food Consumption Behaviors. Psychology & Marketing, Vol. 32 (5): pp. 501–511

Haidt, J., McCauley, C.M., Rozin, P. (1994) Individual differences in sensitivity to disgust: A scale sampling seven domains of disgust elicitors. Personality and Individual Differences, Vol. 16: pp. 701-713

Hallsworth M., Berry, D., Sanders, M., Sallis, A., King, D., Vlaev, I. (2015) Stating Appointment Costs in SMS Reminders Reduces Missed Hospital Appointments: Findings from Two Randomised Controlled Trials. PLOS ONE Vol. 10 (9): pp. 1-14

Hanks, A. S., Just, D. R., Smith, L. E., Wansink, B. (2012) Healthy convenience: nudging students toward healthier choices in the lunchroom. Journal of Public Health, Vol 34 (3): pp. 370-376

Hanks, A. S., Just, D. R., Wansink, B. (2013a) Preordering School Lunch Encourages Better Food Choices by Children. JAMA Pediatrics, Vol. 167 (7): pp. 673

Hanks, A. S., Just, D. R., Wansink, B. (2013b) Smarter lunchrooms can address new school lunchroom guidelines and childhood obesity. The Journal of Pediatrics, 162(4): pp. 867-9

Harnack, L. J., French, S. A., Oakes, J. M., Story, M. T., Jeffery, R. W., Rydell, S. A. (2008) Effects of calorie labeling and value size pricing on fast food meal choices: Results from an experimental trial. International Journal of Behavioral Nutrition and Physical Activity, Vol. 5(1): pp. 63

Hausman, D. M. and Welch, B. (2010) Debate: To Nudge or Not to Nudge. The Journal of Political Philosophy, Vol. 18 (1): pp. 123–136

Haynes, A.B., Weiser, T.G., Berry, W. R., Lipsitz, S.R., Breizat, A., Dellinger, P., Herbosa, T., Joseph, S., Kibatala, P.L., Lapitan, M.C., Merry, A.F., Moorthy, K., Reznick, R., Taylor, B., and Gawande, A. (2009) A Surgical Safety Checklist to Reduce Morbidity and Mortality in a Global Population, New England Journal of Medicine, Vol. 360: pp. 491-499

Haynes, J.-D., Sakai, K., Rees, G., Gilbert, S., Frith, C., Passingham, R. E. (2007) Reading Hidden Intentions in the Human Brain. Current Biology, Vol. 17 (4): pp. 323–328

Heath, R. (2012) Seducing the Subconscious: The Psychology of Emotional Influence in Advertising. Wiley-Blackwell

Herman, C. P., Roth, D. A., Polivy, J. (2003) Effects of the presence of others on eating: A normative interpretation. Psychological Bulletin, Vol. 129: pp. 873–886

Heukelom, F. (2006) Kahneman and Tversky and the Origin of Behavioral Economics. Tinbergen Institute Discussion Paper

HM Government (2010) The Coalition: Our Program for Government. London: HM Government

Holdsworth, M., Haslam, C., Holdsworth, M. A. (1998) review of point-of-choice nutrition labelling schemes in the workplace, public eating places and universities. Journal of Human Nutrition and Dietetics, Vol. 11: pp. 423–45

Holland, R. W., Hendriks, M., Aarts, H. (2005) Smells Like Clean Spirit: Nonconscious Effects of Scent on Cognition and Behavior. Psychological Science, Vol. 16 (9): pp. 689–693

Hollands, G. J., Shemilt, I., Marteau, T. M., Jebb, S. A., Kelly, M. P., Nakamura, R., Ogilvie, D. (2013). Altering micro-environments to change population health behaviour: towards an evidence base for choice architecture interventions. BMC Public Health, Vol. 13 (1)

IRCSS Policlinico San Donato (2015) Progetto EAT Alimentazione Sostenibile [online] Available at: <http://www.progetto-eat.it/>

Istituto Nazionale di Ricerca per gli Alimenti e la Nutrizione (2003). Linee Guida per una sana alimentazione italiana. Roma: Revisione 2003

Jacoby, J. (1984) Perspectives of Information Overload. Journal of Consumer Research, Vol.10: pp. 432-435

James, W. B. (1890) The principles of Psychology, Vol I, II. Cambridge, MA: Harvard University Press

Johnson, E. J. and Goldstein, D. G. (2004) Defaults and donation decisions. Transplantation, Vol. 78 (12): pp. 1713-1716

Johnson, E. J., and Goldstein, D. G. (2003) Do Defaults Save Lives? Science, Vol. 302 (5649): pp. 1338–1339

Johnson, E. J., Shu, S. B., Dellaert, B. G. C., Fox, C., Goldstein, D. G., Häubl, G., Larrick, R. P., Payne, J. W., Peters, E., Schkade, D., Wansink, B., Weber, E. U. (2012) Beyond nudges: Tools of a choice architecture. Marketing Letters, Vol. 23(2): pp. 487–504

Jones, G, and Richardson, M. (2007) An objective examination of consumer perception of nutrition information based on healthiness ratings and eye movements. Public Health Nutrition, Vol. 10: pp. 238–44

Kahn, B. E., and Wansink, B. (2004) The Influence of Assortment Structure on Perceived Variety and Consumption. Journal of Consumer Research, Vol. 30 (4): pp. 519-533

Kahneman, D. (2003) Mapping Bounded Rationality. American Psychologist, Vol. 58 (9): pp. 697–720

Kahneman, D. (2011) Thinking Fast and Slow. New York: Farrar, Straus and Giroux, Macmillan.

Kahneman, D. and Frederick, S. (2002) Representativeness Revisited: Attribution Substitution in Intuitive Judgment. In Heuristics of Intuitive Judgment: Extensions and Applications. Gilovich, Griffin and Kahneman, eds. New York: Cambridge University Press, pp. 49–81

Kahneman, D. and Tversky, A. (1979) Prospect Theory: An Analysis of Decision under Risk. Econometrica, Vol. 47 (2): pp. 263-292

Kahneman, D., and Varey, C. A. (1990) Propensities and counterfactuals: The loser that almost won. Journal of Personality and Social Psychology, Vol. 59: pp. 1101–1110

Kahneman, D., Knetsch, J., Thaler, R. (1991) Anomalies: The endowment effect, loss aversion, and status quo bias. Journal of Economic Perspectives, 5 (1): pp. 193-206

Kahneman, D., Slovic, P., Tversky, A. (1982) Judgment Under Uncertainty: Heuristics and Biases. Cambridge: Cambridge University Press

Kay, A. C., Wheeler, S. C., Bargh, J. A., Ross L. (2004) Material Priming: The Influence of Mundane Physical Objects on Situational Construal and Competitive Behavior Choice. Organizational Behavior and Human Decision Processes, Vol. 95 (1): pp. 83–96

Kearney J. M., Hulshof K. F., Gibney M. J. (2001) Eating patterns - temporal distribution, converging and diverging foods, meals eaten inside and outside of the home - implications for developing FBDG. Public Health Nutrition, Vol. 4: pp. 693–698

Keer, M., Putte, B., Neijens, P. (2010) The role of affect and cognition in health decision making. British Journal of Social Psychology, 49(1), 143–153

Keller, P. A., Harlam, B., Loewenstein, G., Volpp, K. G. (2011) Enhanced active choice: A new method to motivate behavior change. Journal of Consumer Psychology, Vol. 2: pp. 376-383

Kern, R. P., Libkuman, T., Otani, H., Holmes, K. (2005) Emotional Stimuli, Divided Attention, and Memory. Emotion, Vol. 5 (4): pp. 408-417

Kirby, K. N., and Guastello, B. (2001) Making choices in anticipation of similar future choices can increase self-control. Journal of Experimental Psychology Applied, Vol.7 (2): pp. 154–164

Kiviniemi, M. T., and Duangdao, K. M. (2009) Affective associations mediate the influence of cost–benefit beliefs on fruit and vegetable consumption. Appetite, Vol. 52(3): pp. 771–775

Kiviniemi, M. T., Voss-Humke, A. M., Seifert, A. L. (2007) How Do I Feel About the Behavior? The Interplay of Affective Associations with Behaviors and Cognitive Beliefs as Influences on Physical Activity Behavior. Health Psychology, Vol. 26: pp. 152–158

Kling, J., Mullainathan, S., Shafir, E., Vermeulen, L.C., and Wrobe, M.V. (2012), Comparison Friction Experimental Evidence from Medicare Drug Plans. The Quarterly Journal of Economics, Vol. 127 (1): pp. 199-235

Klockner, C. A., and Prugsamatz, S. (2012) Habits as barriers to change behaviour. Psykologisk Tidsskrift, Vol. 16 (3): pp. 26-30

Lapinski, M. K. and Rimal, R. N. (2005) An explication of social norms. Communication Theory, Vol. 15 (2): pp. 127–147

Lau, H. C. and Passingham, R. E. (2007) Unconscious Activation of the Cognitive Control System in the Human Prefrontal Cortex. Journal of Neuroscience, Vol. 27 (21): pp. 5805–5811

Ledikwe, J. H., Ello-Martin, J.A, Rolls, B.J. (2005) Portion Sizes and the Obesity Epidemic. Journal of Nutrition, Vol. 135 (4): pp. 905–909

Lerner, J. S., Small, D. A., Loewenstein, G. (2004) Heart Strings and Purse Strings. Carryover Effects of Emotions on Economic Decisions. Psychological Science, Vol. 15 (5): pp. 337–341

Levine, L. J. and Edelstein, R. S. (2009) Emotion and memory narrowing: A review and goal-relevance approach. Cognition and Emotion, Vol. 23 (5): pp. 833-875

Levitsky, D. A. (2005) The non-regulation of food intake in humans: hope for reversing the epidemic ofobesity. Physiology and behavior, Vol. 86: pp. 623–32

Levitsky, D. A., Obarzanek E., Mrdjenovic, G., Strupp, B. J. (2005) Imprecise control of energy intake: absence of a reduction in food intake following overfeeding in young adults. Physiology and behavior, Vol. 84: pp. 669–75

Libet, B. (1993) Unconscious cerebral initiative and the role of conscious will in voluntary action. Neurophysiology of Consciousness: pp. 269–306

Libet, B., Gleason, C. A., Wright, E. W., and Pearl, D. K. (1983). Time of Conscious Intention to Act in Relation to Onset of Cerebral Activity (Readiness-Potential). Brain, Vol. 106 (3): pp. 623–642

Libet, B., Pearl, D. K., Morledge, D. E., Gleason, C. A., Hosobuchi, Y., Barbaro, N. M. (1991) Control of the transition from sensory detection to sensory awareness in man by the duration of a thalamic stimulus. Brain, Vol. 114 (4): pp. 1731–1757

Liu, P.J., Wisdom, J., Roberto, C.A., Liu, L.J., Ubel, P.A. (2013) Using behavioral economics to design more effective food policies to address obesity. Appl Econ Perspect Pol, Vol. 36: 6–24

Loftus, E. F. and Klinger, M. R. (1992) Is the unconscious smart or dumb? American Psychologist, Vol. 47 (6): pp. 761–765

Lowe, M. R., Butryn, M. L., Didie, E. R., Annunziato, R. A., Thomas, J. G., Crerand, C. E., Halford, J. (2009) The Power of Food Scale. A new measure of the psychological influence of the food environment. Appetite, Vol. 53 (1): pp. 114–118

Lupton, D. (1994) Toward the Development of Critical Health Communication Praxis. Journal of Health Communication, Vol. 6

Ly, K. and Soman, D. (2013) Nudging Around The World. Research Report Series “Behavioural Economics in Action”. Rotman School of Management, University of Toronto

Maas, J., de Ridder, D.T., de Vet, E., de Wit, J.B. (2012) Do distant foods decrease intake? The effect of food accessibility on consumption. Psychology & Health, Vol. 27 (sup2): 59–73

MacAndrews, M. P., Glisky, E. L., Schacter, D. L. (1987) When priming persists: longlasting implicit memory for a single episode in amnesic patients. Neuropsychologia, Vol. 25: pp. 497-506

Mann, T. and Ward, A. (2004) To Eat or Not to Eat: Implications of the Attentional Myopia Model for Restrained Eaters. Journal of Abnormal Psychology, Vol. 113 (1): pp. 90–98

Marteau, T. M., Ogilvie, D., Roland, M., Suhrcke, M., Kelly, M. P. (2011) Judging nudging: can nudging improve population health? BMJ, Vol. 342 (jan25 3): d228–d228

Mattes, R. (1990) Hunger ratings are not a valid proxy measure of reported food intake in humans. Appetite, Vol. 15 (2): pp. 103-113

McNeil, B. J., Pauker, S. G., Sox, H. C., and Tversky, A. (1982) On the Elicitation of Preferences for Alternative Therapies. New England Journal of Medicine, Vol. 306 (21): pp.1259–1262

McNeil, B. J., Pauker, S. G., Sox, H. C., Tversky, A. (1982) On the Elicitation of Preferences for Alternative Therapies. New England Journal of Medicine, Vol. 306(21): pp. 1259–1262

Metcalfe, J., and Mischel, W. (1999) A hot/cool-system analysis of delay of gratification: Dynamics of willpower. Psychological Review, Vol. 106: pp. 3–19

Milkman, K., Beshears, J., Choi, J., Laibson, D., Mandrian, B. (2011) Using implementation intentions prompts to enhance influenza vaccination rates. Proceedings of the National Academy of Sciences, Vol. 108: pp. 10415-1020

Mills, C. (2013) Why Nudges Matter: A reply to Goodwin. Politics, Vol. 33 (1): pp. 28 –36

Milosavljevic, M., Koch, C., Rangel, A. (2011) Consumers can make decisions in as little as a third of a second. Judgment and Decision Making, Vol. 6 (6): pp. 520–530

Molden, D. C. (2014) What is "social priming"? Understanding priming effects in social psychology: what is "social priming" and how does it occur? Social cognition, vol. 32: pp. 1–11

Morewedge, C. K., and Kahneman, D. (2010) Associative processes in intuitive judgment. Trends in Cognitive Sciences, Vol. 14 (10): pp. 435–440

Murdock, B. Jr. (1962) The serial position effect of free recall. Journal of Experimental Psychology, Vol. 64 (5): pp. 482-488

Mussweiler, T., and Englich, B. (2005) Subliminal anchoring: Judgmental consequences and underlying mechanisms. Organizational Behavior and Human Decision Processes, Vol. 98 (2): pp. 133–143

Naik, N. Y., and Moore, M. J. (1996) Habit formation and intertemporal substitution in individual food consumption. Review of Economics and Statistics, Vol. 78(2): pp. 321-328

Neal, D. T., Wood, W., Quinn, J. M. (2006) Habits: A Repeat Performance. Current Directions in Psychological Science, Vol. 15(4): pp. 198–202

Nickerson, R. S. (1998) Confirmation Bias: A Ubiquitous Phenomenon in Many Guises. Review of General Psychology, Vol. 2 (2): pp. 175-220

Nolan, J., Schultz, W., Cialdini, R.B., Goldstein, N., Griskevircius, V. (2008) Normative Social influence is Underdetected. Personality and Social Psychology Bulletin, Vol. 34: pp. 913-923

North, A. C., Hargreaves, D. J., and McKendrick, J. (1997) In-store music affects product choice. Nature, Vol. 390 (6656): pp. 132

O'Connor, J. C. (1988) Effects of Framing and Level of Probability on Patients' Preferences for Cancer Chemotherapy, Journal of Clinical Epidemiology, Vol. 42 (2): pp. 119-126

O'Donoghue T, and Rabin M. (2000) The economics of immediate gratification. Journal of Behavioural Decision Making, Vol. 13 (2): pp. 233–50

O'Dwyer, N.A., McCarthy, S. N., Burke, S. J., Gibney, M. J. (2005) The temporal pattern of the contribution of fat to energy and of food groups to fat at various eating locations: implications for developing food-based dietary guidelines. Public Health Nutrition, Vol. 8: pp. 249–257

O'Donoghue, T., and Rabin, M. (1999) Doing it now or later. American Economic Review, Vol. 89(1): pp. 103-124

Organisation for Economic Cooperation and Development (2010) Consumer Policy Toolkit. [online] Available at: <http://www.keepeek.com/Digital-Asset-Management/oecd/governance/consumer-policy-too lkit_9789264079663-en#page1>

Osservatorio nazionale sulla salute nelle regioni italiane (2016) Rapporto Osservasalute: Stato di salute e qualità dell'assistenza nelle regioni italiane [online] Available at: <file:///C:/Users/victoria/Downloads/ro-2016.pdf>

Oztop E., Kawato M., Arbib M. (2006) Mirror neurons and imitation: A computationally guided review. Neural Networks, Vol. 19: pp. 254-271

Painter, J. E., Wansink, B., Hieggelke, J. B. (2002) How visibility and convenience influence candy consumption." Appetite, Vol. 38 (3): pp. 237-8

Papies, E. K., and Hamstra, P. (2010) Goal priming and eating behavior: Enhancing self-regulation by environmental cues. Health Psychology, Vol. 29(4): pp. 384–388

Perry, C., Chhatralia, K., Damesick, D., Hobden, S., Volpe, L. (2015) Behavioural Insights in Health Care: Nudging to reduce inefficiency and waste. London: Health Foundation

Peters E. (2009) A perspective on eating behaviors from the field of judgment and decision making. Annals of Behavioral Medicine, Vol. 38: S81–S87

Peters, E., Dieckmann, N., Dixon, A., Hibbard, J. H., Mertz, C. K. (2007) Less is more in presenting quality information to consumers. Med Care Res Rev, Vol. 64 (2): pp. 169–90

Peters, E., Vastfjall, D., Slovic, P., Mertz, C. K., Mazzocco, K., Dickert, S. (2006) Numeracy and decision making. Psychology Science, Vol. 17(5): pp. 407–13

Petty, R. E., Cacioppo, J. T., Schumann, D. (1983) Central and Peripheral Routes to Advertising Effectiveness: The Moderating Role of Involvement. Journal of Consumer Research, Vol. 10 (2): pp. 135

Poothullil, J. M. (2002) Role of oral sensory signals in determining meal size in lean women. Nutrition, Vol. 18 (6): pp. 479–483

Posner, M. I., and Snyder, C. R. R. (1975) Attention and cognitive control. In R. L. Solso (Ed.), "Information processing and cognition: The Loyola Symposium". Potomac, MD: Erlbaum

Prentice, A. M. and Jebb, S.A. (2004) Fast foods, energy density and obesity: A possible mechanistic link. Obesity Review, Vol. 4: pp. 187–194

Prinz, W. (1997) Perception and action planning. European Journal of Cognitive Psychology, Vol. 9: pp. 129-154

Prinz, W. (2003) How do we know about our own actions? In S. Maasen, W. Prinz, and G. Rogh (Eds.), Voluntary action: Brains, minds, and sociality, pp. 21-33. New York: Oxford University Press

Proffitt, D. R. (2006) Embodied Perception and the Economy of Action. Perspectives on Psychological Science, Vol. 1(2): pp. 110–122

Pronin, E., Berger J., Molouki S. (2007) Alone in a crowd of sheep: asymmetric perceptions of conformity and their roots in an introspection illusion. Journal of Personality Social Psychology, Vol. 92 (4): pp. 585–95

Quinn, J. M., and Wood, W. (2005) Habits across the lifespan. Unpublished manuscript, Duke University, Durham, NC.

Rainford, P. and Tinkler, J. (2011) Designing for nudge effects: how behaviour management can ease public sector problems. Innovating through design in public sector services seminar series, Vol. 23, LSE Public Policy Group

Ratner, R. K., and Riis, J. (2014) Communicating science-based recommendations with memorable and actionable guidelines. Proceedings of the National Academy of Sciences, Vol. 111 (Supplement_4): pp. 13634–13641

Rawls, J. (1971) Justice as Fairness [online] Available at: <https://macaulay.cuny.edu/eportfolios/thorne15/files/2015/03/Rawls-JUSTICE-AS-FAIRNESS.pdf>

Regione Lombardia (2014) Manuale WHP: Come aderire alla Rete Workplace Health Promotion Lombardia e diventare una Azienda che promuove salute [online] Available at: <http://www.assolombarda.it/servizi/salute-e-sicurezza-sul-lavoro/documenti/manuale-whp>

Regione Lombardia (2015) Piano Regionale della Prevenzione 2015–2018 (PNR) [online] Available at: <http://www.welfare.regione.lombardia.it/shared/ccurl/243/708/Allegato%20alla%20DGR%203654%20PRP%202015-2018_RL+Tab.Indicatori.pdf >

Report ASL Lodi (2014) Workplace Health Promotion, Regione Lombardia. Dipartimento di Prevenzione Medico, USSD: Prevenzione, Controllo e Orientamento al Cliente [online] https://retewhplombardiadotorg.files.wordpress.com/2015/01/report-lodi.pdf

Rete WHP Bergamo [online] https://retewhpbergamo.org/

Riet, J. Van't, Sijtsema, S. J., Dagevos, H., De Bruijn, G.-J. (2011) The importance of habits in eating behaviour. An overview and recommendations for future research. Appetite, Vol. 57(3): pp. 585–596

Rizzo, M., and Whitman, D. (2008) Little Brother is Watching You: New Paternalism on the Slippery Slopes. SSRN eLibrary [online] Available at: <http://tinyurl.com/6879ruy>

Rizzolatti, G. and Vozza, L. (2007) Nella mente degli altri. Neuroni specchio e comportamento sociale. Bologna: Zanichelli

Roberto, C. A., and Brownell, K. D. (2011) The imperative of changing public policy to address obesity. In: The Oxford handbook of the social science of obesity. Oxford UK: Oxford University Press

Roberto, C. A., and Kawachi, I. (2014) Use of Psychology and Behavioral Economics to Promote Healthy Eating. American Journal of Preventive Medicine, Vol. 47(6): pp. 832–837

Rolls, B. J. (1986) Sensory-specific satiety. Nutrition Review, Vol. 44: pp. 93–101

Rolls, B. J. and McDermott, T. M. (1991) Effects of age on sensory-specific satiety. The American Journal of Clinical Nutrition, Vol. 54: pp. 988–96

Rolls, B. J., Rowe, E. A., Rolls, E. T., Kingston, B., Megson, A., Gunary, R. (1981) Variety in a meal enhances food intake in man. Physiology and Behavior, Vol. 26 (2): pp. 215–221

Rolls, B., Morris, L., Roe, L. (2003) Portion Size of Food Affects Energy Intake in Normal-Weight and Overweight Men and Women. American Journal of Clinical Nutrition, Vol. 76 (6): pp. 1207-13

Rozin, P. (1996) Sociocultural influences on human food selection. In E. D. Capaldi (Ed.), Why we eat what we eat: The psychology of eating (pp. 233–263). Washington, DC: American Psychological Association.

Rozin, P., Scott, S., Dingley, M., Urbanek J.K., Jiang, H., Kalternach, M. (2011) Nudge to Nobesity I: minor changes in accessibility decrease food intake. Judgement and Decision Making, Vol. 6: pp. 323-332

Russo, V. (2015) Neuromarketing, comunicazione e comportamento di consumo. Milano: Franco Angeli Editore.

Samson, A. (2015) Behavioural Economics Guide 2015 (with an introduction by Dan Ariely) [online] Available at: <http://www.behavioraleconomics.com>

Samuelson, W. and Zeckhauser, R.J. (1988) Status quo bias in decision-making. Journal of Risk and Uncertainty, Vol. 1: pp. 7-59

Sassi F. (2010) Obesity and the Economics of Prevention: Fit not Fat. OECD

Schacter, D. L. (1992) Priming and Multiple Memory Systems: Perceptual Mechanisms of Implicit Memory. Journal of Cognitive Neuroscience, Vol. 4 (3): pp. 244–256

Schacter, D. L. Peter Chiu, C.Y., Ochsner, K. N. (1993) IMPLICIT MEMORY: A Selective Review. Annual Review Neuroscience, Vol. 6: pp. 159-82

Schlaghecken, F., and Eimer, M. (2004). Masked prime stimuli can bias "free" choices between response alternatives. Psychonomic Bulletin & Review, Vol. 11 (3): pp. 463–468

Schnellenbach, J. (2012): Nudges and norms. On the political economy of soft paternalism, European Journal of Political Economy, Vol. 28 (2): pp. 266-277

Schopenhauer, Arthur (1851). The Wisdom of Life.

Schultz, W., Nolan, J., Cialdini, R.B., Goldstein, N., Griskevircius, V. (2007) The Constructive, Destructive, and Reconstructive Power of Social Norms. Psychological Science, Vol. 18 (5): pp. 429-434

Schwartz, B. (2004) The Paradox of Choice: Why More is Less. Harper-Collins Ebooks.

Schwartz, J., Mochon, D., Wyper, L., Maroba, J., Patel, D., Ariely, D. (2014) Healthier by precommitment. Psychological Science Vol. 25 (2): pp. 538–546

Schwartz, J., Riis, J., Elbel, B. and Ariely, D. (2012) Inviting Consumers To Downsize Fast-Food Portions Significantly Reduces Calorie Consumption. Health Affairs, Vol. 31 (2): pp 399-407

Schwartz, M. B. (2007) The influence of a verbal prompt on school lunch fruit consumption: A pilot study. International Journal of Behavioral Nutrition and Physical Activity, Vol. 4 (1): p. 6

Schwarz, N., and Clore, G. L. (1983) Mood, misattribution, and judgments of well-being: Informative and directive functions of affective states. Journal of Personality and Social Psychology, Vol. 45: pp. 513–523

Schwarz, N., Bless, H., Strack, F., Klumpp, G., Rittenauer-Schatke, H., Simons, A. (1991) Ease of retrieval as information: Another look at the availability heuristic. Journal of Personality and Social Psychology, Vol. 61: pp. 195–202

Seeman, T. E. (1996). Social ties and health: The benefits of social integration. Annals of Epidemiology, Vol. 6 (5): pp. 442–451

Sela, A., Berger, J., Liu, W. (2008) Variety, Vice, and Virtue: How Assortment Size Influences Option Choice. Journal of consumer research, Vol. 35 (6): pp. 941-951

Selinger, E. (2015) Concerns over Nudging. ISSP - Initiative for Science, Society, and Policy [online] Available at: <http://www.issp.center/wp-content/uploads/2015/04/Concerns-over-nudging.pdf>

Selinger, E. and Whyte, K. (2011) Is There a Right Way to Nudge? The Practice and Ethics of Choice Architecture. Sociology Compass, Vol. 5: pp. 923–935

Sen, A. (1977) Rational Fools: A Critique of the Behavioural Foundations of Economic Theory. Philosophy & Public Affairs, Vol. 6 (4): pp. 317-344

Simon, H. A. (1947) Administrative behaviour: A Study of Decision-making Processes in Administrative Organization, 1st ed., New York: The Macmillan Company

Simon, H. A. (1955) A Behavioural Model of Rational Choice. The Quarterly Journal of Economics, Vol. 69 (1): pp. 99-118

Sims, H., Sanghara, H., Hayes, D., Wandiembe, S., Finch, M., Jakobsen, H., Tsakanikos, E., Okocha, C.I., Kravariti, E. (2012) Text message reminders of appointments: a pilot intervention at four community mental health clinics in London. Psychiatric Services, Vol. 63: pp. 161-168

Slovic, P., Finucane, M., Peters, E., MacGregor, D. G. (2002) The affect heuristic. In T. Gilovich, D. Griffin, and D. Kahneman (Eds.), Heuristics and biases (pp. 397–420). New York: Cambridge University Press

Smith, A. (1776) The Wealth of Nations.

Sobal, J., and Wansink, B. (2007) Kitchenscapes, tablescapes, platescapes, and foodscapes: Influences of microscale built environments on food intake. Environment and Behavior, Vol. 39: pp. 124–142

Sorveglianza Passi (2017) Consumo di frutta e verdura [online] Available at: <http://www.epicentro.iss.it/passi/dati/frutta.asp>

Sorveglianza Passi (2017a) [online] Sovrappeso e obesità – Mappe percentuali per regione. Available at: <http://www.epicentro.iss.it/passi/dati/sovrappeso.asp>

Squire, E. and Kandel, L. (2000) Memory: From Mind to Molecules. Henry Holt and Company

Stanovich, K. E. and West, R. F. (2000) Individual differences in reasoning: Implications for the rationality debate. Behavioral and Brain Sciences, Vol. 23: pp. 645–665

Stock, A. and Stock, C. (2004) A short history of ideo-motor action. Psychological Research, Vol. 68 (2-3): pp. 176–188

Struttura Tutela della persona, Promozione della Salute e Igiene degli alimenti UO Governo della Prevenzione e tutela sanitaria (2015) Programma "Aziende che Promuovono Salute – Rete WHP Lombardia" Report attività 2014.

Stutts, M. A., Zank, G.nM., Smith K. H., Williams, S. A. (2011) Nutrition information and children's fast foodmenu choices. Journal of Consumer Affairs, Vol. 45 (1): pp. 52–86

Sunstein, C. R. (2014a) Simpler: the Future of Government. New York: Simon & Schuster

Sunstein, C. R. (2014b) Nudging: A Very Short Guide. Journal of Consumer Policy, Vol. 37: pp. 583

Suntein, C. R. (2015) Nudging and Choice Architecture: Ethical Considerations. Discussion Paper No. 809, forthcoming in Yale Journal on Regulation

Temple, J. L., Johnson, K. M., Archer, K., Lacarte, A., Yi, C., Epstein, L. H. (2011) Influence of simplified nutrition labeling and taxation on laboratory energy intake in adults. Appetite, Vol. 57 (1): pp. 184–192

Thaler, R. H. and Sunstein, C. R. (2008) Nudge: Improving Decisions about Health, Wealth, and Happiness. Yale University Press

Thaler, R. H., and Sunstein, C. R. (2003) Libertarian Paternalism. American Economic Review, Vol. 93 (2): pp. 175–179

The White House (2015) Executive order: Using behavioral science insights to better serve the American people [online] Available at: <https://www.whitehouse.gov/the-press-office/2015/09/15/executiveorder-using-behavioral-science-insights-better-serve-american>

Thorndike, A.N., Sonnenberg, L., Riis, J., Barraclough, S., Levy, D.E. (2012) A 2 phase labeling and choice architecture intervention to improve healthy food and beverage choices. Am J Public Health, Vol. 102: pp. 527–33

Tsai A.G., Williamson D.F., Glick H.A. (2011) Direct medical cost of overweight and obesity in the USA: a quantitative systematic review, Obesity Reviews, Vol. 12: pp. 50–61

Tulving, E., and Schacter, D. (1990) Priming and human memory systems. Science, Vol. 247 (4940): pp. 301–306

Tversky, A., and Kahneman, D. (1973) Availability: A Heuristic for Judging Frequency and Probability. Cognitive Psychology, Vol. 5: pp. 207-232

Tversky, A., and Kahneman, D. (1974) Judgment under Uncertainty: Heuristics and Biases. Science, New Series, Vol. 185 (4157): pp. 1124-1131

Tversky, A., and Kahneman, D. (1981) The framing of decisions and the psychology of choice. Science, Vol. 211 (4481): pp. 453–458

Tversky, A., and Kahneman, D. (1983) Extensional vs. intuitive reasoning: The conjunction fallacy in probability judgment. Psychological Review, Vol. 90: pp. 293–3l5

Uleman, J. S., Newman, L. S., Moskowitz, G. B. (1996) People as flexible interpreters: Evidence and issues from spontaneous trait inferences. In M. P. Zanna (Ed.), “Advances in experimental social psychology”, pp. 211–279

Vadiveloo, M. K., Dixon, L. B., Elbel, B. (2011) Consumer purchasing patterns in response to calorie labeling legislation in New York City. International Journal of Behavioral Nutrition and Physical Activity, Vol. 8 (1): pp. 51

Van der Heijden, J. and Kosters, M. (2015) From mechanism to virtue: Evaluating Nudge-theory. Working Paper, N. 80, Regulatory Institutions Network

Van Kleef, E., Otten, K., van Trijp, H. C.M. (2012) Healthy snacks at the checkout counter: A lab and field study on the impact of shelf arrangement and assortment structure on consumer choices. BMC Public Health, Vol. 12

Vartanian, L. R., Herman, C. P., Wansink, B. (2008) Are we aware of the external factors that influence our food intake? Health Psychology, Vol. 27 (5): pp. 533–538

Vase, E. (2015) Kalorier på kaffeautomaten - et pilotprojekt af "situated information" nudging. Rapport af Kræftens Bekæmpelse [online] available at: < https://www.cancer.dk/dyn/resources/File/file/1/4681/ 1428651372/kaloriemaerkning-pa-kaffeautomater.pdf>

Verplanken, B. and Wood, W. (2006) Interventions to Break and Create Consumer Habits. Journal of Public Policy and Marketing, Vol. 25 (1): pp. 90–103

Vohs, K. D., Mead, N. L., Goode, M. R. (2006) The Psychological Consequences of Money. Science, Vol. 314 (5802): pp. 1154–1156

Volpp, K. G., John, L. K., Troxel, A. B., Norton, L., Fassbender, J., Loewenstein, G. (2008) A randomized controlled trial of financial incentives for weight loss. Journal of the American Medical Association, Vol. 300 (22): pp. 2631–2637

Voyer, B. G. (2015) Nudging behaviours in healthcare: insights from behavioural economics. British Journal of Healthcare Management, Vol. 21 (3): pp. 130-135

Vreugdenburg, L., Bryan J., Kemps, E. (2003) The effect of self-initiated weight-loss dieting on working memory: the role of preoccupying cognitions. Appetite, Vol. 41: pp. 291–300

Walsh, E. M., Kiviniemi, M. T. (2014) Changing how I feel about the food: experimentally manipulated affective associations with fruits change fruit choice behaviors. Journal of Behavioral Medicine, Vol. 37 (2): pp. 322–331

Wansink B., and Sobal J. (2007) Mindless eating: the 200 daily food decisions we overlook. Environmental Behaviour, Vol. 39 (1): pp. 106–23

Wansink B., and van Ittersum, K. (2007) Portion size me: downsizing our consumption norms. Journal of American Dietetic Association, Vol. 107 (7): pp. 1103–6

Wansink, B. (2004) Environmental factors that increase the food intake and consumption volume of unknowing consumers. Annual Review of Nutrition, Vol. 24: pp. 455–579

Wansink, B. (2010) From mindless eating to mindlessly eating better. Physiology and Behavior, Vol. 100: pp. 454-463

Wansink, B., and Chandon, P. (2006) Can “low-fat” nutrition labels lead to obesity? Journal of Marketing Research, Vol. XLIII: pp. 605–617

Wansink, B., and Chandon, P. (2014) Slim by Design: Redirecting the accidental drivers of mindless overeating. Journal of Consumer Psychology, Vol. 24 (3): pp. 413-431

Wansink, B., and Hanks, A. S. (2013) Slim by Design: Serving Healthy Foods First in Buffet Lines Improves Overall Meal Selection. PLoS ONE, Vol. 8 (10)

Wansink, B., and Kim, J. (2005) Bad Popcorn in Big Buckets: Portion Size Can Influence Intake as Much as Taste. Journal of Nutrition Education and Behavior, Vol. 37 (5): pp. 242–245

Wansink, B., Cheney, M. M., Chan, N. (2003) Exploring comfort food preferences across age and gender. Physiology and Behavior, Vol. 79: pp. 739–747

Wansink, B., Just, D. R., Payne, C. R. (2009) Mindless Eating and Healthy Heuristics for the Irrational. American Economic Review, Vol. 99 (2): pp. 165–169

Wansink, B., Just, D. R., Payne, C. R., Klinger, M. Z. (2012) Attractive names sustain increased vegetable intake in schools. Preventive Medicine, Vol. 55 (4): pp. 330–332

Wansink, B., Painter, J. E., North, J. (2005) Bottomless Bowls: Why Visual Cues of Portion Size May Influence Intake. Obesity Research, Vol. 13 (1): pp. 93–100

White House (2016) FACT SHEET: New Progress on Using Behavioral Science Insights to Better Serve the American People. Office of the Press Secretary [online] Available at: <https://obamawhitehouse.archives.gov/the-press-office/2016/09/15/fact-sheet-new-progress-using behavioral-science-insights-better-serve>

Wilson T, Nisbett R. (1978) The accuracy of verbal reports about the effects of stimuli on evaluations and behavior. Social Psychology, Vol. 41: pp. 118–31

Wilson, A. L., Buckley, E., Buckley, J. D., Bogomolova, S. (2016) Nudging healthier food and beverage choices through salience. and priming. Evidence from a systematic review. Food Quality and Preference, Vol. 51: pp. 47-64

Wilson, T. and Brekke, N. (1994) Mental Contamination and Mental Correction: Unwanted Influences on Judgments and Evaluations. Psychological Bulletin, Vol.1 1(6): pp. 117-142

Wong, M. S., Nau, C., Kharmats, A. Y., Vedovato, G. M., Cheskin, L. J., Gittelsohn, J., Lee, B. Y. (2015) Using a computational model to quantify the potential impact of changing the placement of healthy beverages in stores as an intervention to "Nudge" adolescent behavior choice. BMC Public Health, Vol. 15 (1): pp. 1284

Wood, W. and Neal, D. T. (2009) The habitual consumer. Journal of Consumer Psychology, Vol. 19 (4): pp. 579–592

Wood, W., and Neal, D. T. (2007) A new look at habits and the habit-goal interface. Psychological Review, Vol. 114(4): pp. 843–863

Wood, W., and Neal, D. T. (2009) The habitual consumer. Journal of Consumer Psychology, Vol. 19 (4): pp. 579–592

Wood, W., Quinn, J. M., Kashy, D. A. (2002) Habits in everyday life: Thought, emotion, and action. Journal of Personality and Social Psychology, Vol. 83(6): pp. 1281–1297

Wood, W., Tam, L., Witt, M. G. (2005) Changing Circumstances, Disrupting Habits. Journal of Personality and Social Psychology, Vol. 88(6): pp. 918–933

World Health Organisation (2009) WHO Guidelines for Safe Surgery. Safe Surgery Save Lives [online] Available at: <http://apps.who.int/iris/bitstream/10665/44185/1/9789241598552_eng.pdf>

World Health Organisation (WHO, 2017) Promoting fruit and vegetable consumption around the world, Information sheet [online] Available at: <http://www.who.int/dietphysicalactivity/fruit/en/index2.html>

World Health Organization (2003) Social Determinants of Health: the Solid Facts. Wilkinson and Marmot (ed.) [online] Available at: http://www.euro.who.int/__data/assets/pdf_file/0005/98438/e81384.pdf

World Health Organization (2009) Milestones in Health Promotion: Statements from Global Conferences [online] Available at: <http://www.who.int/healthpromotion/Milestones_Health_Promotion_05022010 .pdf>

World Health Organization (2015) Guideline: Sugars intake for adults and children. Geneva. [online] Available at: <http://apps.who.int/iris/bitstream/10665/149782/1/9789241549028_eng.pdf?ua=1>

Zajonc, R. B. (1980) Feeling and thinking. Preferences need no inferences. American Psychologist, Vol. 35: pp. 151-175

Zajonc, R. B. (1984) On the primacy of affect. American Psychologist, Vol. 39: pp. 117–123

Zajonc, R. B. (2001) Mere Exposure: a Gateway to the Subliminal. Current Directions in Psychological Science, Vol. 10 (6): pp. 224-228